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Analysis of four categories of environmentally friendly building assessment (case study: Ministry of Energy and Mineral Resources, Jakarta)

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Abstract. *The Chairul Saleh Building, or the Secretariat General Office Building, has implemented the Energy Management Program since 2016. In this study, an assessment was carried out based on the Greenbuilding Council Indonesia (GBCI) using the rating tool of greenship existing building ver 1.1. The assessment focused on 4 out of 6 greenship categories: appropriate site development, energy efficiency and conservation, water conservation, and building environmental management. Points assessment provides the requirement analysis to get a green predicate, which fulfills the standard. The results showed that Chairul Saleh building had implemented 10 of the 16 points in the appropriate site development category, 29 of the 36 maximum points for energy efficiency and conservation. Meanwhile, water conservation category managed to get 5 out of 20 maximum points and 11 out of 13 points for building and environmental management. Material resource, and cycle get 8 out of 12 points, indoor health, and comfort get 9 out of 20 points, which was determined in the GBCI greenship rating tools for the existing building. The result revealed that the total value of Chairul Saleh Building was 72 of the 117 maximum points. Based on the rating system by the GBCI greenship, the Chairul Saleh building is currently awarded a certificate of Gold Rating for its ability to apply the green building standard.*

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INTRODUCTION

In the last two decades, there has been rapid infrastructure development, the population has increased, the urban area has grown very high, and the need for clean water has increased greatly. These conditions has impact on decreasing land functions in urban area because built infrastructure commonly ignoring environment value, which results in the problem of groundwater (Djaendi 2003). Land planning –is said to be sustainable if it has the lowest environmental impact, and is financially feasible, complies with development parameters and meets its development objectives. Sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their needs (Wheeler 2013). According to Wheeler (2013), sustainable development is a development that improves the long-term health of human systems and ecology.

Frick and Suskiyatno (2007) stated that in Indonesia almost all buildings built since 1950 do not meet the requirements for sustainable development. This is enough to show that buildings and structures are big in creating a balance of ecosystems, especially in environmental issues of air resources. In this case, green building is a construction technology that is in harmony with nature, sustainable, environmentally friendly, and efficient in the use of natural resources. Maintenance is an important step in maintaining the quality of a building, especially from the aspect of appropriate site development (ASD), energy efficiency and conservation (EEC), water conservation (WAC), and building and environment management. Maintenance is a combination of various actions taken to maintain an asset, or repair it to an acceptable condition with reference to the standards set by the organization that performs maintenance (Corder 1996).

The need for water in the city, especially in DKI Jakarta, is increasing over time in line with the increase in population and economic development. Based on the latest data from the Department of Population and Civil Registration, the total population of DKI Jakarta in 2019 reached 11,063,324, including 4,380 foreigners. Meanwhile, the area of DKI Jakarta is 662.33 km² according to Governor Decree No. 171 of 2007. Water availability for both quantity and quality tends to decline because of water pollution, disruption of infiltration functions, changes in water catchment functions, and disruption of the balance of the subsurface hydrological system (Damayanti 2011). Therefore, it is necessary to make serious efforts to conserve water resources so that water has the opportunity to seep into the ground. Water conservation, in principle, is the use of rainwater that falls on the ground and is managed as efficiently as possible with proper flow regulation so that there are no floods during the rainy season and sufficient water is available during the dry season. Water conservation can be done by increasing the utilization of hydrological components in the form of surface water and groundwater as well as increasing the efficiency of irrigation use (Sallata 2015).

The Chairul Saleh Building has also implemented an energy management program since 2016 for energy saving and efficiency through various programs and activities. By installing renewable energy in the form of solar panels with a capacity of 34 kWp resulted in energy savings of up to 81,156 kWh or 5.39% of energy consumption in 2016. Increasing the knowledge and expertise of building managers in operating and maintaining buildings, as well as involving employees in energy-saving activities, resulted in energy savings of up to 308.029 kWh or 20.5% of energy consumption in 2016. Energy saving efforts continued in 2019 with the same pattern relying on good operational patterns supported by the use of renewable energy and a building automation system (BAS) to run electrical equipment. These efforts resulted in energy savings of up to 318,700 kWh or 21.17% of energy consumption in 2016. Entering 2020, the Chairul Saleh Building is also implementing ISO 50001 energy management system: 2018 since 2020. Those excellent performance of energy conservation is in line with green-building principles. However, it's unknown the contribution to the assessment point of greenship.

Hence, an efficient and effective energy and water conservation system is urgently needed, based on the principles of benefit, balance, and sustainability, in order to maintain the continuity of the availability of resources in supporting sustainable development. In this case, green building is a construction technology that is in harmony with nature, is sustainable, environmentally friendly, and efficient in the use of natural resources (Anbarci et al. 2012). Indonesia already has green building rating system for new and existing buildings, namely in the form of a greenship developed by Green Building Council Indonesia (GBCI). One of the important benefits of the green building concept is the climate and natural environment. Green Building can not only reduce or eliminate negative impacts on the environment, but in most cases it has a positive impact on the environment at the building or city scale. GBCI is an independent (non-government) institution that is fully committed to public education in applying environmental best practices (GBCI 2010).

The green building concept can be applied to both new buildings and existing buildings. Greenship of existing building from GBCI rating tools consist of 6 categories, namely appropriate site development (ASD), energy efficiency and conservation (EEC), water conservation (WAC), material resources and cycle (MRC), indoor health and comfort (IHC) and building and environmental management (BEM). The four selected categories (ASD, EEC, WAC, and BEM) are the focus of the research because they relate directly to the quality

of building site development. The purpose of this study is to provide an assessment of the existing condition of the Chairul Saleh Building based on green building for the categories of appropriate site development, energy efficiency and conservation, water conservation, and building and environmental management, on the GBCI rating tools.

METHOD

Location and Time

The research was conducted from February 2021 to May 2021. The location of the research was at the Ministry of Energy and Mineral Resources building on Jalan Medan Merdeka Selatan, Central Jakarta. Researcher chose this location because the Ministry of Energy and Mineral Resources have energy audit program and won the Subroto Award in the Field of Energy Efficiency, especially for Category A "Energy Efficient Buildings" sub-category Green Buildings and Special Innovations.

Data Collection and Analysis Methods

The assessment carried out refers to greenship rating tools of GBCI, namely a collection of several values or credits that determine whether the building deserves the title of green building or not. The scoring system is divided into three types of criteria, namely prerequisite (P), credit, and bonus criteria (GBCI 2017). Chairul Saleh building is an existing building category that has been operating since 1980. Assessment of the Chairul Saleh Building is carried out based on the GBCI Greenship for existing building version 1.1. The level of assessment score achievement was categorized into 4 levels: Platinum if a minimum percentage 73% with score 83, Gold if a minimum percentage 57% with score 66, Silver if a minimum percentage 46% with score 53 and Bronze if a minimum percentage 35% with score 41. In this study, the assessment focused on for 4 out of 6 categories, namely: Appropriate Site Development (ASD), Efficiency and Conservation (EEC), water conservation (WAC), and Building Environmental Management (BEM).

The other 2 of greenship categories, namely Material Resources and Cycle (MRC) and Indoor Health and Comfort (IHC) were used to obtain total score; thus certificate rating could be determined. The data used in this study are primary and secondary data. Primary data was obtained through direct observation in the field and interviews (in-depth interviews) with stakeholders and related key persons. Secondary data were obtained from literature studies, namely books, related journals and previous research. The data obtained from the research are in the form of quantitative and qualitative data. Quantitative data is processed by mathematical calculations using Microsoft Excel program. The results of data analysis are then presented in the form of matrices, graphs, and charts and described descriptively.

RESULTS AND DISCUSSION

The Chairul Saleh Building of the Ministry of Energy and Mineral Resources was established in 1979 with an area of each floor of approximately 618.75 m2 with a total building area of approximately 6,499.71 m^2. This building consists of 10 floors and 1 rooftop floor, which functions as the central building of the Ministry of Energy and Mineral Resources (Office of the Secretariat General). Each floor of this building consists of employee rooms with a total of 583 civil servants/populations, 102 PPNPN population/populations, and 249 building managers, the total building users are only 685 people because building managers are not included. Although not yet certified green, the Chairul Saleh Building or the Secretariat General Office Building has implemented the Energy Management Program since 2016.

As part of the government agency in charge of energy conservation policies, the Secretariat General of the Ministry of Energy and Mineral Resources is committed to implementing energy and water savings. Energy-saving programs carried out at the Secretariat General of Energy and Mineral Resources are implementing energy-saving policies, forming energy and water-saving teams, setting budgets, and developing

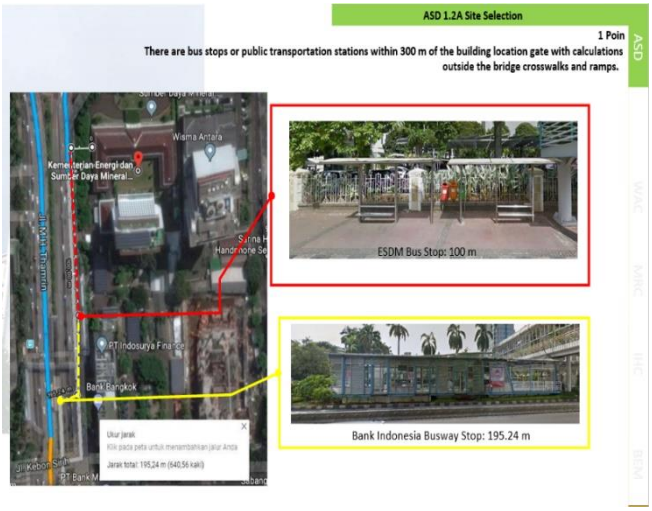
savings programs. In this study, an assessment was carried out on the Ministry of Energy and Mineral Resources building using the GBCI greenship rating tools, especially for aspects of land use, energy efficiency and conservation, water conservation, and building environmental management aspects. The following are the results of the assessment that has been carried out on these four aspects:

Appropriate Site Development (ASD)

The ASD category consists of 2 prerequisite ratings, 7 regular ratings and no bonus ratings with a maximum total of 16 regular points. The results of the Ministry of Energy and Mineral Resources Building assessment based on the application of benchmarks for the ASD category in the GBCI Greenship rating tools for built buildings version 1.1 can be seen in Table 1.

Table 1 Results of the ESDM Ministry Building assessment for the ASD category

No.	Rating tools	Assessment results	Point	Max
1.	Site management policy	There is a statement of commitment from top management regarding exterior building maintenance, integrated pest management (IPM), and weeds and habitat management around the site using non-toxic materials (fulfilled).	P	
2.	Motor vehicle reduction policy	There has been a statement of commitment from top management regarding taking various actions in order to achieve a reduction in the use of private motorized vehicles, for example, carpooling, feeder buses, public transportation vouchers and parking tariff discrimination, and weeds and habitat management around the site using non-toxic materials (fulfilled).	P	
3.	Community accessibility	(1) There are at least 5 types of public facilities within reach of the main road as far as 500 m from the site (Figure 1) (fulfilled).  Figure 1 Five types of public facilities within reach of the main road as far as 500 m from the site (2) Bus stop or public transportation station within 300 m. From the main site of the Chairul Saleh Building, Ministry of Energy and Mineral Resources, there are two bus stops, namely the ESDM Stop and the BI Busway Stop, which are 100 m and 195.24 m away from the location, respectively (Figure 2) (fulfilled).	3	3

No.	Rating tools	Assessment results	Point	Max
		 Figure 2 Public transport stops or stations within 300 m (3) Facilities for pedestrian paths within the building area to go to the nearest public transportation bus stop or station in accordance with the Minister of Public Works Regulation No. 30/PRT/M/2006 Chapter 2B (fulfilled).		
4.	Motor vehicle reduction	(1) Reducing the use of private motorized vehicles with one of the options: car 2 pooling, feeder bus, public transportation vouchers, or parking tariff discrimination. The Ministry of Energy and Mineral Resources building has 4 employee buses (fulfilled). (2) There is a secure bicycle parking space of 1 parking unit per 30 permanent building users, up to a maximum of 100 bicycle parking units. The Ministry of Energy and Mineral Resources has provided more than 1 bicycle parking unit (fulfilled).	2	2
5.	Site landscaping	(1) Vegetation (softscape) that is free from garden buildings (hardscape) located on 1 land surface with an area of at least 30% of the total land area. The percentage of softscape to the total land area of the Ministry of Energy and Mineral Resources is 23.27% (not fulfilled) with the following calculation: Softscape area (%) = $\frac{10{,}121.21\ m^2}{43{,}492.81\ m^2} \times 100\% = 23.27\%$ (2) Using 60% of local plants from local nurseries with a maximum distance of 1,000 km. The percentage of local canopy to the total softscape of the Ministry of Energy and Mineral Resources is 75.90% (fulfilled) with the following calculation: Total local headers (%) = $\frac{7{,}682.01\ m^2}{10{,}121.21\ m^2} \times 100\%$ = 75.90% %	1	3

No.	Rating tools	Assessment results	Point	Max
6.	Heat island effect	The minimum albedo value, according to the GBCI is 0.3 for roofs that are covered with pavement and 1 for non-roofs that are covered with pavement. The roof of the 1st floor of the Chairul Saleh Building uses a roof covering material in the form of brick roof tiles (ceramic tiles made of bricks). Albedo is the ratio of reflected solar radiation to absorbed solar radiation on a surface (Turner et al. 2008). Heat island is a phenomenon where the air temperature in densely populated areas is higher than the surrounding open air temperature. The heat island phenomenon is characterized by the existence of an area that has a much higher temperature when compared to the ambient temperature. Based on the results of the calculation of the roof area on the albedo value in Table 2, the results obtained are 0.41 (fulfilled).	1	2
7.	Storm water management	The volume of rainwater runoff has not been calculated from the land area to the city drainage network (not fulfilled).	0	2
8.	Site management	(1) Ownership of SPO (Standard Operating Procedure) control of pests and weeds (fulfilled). (2) Available habitat (animal activity area) for non-pet animals at least 5% of the total building site area. There are several non-pet animals around the Ministry Building: Kelelawar Kepala Palu, Burung Tekukur, Burung Gereja, Burung Takur Ungkut-ungkut, Burung Perkutut Jawa, Burung Kutilang, Burung Betet, dan Punai Gading (fulfilled).	2	2
9.	Building neighbourhood	(1) Improving the quality of life of the community around the building by taking one of the following actions: improvement of sanitation, provision of places of worship, public toilets, street vendors and community development training (not fulfilled). (2) Pedestrian access to at least 2 orientations (cardinal directions) to neighboring buildings without having to go through public areas (not fulfilled). (3) Revitalization of cultural heritage buildings. The Ministry of Energy and Mineral Resources has one ancient building, namely the Heritage Building, designed in 1937, combining Dutch and Local elements. This heritage building has been occupied by the Secretary General of the Ministry of Energy and Mineral Resources of Indonesia since 1966. In 2016, the Indonesian government, through the ESDM Secretariat, renovated this building into a Near Zero-Energy building (fulfilled).	1	2
Total Score ASD Category			10	16

Table 2 Albedo value of total roof area

No	Roof Area	Area (m^2)	Material	Albedo Value	Wide x Albedo
1.	1st Floor Lobby Roof	244.2	Brick	0.5	122.1
2.	10st Floor Roof	200.17	Concrete	0.3	60.051
Total		444.37			182.15
Albedo value = total area/(area x albedo)					0.41

Energy Efficiency and Conservation (EEC)

EEC on existing buildings has 2 requirements. The first requirement (EEC P1) is called the Policy and Energy Management Plan. The second requirement (EEC P2) is the Minimum Building Energy Performance. Here are the ratings and ratings in terms of aspects. The EEC consists of 2 prerequisite ratings, 5 regular ratings, and 2 bonus ratings with a maximum total score of 36 points (Table 3).

Table 3 Results of the Ministry of Energy and Mineral Resources Building assessment for the EEC category

No	Rating tools	Assessment results	Point	Max
1.	Policy and energy management plan	(1) There is a statement letter containing a commitment from top management which includes: the existence of a procedure (SOP) covering: monitoring, saving targets, and an action plan for a certain period of time by the energy team (fulfilled). (2) Campaigns in order to encourage energy savings with a minimum of permanently written campaigns installed on each floor, among others in the form of stickers, posters, and emails (fulfilled).	P	
2.	Minimum building energy performance	In addition to proof of commitment letter and action plan, one of the parameters that are easy to monitor is electricity IKE which is within reasonable limits. Overall energy consumption in 2019 reached 1,180,890 kWh, in 2020 it decreased to 1,057,000 kWh, one of the contributing factors is that the number of employees working in the office is not as much as before the Covid-19 pandemic since the work-from-home system was implemented. In 2019, the building's IKE was below the 181.68 kWh/m2/year standard. In 2020, there was a decrease in the previous year, which was 162.62 kWh/m2/year. Because the IKE for electricity is smaller than the IKE for the reference electricity, which is 250 kWh/m2/month, this criterion has been fulfilled.	P	
3.	Optimized efficiency building energy performance	Calculation of the building IKE value which shows a value below the reference standard IKE, every 3% decrease will get 1 additional point up to a maximum of 16 points. Figure 3 shows a comparison of the Chairul Saleh Building IKE value in 2019 and 2020, the highest Chairul Saleh Building IKE is at 216.01 kWh/m2/month, and the lowest figure is 153.33 kWh/m2/month, much smaller than 190 kWh/m2/month, which is the standard for getting 16 points. Thus this category gets 16 points.	16	16

No	Rating tools	Assessment results	Point	Max

Electricity Usage Chairul Saleh Building

Monthly data	NLA	kWh		Energy Consumption Intensity Per 6 Months	
		2019	2020	2019	2020
Januari	4.018,0	57.541	55.410		
Februari		61.838	55.160		
Maret		62.496	43.930		
April		63.586	32.726		
Mei		72.337	32.486		
Juni		52.431	56.705	184,29	137,59
Juli		78.121	56.482	194,53	138,12
Agustus		74.906	51.170	201,03	136,14
September		72.351	53.751	205,94	141,03
Oktober		79.020	44.350	213,62	146,81
November		62.070	53.750	208,51	157,40
Desember		67.496	48.545	216,01	153,33
TOTAL (kWh)		433.964	308.048		

Energy Consumption Intensity Standard for Office	Point Earning
EEC 1.2	
375 < x ≤ 400	0
350 < x ≤ 375	1
325 < x ≤ 350	2
300 < x ≤ 325	3
EEC 1.1A	
287.5 < x ≤ 300	4
275 < x ≤ 287.5	5
262.5 < x ≤ 275	6
250 < x ≤ 262.5	7
REFERENCE STANDARD	
250	8
EEC 1.1B	
242.5 < x < 250	9
235 < x ≤ 242.5	10
227.5 < x ≤ 235	11
220 < x ≤ 227.5	12
212.5 < x ≤ 220	13
205 < x ≤ 212.5	14
197.5 < x ≤ 205	15
190 < x ≤ 197.5	16

Figure 3 Comparison of Chairul Saleh Building IKE and IKE Office Standards

In EEC 1, there are 3 categories. The first is EEC 1.1A, if the Chairul Saleh building's electricity IKE is above the reference standard electricity IKE and is less or equal to 120% of the building's electricity IKE in the last 6 months, then every 5% decrease will get 1 additional point up to a maximum of 8 points. Then enter EEC 1.1B, if the building electricity IKE shows a value below the reference standard electricity IKE in the last 6 months, then every 3% decrease will get 1 additional point up to a maximum of 16 points. However, if the building's electricity IKE is more than 120% of the reference standard electricity IKE, then every 10% decrease in the last 6 months gets 1 point with a maximum of 3 points, this is included in EEC 1.2. Chairul Saleh Building has succeeded in lowering the IKE to EEC 1.1B, thus getting an additional 16 points.

4.	Testing, recommisioning or retrocommisioning	The Ministry of Energy and Mineral Resources has carried out re-commissioning or retro-commissioning with the target of improving performance (KW/TR) on MVAC (Mechanical Ventilation and Air Conditioning) main equipment (for example: chiller). The Building Management Management rarely conducts detailed commissioning of AC units. Repairs are only carried out if there are reports of damage (not fulfilled).	0	2
5.	System energy performance	Chairul Saleh building has used LED lights by 69%, while the remaining 31% still uses TL lamps. The use of LED lights in the Chairul Saleh Building can save electricity usage by 1,697 kWh/month, or equivalent to Rp 2,489,241. In 2020, all TL lamps will be replaced with LED lamps. The Chairul Saleh building uses 69% LED lights in the public workspace, so it will get 1 point. The total points obtained for this criterion are 2 points. In addition to scheduling and	2	12

No	Rating tools	Assessment results	Point	Max
		managing energy equipment, the Ministry of Energy and Mineral Resources has also implemented the ECO List (Energy Conservation Opportunity List).		
6.	Energy monitoring and control	(1) Provision of kWh meters which include air conditioning systems, lighting systems, and contact boxes, other load systems and rooms that are not excluded or conditioned. (2) There is a regular monthly recording of the monitoring results and data collection on the kWh meter, which has been recorded for at least the last 6 months. (3) Appreciating the use of energy in the form of energy displays placed in public areas. (*) The three benchmarks can be replaced with other benchmarks, namely, applying technology support to monitor and control building equipment through EMS (Energy Management System) technology or the benchmark of conducting external energy audits (level 2) at least once in the last 1 year. There is already a regular monthly recording of monitoring results and data collection on the kWh meter. Recording is carried out for a minimum of the last 6 months (fulfilled).	3	3
7.	Operation and maintenance	(1) Operation and maintenance manual for the entire AC system (chiller, air handling unit, cooling tower) (fulfilled). (2) Availability of operating and maintenance manuals for all other equipment systems (transportation systems in buildings, distribution systems for clean and dirty water, and power plants) (fulfilled). (3) There is a monthly report for the last 6 months for the operation and maintenance of the building system (fulfilled).	3	3
8.	On site renewable energy	The Chairul Saleh building is already using renewable energy from solar panels, air conditioning condensation, and rainwater utilization (fulfilled).	5	5
9.	Less energy emission	The benchmark in this category is CO2 emission reduction measures. In this category, a comparison of the CO2 emissions released between renewable and non-renewable energy is carried out. Chairul Saleh building does not use renewable energy (not fulfilled).	0	3
Total Score EEC Category			29	36

Water Conservation (WAC)

The WAC category consists of 1 prerequisite rating, 7 regular ratings, and 1 bonus rating with a maximum total of 20 ordinary points and 2 bonus points. The results of the Chairul Saleh Building assessment based on the application of benchmarks for the WAC category in the GBCI Greenship rating tools for built buildings version 1.1 can be seen in Table 4.

Table 4 Results of the Ministry of Energy and Mineral Resources Building assessment for the WAC category

No.	Rating tools	Assessment results	Point	Max
1.	Water management policy	There has been a statement of commitment from top management regarding the target and timed water-saving actions, along with an audit of the building's water. There has been a written water use saving campaign in the form of stickers, and posters affixed to every toilet in the building (fulfilled).	P	
2.	Water sub-metering	Water consumption sub-meters are available in public area systems, commercial areas, and building utilities (fulfilled).	1	1
3.	Water Monitoring Control	Standard operating procedures and their implementation regarding the maintenance and inspection of plumbing systems on a regular basis to prevent leakage and water wastage by showing the water balance in the last 6 months (fulfilled).	1	2
4.	Fresh Water Efficiency	- Buildings with 20% water consumption above SNI, every 10% decrease gets 1 point until it reaches the reference standard (SNI 03-7065-2005 concerning Procedures for Implementing Plumbing Systems). - Chairul Saleh building has 934 water users in the building area. Average Water Consumption Intensity (IKA) in one building per month, by adding up the total water usage starting from January until December, until a value of 54.99 L/peg/day was obtained. The total IKA is already below 60–55 L/peg.day, so this category gets 1 point. However, if you look at the decrease in IKA every 6 months from July to December, the difference is not too much difference. This indicates that there is not much austerity action.	1	8
5.	Water Quality	The Ministry of Energy and Mineral Resources has scheduled laboratory analysis checks, either periodically or not, on the quality of clean water used in the Chairul Saleh Building. Based on the results of laboratory tests, the Chairul Saleh building can be declared to have passed and get 1 point.	1	1
6.	Recycled Water	The waste from the Chairul Saleh building itself has not been processed into recycled water. To support water efficiency, this building utilizes alternative water sources, such as AC condensate water, to be stored in the Ground Water Tank and used for irrigation. However, this recycled water has insufficient capacity to be used for irrigation needs, so it still requires water sourced from PDAM (not 100% recycled water). Thus this category does not get any points at all (not fulfilled).	0	5
7.	Potable Water	A filtration system to produce drinking water quality that meets the standards of the Minister of Health Regulation No.492/MENKES/PER/IV/2010 for assessed building. Currently, the Chairul Saleh building does not have a filtration system (not fulfilled).	0	1

No.	Rating tools	Assessment results	Point	Max
8.	Deep Well Reduction	There are measures to save the use of groundwater. However, all water usage in Chairul Saleh Building still comes from PDAM (not fulfilled).	0	2
9.	Water tap efficiency	There is the use of water faucets with auto stop features in public areas which amounts to 50% or 80% of the total number of water faucet units in the public areas of the building (not fulfilled).	0	2
Total Score WAC Category			5	20

Building Environment Management (BEM)

The BEM category consists of 1 prerequisite rating and 5 regular ratings with a maximum total of 13 points. The results of the Chairul Saleh building's assessment of the existing rating on Greenship for the BEM category can be seen in Table 5.

Table 5 Results of the ESDM Ministry Building assessment for the BEM category

No.	Rating tools	Assessment results	Point	Max
1.	Operation and maintenance policy	- There is an operation and maintenance plan that supports the greenship achievement target for the built building. - Chairul Saleh building already has an operation and maintenance plan, as evidenced by the existence of standard operating procedures for electrical systems, water quality, exterior and interior, and waste management. In addition, there is also an organizational structure for the building maintenance team. Thus, it can be stated that the benchmark for the prerequisite category in the BEM aspect has been met by the Chairul Saleh building. - Chairul Saleh Building implements technology support to monitor and control building equipment through EMS (Energy Management System) technology and conduct external energy audits.	P	
2.	Innovations	(1) There is an application of innovation by improving the quality of buildings quantitatively. The innovation carried out by the Ministry of Energy and Mineral Resources is in the ASD aspect, namely the existence of green open space (GOS) for Landscape Energy. (2) The application of innovation by taking a management approach, such as encouraging behavior change. Employees at the Secretariat General of ESDM are always involved and play an active role in energy-saving activities. To improve the competence of employees who are directly involved in the management and maintenance of office buildings, the Energy and Water Saving Team and employees involved in building management will be involved in energy saving and efficiency training, such as energy efficiency training in buildings, conservation training, energy auditors in buildings, and manager energy.	5	5

No.	Rating tools	Assessment results	Point	Max
		In the ASD aspect, there is a green open space (GOS) of the ESDM Energy Landscape as an effort by the Ministry of Energy and Mineral Resources to improve environmental quality and reduce surface runoff against the burden of the drainage system, which can be seen in Figure 4.  Figure 4 Energy Plaza ESDM Landscape In the EEC aspect, energy conservation measures are taken as an effort by building managers to save energy. Energy monitoring system is one of the efforts of the Ministry of Energy and Mineral Resources to save energy, the function of the energy monitoring system is as a facility to collect energy consumption information by showing data and analyzing it. The Chairul Saleh building utilizes energy partially supplied from the photovoltaic rooftop. The Chairul Saleh Building is equipped with a 34 kWp PLTS Roof and has been operating since January 2017. The average annual production of the Chairul Saleh Roof PLTS is 40,977 kWh or equivalent to a CO_2 reduction of 35.9 tons e per year. The total production of the PLTS is able to save Rp 60,125,000 per year. In addition to photovoltaic rooftops, there is electrical energy from mini photovoltaics that are installed on street lights and directly used for street lighting (PJU). PJU units with a power per unit of 60 watts are currently installed in as many as 21 units. The average annual savings from PJU photovoltaic usage is 5,443 kWh, or equivalent to a savings of IDR 7,985,000, per year. Thus this category gets a score of 5 points.		
3.	Design Intent and Owner's Project Requirement	There are intent design documents and owner's project requirements, as-built drawing documents since the building was established, as well as technical specifications and building equipment manuals. The results of a direct survey conducted showed the existence of these documents in the Chairul Saleh building.	2	2

No.	Rating tools	Assessment results	Point	Max
4.	Green operational and maintenance team	- The involvement of a professional greenship in the building and an organizational structure that is responsible for managing the building environment to match the green building concept. - The General Bureau Division is tasked with supervising and monitoring the environmental development of the Chairul Saleh building, in particular, to create environmental quality that is in accordance with environmentally friendly aspects (green building). While the third parties involved as greenship professionals who work full time are consultants from PT. Airkon Pratama who is paid full-time and works in the MEMR environment. Chairul Saleh building meets 2 benchmarks and gets 2 points.	2	2
5.	Green occupancy/lease	Ownership of SPO and Training which includes efforts to meet the criteria in Greenship for Existing Building at least 1 benchmark in each category ASD, EEC, WAC, IHC, and MRC. There is no SPO yet, but there is already a training rundown at the Ministry of Energy and Mineral Resources. It can be seen in the attachment. This category earns 1 point.	1	2
6.	Operation and maintenance training	Have a regular schedule for training programs in operation and maintenance for site, energy, water, materials, and HSES (Health Safety Environmental, and Security) accompanied by evidence of the implementation of the training. In the Chairul Saleh building, there is no evidence of a regular training schedule for 6 months, but there is already a training program for site maintenance, energy, and water, with evidence of training implementation in the form of documentation. This category gets 1 point.	1	2
Total Score BEM Category			11	13

After conducting the assessment, the following points/values have been collected by Chairul Saleh Building:

Tabel 6 Total score

Criteria	Max point	Point	Achievement (%)
Appropriate Site Development	16	10	8.5
Energy Efficiency and Conservation	36	29	24.8
Water Conservation	20	5	4.3
Material Resource and Cycle	12	8	6.8
Indoor Health and Comfort	20	9	7.7
Building Environmental Management	13	11	9.4
Total	117	72	61.5

The requirement to get a green predicate is if the assessment points reach the standard. For the value range, Chairul Saleh Building is at 72 points. This is included in the Gold certification. The results of the sum of the total points obtained in all aspects of the green building show that the Chairul Saleh building managed to get 72 points (63.39%) of its 117 maximum total points. Based on the rating set by the GBCI greenship, the Chairul Saleh building is currently awarded a Gold rating for its ability to apply the green building criteria benchmarks to the building. However, if you look back at the table, the acquisition value of water conservation

is still smaller than energy conservation, which is much larger. This shows that the steps implemented have not been maximal in their achievement. According to the management, most of the water used is still dependent on the PDAM because the capacity of the rainwater produced is insufficient for use in the dry season, so it still has to be assisted by the PDAM. To help the lack of water conservation aspects, in the Water Tap Efficiency category, you can try replacing conventional faucets with faucets that have an auto stop feature (automatic stop faucet) so that when the faucet is not used, the faucet does not continue to release water and stops automatically. According to Kubba (2010), minimizing water can be done by using recycled water for flushing toilets and gray water for watering plants/irrigation. To be more optimal in saving water, you should use recycled water from gray water waste. In the Ministry of Energy and Mineral Resources, this processing has not been considered at all.

Site selection is also important in the assessment. The location of the Chairul Saleh building of the Ministry of Energy and Mineral Resources is strategic, which is close to public facilities and easily accessible by land transportation, and has a building design that rises upwards. This is supported by Kubba (2010), who states that site selection basically emphasizes the reuse and restoration of existing buildings or sites; reduces the development footprint; reduces construction waste/garbage, and reduces the city's heating effect (heat island effect). Yudelson (2008) also states that the location of the building must be in accordance with regulations, land use, and function, and must also pay attention to the development to avoid negative environmental impacts. Regarding the initial location planning, Vale and Vale (2009) stated that minimizing the building footprint (footprint development) can be done by designing the building to rise upwards so that it has a smaller building footprint than the building design that extends to the side (Froeschle 1999).

In addition, the use of air conditioning also requires a large amount of energy. Research that has been done by Sugiyanto in Samudro (2010) in Surabaya is about the composition of energy use used in high-rise rental office buildings which in general are AC = 42.5%, Fans/Pump = 18.6%, Lights = 20.9%, Elevators = 5.9%, Equipment = 12.1%. Samudro (2010) explained that it is known that the largest energy use refers to two types of value aspects, namely airing and lighting. The largest use of energy is generated by the use of air conditioning and lighting. The results of the study revealed that optimizing the light system through the use of natural light technology, the use of double-glazing technology on the building facade, and the use of energy-efficient air conditioning systems can be used to maximize energy savings in high-rise buildings.

The gold rating of this building could be shifted to Platinum rating if there are some efforts to gain at least 11 points. There is a possibility to gain 7 more points by increasing freshwater efficiency until 18% below the water consumption standard refer to SNI 03-7065-2005. There is a possibility to gain 10 more points if building management could increase the efficiency of mechanical ventilation and air conditioning.

CONCLUSION

Based on the results of the assessment of the green building concept according to the GBCI that has been carried out, the conclusion that can be drawn in this study is that the Chairul Saleh Building has implemented 10 out of 16 points in the benchmark for the Appropriate Site Development (ASD) category. Then in the Energy Efficiency and Conservation (EEC) category, 29 of the 36 maximum points were applied. In the Water Conservation (WAC) category, they managed to get 5 of the maximum 20 points, while in the Building Environmental Management (BEM), they managed to get 11 out of 13 points, which were determined in the GBCI greenship rating tools for built buildings.

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