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ANALYSIS OF SITE MANAGEMENT IN THE PASSENGER TERMINAL BUILDING OF BANDAR DELI, BELAWAN PORT WITH A GREEN BUILDING APPROACH

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ABSTRACT

Deli Port Passenger Terminal , Belawan Port is one of form infrastructure important which is located in Medan City which is in the form of terminal port . This terminal own role For accommodation passenger between island in Sumatra. The existence of the Bandar Deli Terminal is certainly give impact positive in aspect economy and social . A study conducted by Aprilia (2024); Fadillah & Sinaga (2020) revealed that the passenger terminal This own arrangement less than optimal space and rumored can trigger failure operational sustainable building . Conditions This naturally not enough in accordance with hope government related importance adoption principle building green building in Indonesia for achieve the development agenda sustainable development that was initiated in Regulation of the Minister of PUPR No. 21 of 2021 concerning the Assessment of Green Building Performance and with attachments PUPR Circular Letter No.01/SE/M/2022 .). In addition, the implementation of green building standards in Indonesia is expected to reduce the carbon footprint and increase energy efficiency by up to 30% compared to conventional buildings in accordance with the Energy Efficiency Guidelines for Buildings (Ministry of Energy and Mineral Resources, 2020). This study aims For analyze the site management of the Bandar Deli Terminal Building, Belawan Port based on the Indonesian Green Building Performance Assessment Parameters (BGH) which is one of the main variables in the BGH parameters. The method used is descriptive-qualitative, to describe the results of observations related to site management based on PUPR Circular Letter No.01/SE/M/2022 concerning Technical Instructions for Green Building Performance Assessment (BGH). The results of the study show that the management of the Bandar Deli Passenger Terminal site still does not meet the parameters in the Site Management variable in accordance with the Green Building (BGH) standards, with a score of 14 points out of 38 points so that further evaluation is needed in research on other variables and also possible improvements to support the achievement of Green Building (BGH) standards in Indonesia.

Keywords: Site Management, Green Building, Bandar Deli Passenger Terminal.

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Introduction

Adequate social infrastructure plays a crucial role in supporting easy public accessibility to create a sustainable, efficient and highly competitive urban environment. Sustainable urbanization implements the importance of green building standards in Indonesia which are increasingly recognized along with the increasing awareness of climate change and the urgency of sustainable development. Green buildings, which prioritize energy efficiency, water management, use of environmentally friendly materials, and indoor air quality, are key to reducing the environmental impact of the construction sector (Green Building Council Indonesia, 2021) .

The adoption of green building standards in Indonesia is crucial to achieve the target of reducing greenhouse gas emissions and supporting the national sustainable development agenda. Therefore, the government has begun to emphasize development based on green building standards as outlined in the Regulation of the Minister of PUPR No. 21 of 2021 concerning the Assessment of Green Building Performance ("Existing Buildings with mandatory and recommended categories, namely Class 9 Buildings or public buildings with an area of more than 10,000 m^2") with consideration to implement the provisions of Article 123 of Government Regulation No. 16 of 2021 concerning the Implementation of Law No. 28 of 2002 concerning Buildings (considering the creation of outdoor space for buildings, green open spaces that are balanced, harmonious, and in harmony with their environment). In addition, the implementation of green building standards in Indonesia is expected to reduce the carbon footprint and increase energy efficiency by up to 30% compared to conventional buildings in accordance with the Energy Efficiency Guidelines for Buildings (Ministry of Energy and Mineral Resources, 2020). Green Building (GBU) has also raised awareness of the impact on the environment, encouraged sustainable development and has become a government regulation in Indonesia, so that existing buildings should comply with Green Building (GBU) standards.

One of the benchmarks in supporting the creation of sustainable green buildings in the development concept, both in the form of social infrastructure and other facilities and infrastructure, is the existence of a good *site in green building construction* (Sudarman *et al* ., 2021) . Therefore, site management is one of the

guidelines in the parameters for assessing green building construction in accordance with the Regulation of the Minister of PUPR No. 21 of 2021 concerning the Assessment of Green Building Performance which is attached to the PUPR Circular Letter No. 01/SE/M/2022 regarding Technical Guidelines for Green Building Performance Assessment (BGH) because site management can produce responsive building designs and building orientations that are adaptive to the direction of the sun's circulation so that the building has good performance and minimizes negative impacts on the environment.

The Bandar Deli Passenger Terminal of Belawan Port is a form of social infrastructure in the form of a port, which has a public transportation service function in Medan City. This passenger terminal is the third largest terminal in Indonesia and the largest on the island of Sumatra (Listantari, 2019) . Therefore, the Bandar Deli Passenger Terminal has the function and role of connecting dense accommodation, both between islands and within the island of Sumatra . The existence of the Bandar Deli Terminal has a real positive impact on the economy and society of the surrounding community (Aprilla, 2024) . However, this is actually the opposite when viewed from its less than optimal spatial planning (Aprilla, 2024 ; Fadillah & Sinaga, 2020) . This condition raises an assumption that the technical planning of the site or building footprint is still not in accordance with the parameters of green building buildings (BGH). Therefore, this study aims to analyze the site management of the Bandar Deli Terminal, Belawan Port according to the Green Building (GWB) performance parameters because it is very important to implement site management according to the Green Building parameters in order to improve the efficiency, comfort, safety, and sustainability of port terminal operations and strengthen Belawan's position as a transportation and logistics hub.

Method

Location and Method study

This study is located at the Bandar Deli Passenger Terminal in Belawan Port, precisely at Jalan Pelabuhan Lama No.1 Medan-Belawan, Medan City, North Sumatra (seen in Figure 1). This terminal is a terminal port that has an important role for inter-island passenger accommodation in Sumatra.

Figure 1 : Location of the Deli Port Passenger Terminal Building , Belawan Port (Source : Google Earth, 2024)

The Belawan Terminal building has a passenger terminal building area of 4,426 m2, a pier of 6,374 m2, and a parking area for 4 and 2 wheels of 2,956 m2 and a total garden area of 1,870.5 m2. The total footprint of the Bandar Deli Passenger Terminal building is 15,836 m2, with a building age of nine years since it was inaugurated in 2015. This terminal has a passenger capacity of 1,500 to 2,000 people per day (Monday and Tuesday), while the intensity of goods transportation reaches 10,000 to 20,000 tons per day using 4 ships . In

addition, the Basic Building Coefficient (KDB) value is 40% (6,334 m2), the Building Floor Coefficient is 1.2, the Basic Green Coefficient (KDH) is 50% (7,918 m2), and the Building Boundary Line (GSB) is 6.5 meters.

Figure 2 : Siteplan Passenger Terminal Building of Deli Port, Belawan Port (Source : Analysis Author , 2024)

In achieving the study objectives to analyze the management of the Bandar Deli Terminal site of Belawan Port according to the parameters of Green Buildings in Indonesia, this study uses a descriptive-qualitative method. Descriptive research is used to determine the value of variables and to reveal and describe these values (Sugiyono, 2013) . Furthermore, the qualitative approach in this study is related to the analysis of field conditions according to the parameters for assessing green buildings based on PUPR Circular Letter No. 01/SE/M/2022 concerning Technical Instructions for Green Building Performance Assessment which is an attachment to the Regulation of the Minister of PUPR of the Republic of Indonesia No. 21 of 2021 concerning Green Building Performance Assessment (BGH). Then, data collection was carried out by means of observation and interviews, so that primary and secondary data were obtained. Primary data in the form of field data from observations and interviews, while secondary data in the form of as-built drawings of Belawan Port and other data.

Theoritical review

Green Building Construction

Green building or commonly known as green building is a form of efficient use of energy, resources, costs that can minimize environmental impacts in a construction development from the planning, implementation, management, maintenance, renovation, to demolition stages (Pratiwi et al., 2023 ; Komalasari et al., 2013) . The concept of green buildings is one of the implementations in the application of sustainable architecture (Sudarman et al., 2021) . In addition, the application of green buildings can reduce carbon emissions so that it can reduce the greenhouse gas effect (Lagalgarin et al., 2023) .

According to PUPR Circular Letter No. 01/SE/M/2022 concerning the assessment of green buildings or BGH including new buildings, existing buildings, green community housing, new green areas, and existing green areas. In new buildings, there are four stages of implementing Green Buildings or Green Buildings, namely: technical planning stage, construction implementation stage, utilization stage, and demolition stage. There are 7 (seven) main variables in assessing green buildings according to SE PUPR No. 01/SE/M/2022 , namely: site management (38 points), energy efficiency (44 points), water use efficiency (22 points), indoor air quality (24 points), use of environmentally friendly materials (21 points), waste management (10 points), and wastewater management (10 points), with a total of 165 points (Lagalgarin et al., 2023) .

A building is said to meet the Green Building (BGH) parameters if it has a BGH eligibility certification. Based on the 2021 PUPR Ministerial Regulation , Green Building eligibility certification is divided into three levels, namely: pratama, madya, and utama, where this certification has a validity period of 5 years. The

pratama level is the basic level in BGH certification. The main focus of this level is related to the basic implementation of green buildings, such as energy efficiency, water management, and the use of environmentally friendly building materials (Kibert, 2012) . At the madya level, it is the second level with a focus on implementation related to better management of natural resources, such as water and energy, improving indoor air quality, and the use of more environmentally friendly building materials (Fowler & Rauch, 2006) . Furthermore, the highest level is the utama level, which at this level focuses on showing maximum efforts in all aspects of sustainability, including very high energy efficiency, use of renewable resources, implementation of advanced technology to reduce environmental impacts (Ries & Bilec, 2009) .

Management Footprint

In the book The Image of The City, site is defined as a specific physical and environmental element in an area that contributes to the visual character and identity of the place (Lynch, 1960) . Architecturally, site is a specific place where architecture interacts with environmental conditions and its social context, creating a close relationship between the building form and the surrounding landscape (Ching, 2015) . Thus, site can be defined as land or area for the construction of a building or artificial environment, which has certain boundaries, either physical boundaries or non-physical boundaries, so that it reflects the identity of the building or reflects the artificial environment.

In the green building concept, site management is one of the important parameters in technical construction planning. Based on SE PUPR No. 01/SE/M/2022 concerning Technical Instructions for Green Building Performance Assessment, site management aims to obtain building design results that are in accordance with site conditions, so that they have good performance in energy efficiency, water conservation, and minimize adverse impacts that will occur on the surrounding environment.

As for site management for the assessment of green buildings as regulated in SE PUPR No. 01/SE/M/2022 , it is assessed in 9 (nine) main parameters, namely: (1) building orientation, (2) site management including accessibility or circulation, (3) management of B3 contaminated land, (4) private green open space (RTH) plans, (5) provision of pedestrian paths, (6) management of basement sites, (7) provision of parking areas, (8) outdoor lighting systems, and (9) construction of buildings above and/or below ground, water and/or public facilities/infrastructure.

Research Results and Discussion
Orientation Building

Table 1: Assessment Orientation Building

No	Evaluation Performance	Point Max	Yield Value BGH Analysis
			Point
1	a. Buildings with walls longest facing north - south	1	0
	b. A building with the longest wall facing east and west in a ratio of 2x The length of the north-south direction and the existence of building envelope engineering in that direction	2	2

Based on Table 1 above, it can be seen that in the assessment of building orientation with the building observation unit with the longest wall more than 2 times the width facing east-west, and there is envelope engineering. The Bandar Deli Terminal Building is a building that has the longest wall facing East-West, with a building footprint length of 167m (east-west) and a width of 15m (north-south) so that it meets category 1b. Thus, the assessment focuses on the influence of sun orientation on the longest wall in the East-West direction which is more than 2 times the length of the building in the north-south direction (seen in Figure 3).

Figure 3 : Circulation Pattern Sun To Orientation Building at the Deli Port Passenger Terminal Building, Belawan Port
(Source : Analysis Author , 2024)

The terminal building that tends to face east-west with a length of more than 2 times the width of north-south, is balanced by the existence of building envelope engineering (seen in figure 4). Building envelope engineering has the benefit of reducing radiation and reflection of solar heat, so that the heat temperature received by the building is not high, and users of the space feel comfortable in the building.

Figure 4 : Sheath Building at the Deli Port Passenger Terminal Building, Belawan Port
(Source : Analysis Author , 2024)

Based on this explanation, the orientation of the building viewed from the longest wall facing east-west with the existence of the envelope engineering gets 2 points.

Processing Footprint Including Accessibility or Circulation

Table 2 : Assessment Processing footprint including accessibility or circulation .

No	Evaluation Performance	Point Max	Yield Value BGH Analysis
			Point
2	a. Roof coverings and pavements that have mark bounce sun (albedo) minimum 0.3	1	1
	b. Rainwater captured in the footprint and building areas all (100%) must be can managed for at least 2 hours with use well infiltration and/ or pool retention / detention which refers to the volume average daily rainfall for 10 years final	2	0
	c. Quantity value title vegetation compared to the footprint area of at least 20%	3	0

In this observation unit, there are three assessments, namely: calculating the albedo value, flood management and the amount of vegetation canopy coverage on the building site. The calculation of the Albedo value (seen in Table 3) shows that the albedo value obtained is 0.32, which is greater than 0.3. Thus, in this observation sub-unit, a value of 1 point is obtained.

Table 3 : Albedo Assessment of the Deli Port Passenger Terminal, Belawan Port

Type	Material	Area (m2)	Albedo	Area x Albedo
Roof	Rooftile white paint concrete	825	0.73	602.25
	Clay Roof Tiles	775	0.33	255.75
	Aluminum	175	0.61	106.75
Landscape	Paving Block	3.250	0.35	1,137.5
	Concrete	3,744	0.22	823.68
	Asphalt	740	0.1	74
	Sand	225	0.75	168.75
	Green Grass	210	0.26	54.6
Total		9,944		3,223.28
Albedo of roof covering and pavement = 3,223.28 / 9,944 =				**0.3 2**

(Source : Analysis Author , 2024)

In the assessment of the flood management observation sub-unit, it does not meet the criteria because there is no infiltration well planning data, so it is worth 0 points. Furthermore, in Table 4 it can be seen that the total area of the vegetation canopy is 885.5m2, with the percentage of the canopy to the land area of 5.59% which shows less than 20%, so it does not meet the parameters of the observation sub-unit for the number of vegetation canopies.

Table 4 : Calculation of Percentage of Header Area with a Land Area at the Deli Port Passenger Terminal , Belawan Port

Types of Plants	Crown Area (m)	Amount Tree (bh)	Crown Area (m2)
Red Cambodia	3.2	21	67.2
Fan Pine	1.5	83	124.5
Red Shoot	1.2	89	106.8
Palm	2.2	26	57.2
Pule Tree	5.2	93	483.6
bougainvillea	1.4	33	46.2

Total Area of the Canopy (m^2)	885.5
Site Area (m^2)	15,836
Headline Percentage (%)	5.59%

Management Land Contaminated
Waste Material Hazardous & Toxic (B3)

. **Table 5 : Assessment Processing Land Contaminated Waste Material Dangerous &**

No	Evaluation Performance	Point Max	Yield Value BGH Analysis
			Point
3	a. BGH that was built on the land contaminated mandatory B3 waste carry out recovery land moreover formerly in accordance with provision law	3	0

The Bandar Deli Passenger Terminal was built on land that was not contaminated with B3 waste (hazardous chemicals). Therefore, in this assessment it received a score of 0 points.

Private Green Open Space (RTH) Plan

Table 6 : Assessment of Private Green Open Space (RTH)

No	Evaluation Performance	Point Max	Yield Value BGH Analysis
			Point
4	a.1 **.** Area Size green	3	1
	b. Planned green area can publicly accessible	1	1
	c.1. Vegetation have one or two functions as shade , damper sound , filter smell , or filter dust	2	2

The assessment of the green area in point a includes three categories, namely: green area 10-20% (1 point), 20-50% (2 points), and >50% (3 points). The Bandar Deli Passenger Terminal, Belawan Port has a total land area calculation of 15,836m^2 with a green area of 1,870.5m^2, resulting in a percentage result of 11.8%. In this observation sub-unit, it gets 1 point based on the 10-20% green area category. Furthermore, the green area in this terminal has also been planned through park and green lane planning.
so that it can be easily passed by the public , it gets a score of 1 point. The types of vegetation planted in the building area are Red Frangipani (as a pollution absorber), Fan Cypress (as a pollution absorber and view barrier), Red Shoot (windbreaker, noise absorber, and view barrier), Palm (as a guide plant), Yellow Broccoli (as a plant that adds aesthetics), Pule Tree (pollution absorber and soil erosion preventer), and Bougainvillea (as a noise absorber and glare blocker). Each plant has two functions, so this observation sub-unit gets a score of 2 points.

Figure 5 : Types of Vegetation in the Passenger Terminal Building of Deli Port , Belawan Port (Source : Analysis Author , 2024)

Provision of Pedestrian Paths

Table 7 : Provision of Pedestrian Paths

No	Evaluation Performance	Max Points	Yield Value BGH Analysis
			Point
5	a. Pedestrian paths with direction to access between track in and out buildings that meet the convenience requirements.	3	0
	b. Have pedestrian facilities that are connected or connect to public facilities.	1	1

The Bandar Deli Passenger Terminal does not have adequate pedestrian paths but can be connected to public facilities such as bus stops and there is access between outside the building to the entrance such as zebra crossings so that it gets a total score of 1 point.

Figure 6 : Public Facilities at the Deli Port Passenger Terminal Building , Belawan Port (Source : Google Earth, 2024)

Management Basement Footprint

Table 8 : Management Basement Footprint

No	Evaluation Performance	Point Max	Yield Value BGH Analysis
			Point
6	a. In matter there is a baseman, no violate rule coefficient basement footprint , as well as still take into account convenience rainwater infiltration	1	0

In the assessment of basement site management, the Deli Passenger Terminal building does not have a basement. The terminal building is a 2-story building without a basement (can seen in Figure 7) , so the value for this parameter is equal to 0 points.

Figure 7: Deli Port Passenger Terminal Building , Belawan Port Without *Basement Area* (Source : Google , 2024)

Provision Land Parking

Table 9 : Provision land Parking

No	Evaluation Performance	Max Points	Yield Value BGH Analysis
			Point
7	a. The building is planned own land parking ≤ 20% of the permitted Gross Floor Area (GFA) or own system parking mechanical ≤ 10% of GFA.	2	2
	Additional points: it is a 2-layer basement and has a mechanical parking system that is not inside the building but is protected from heat and rain.	2	0
	b. Have facility for user bicycle , namely place parking bike and trail special bike . Ratio parking bicycles at least 1% of amount residents . Every additional 1% given value 1 point , maximum 3 points .	3	0
	c. Have shower facilities for user bicycle with ratio 2 shower units for 25 parking spaces bicycle .	1	0
	d. Land parking own facility Station Filling Public Electric Vehicle Charging Station (SPKLU) or Electric Vehicle Charging Station (EVCS) with Minimum requirement of 1 SPKLU unit for every 25 Parking Space Units 4 wheels and 1 SPKLU unit for every 50 Parking Space Units 2 wheels .	2	0

The total area of the entire parking area in the Belawan Port area is 2,956 m2 of the total area of 15,836 m2 . This parking area consists of 4-wheeled and 2-wheeled parking areas (see Figure 8) , which have a GFA of 18.6 % which is smaller than 20%, thus fulfilling the observation sub-unit in the parking area parameters. However, in the parking area there is no special lane for bicycle users, no shower facilities, and no public electric vehicle charging stations or SPKLU or EVCS .

Figure 8 : Parking Location at the Deli Port Passenger Terminal Building , Belawan Port (Source : Documentation) Author , 2024)

System Outdoor Lighting

Table 1 0 : System Outdoor Lighting

No	Evaluation Performance	Point Max	Yield Value BGH Analysis
			Point
8			
	a. Facilities Lighting room outside planned use switch automatic or light sensor	1	0

The outdoor lighting system in this building does not use lighting with automatic switches or light sensors (see Figure 9) . Therefore, the assessment for the outdoor lighting system of the Bandar Deli Belawan Passenger Terminal received value 0 points.

Figure 9 : Lights in the Outdoor Area of the Belawan Port Passenger Terminal Building. (Source : Analysis Author , 2024)

Construction of the above building and/ or Underground, Water and/ or Public Infrastructure /Facilities

Table 1 1 : Construction of the above building and /or under the homeland above and or infrastructure Sumum

No	Evaluation Performance	Point Max	Yield Value BGH Analysis
			Point
9	Building structures above and / or below land , water and/ or infrastructure / facilities must fulfil provision regulation legislation : a. Clarity access entry and facilities road means *of* egress	1	1
	b. Engineering enter air and light experience to in building	1	1
	c. Engineering that allows view to outside building	1	1
	d. Implementation efficiency water and energy usage	1	0
	e. Have processing trash and waste water treatment	1	1

Access track go out Entering the Bandar Deli Terminal is enough clear and can understood by the passengers . Conditions This can seen from existence access door Enter and exit at the south and north gates and there is *signage* or *signs* at the entrance-exit area because That in this parameter get a value of 1 point (seen in Figure 10) .

Figure 10 : Access Path Exit -Enter the Bandar Deli Passenger Terminal (Source : Analysis Author , 2024)

Beside that , this terminal building also has engineering lighting and ventilation experience with form design *mezzanine* and there are *roster stones* , as well as use glass translucent view also makes it easier entry

light inside room as well as make it easier view to outside building (seen in Figure 11). Condition This meets the parameters in points b & c in Table 1 1 , so that get 1 each points .

Figure 11 : Glass Material Clear and mezzanine. Form Engineering Lighting and Ventilation Experience
(Source : Documentation) Author , 2024)

The Belawan Passenger Terminal building also has trash bins in every corner. The building also has septic tank waste management and *ground water tank* (seen in Figure 12), thus fulfilling the assessment in point e. The total assessment points in this parameter are 4 points.

Figure 12 : Ground Water Tank & Septic Tank at Belawan Passenger Terminal Building
(Source : Documentation) Author , 2024)

Assessment Results Green Building (BGH) of the Deli Port Passenger Terminal , Belawan Port

Table 1 2 : Results of BGH Assessment on Management Footprint Deli Airport Passenger Terminal Building

No	Evaluation Management BGH Footprint	Points Max	BGH Analysis Result Value	Information
			Points	
1.	Orientation Building	2	2	terminal building tends to facing East -West with a Length of More of 2 times the width , offset with existence engineering sheath building

2.	Processing Footprint Including Accessibility or Circulation	6	1	Albedo value 0.3 2 , plan title vegetation not in accordance with the field . No There is management water infiltration and flooding
3	Management Land Contaminated Waste Material Hazardous & Toxic (B3)	3	0	No Being on the land contaminated with B3
4	Private Green Open Space (RTH) Plan	6	4	There is plan park , but Not yet > 50%
5	Provision of Pedestrian Paths	4	1	Inadequate pedestrian paths
6	Management Basement Footprint	1	0	No there is a basement
7	Provision Land Parking	10	2	Land parking wide However No equipped adequate facilities such as SPKLU
8	System Outdoor Lighting	1	0	No there is lighting outside with switch automatic or sensory
9	Construction of the above building and/ or Underground, Water and/ or Public Infrastructure /Facilities	5	4	There is no information about energy and water efficiency management in buildings.
	Total =	38	**14**	

(Source : Analysis Author , 2024)

Based on Table 1 2 above, it can be seen that the final points for the assessment of the Green Building on the site management variable at the Bandar Deli Passenger Terminal, it is worth 14 points from a maximum of 38 points . Therefore , the Bandar Deli Passenger Terminal has not met the assessment on the Green Building site management variables that comply with BGH parameters.

Closing

Conclusion

Based on the results of the study, it was found that the Deli Port Passenger Terminal Building , Belawan Port Still Not yet meet the parameters on the variable Management T apak based on Green Building Standards in accordance PUPR Circular Letter No. 01/SE/M/2022 . The assessment results show that the site management variable has a low score of 14 points out of a maximum value of 38 points. This indicates the need to conduct an evaluation of the need for further evaluation in research on other variables and also possible improvements to this terminal building, in order to support the achievement of Green Building (BGH) standards in Indonesia.

Suggestion

1. Deli Port Passenger Terminal Building at Belawan Port can try to re-maximize it according to the Green Building parameters . SE PUPR No. 01/SE/M/2022 on the possible matters such as Provision of pedestrian paths, Outdoor lighting systems, and Green open space plans or also called RTH .
2. Additions *green facade* (facade) green) with integrate plant living on the facade can also improve aesthetics and add Green Open Space in accordance with the provisions of the Basic Green Coefficient value to improve the air quality around the passenger terminal building.
3. In the study furthermore can done assessment more related efficiency use energy , water, assessment quality air in space , and use of friendly materials environment at the Bandar Deli Passenger Terminal, Belawan Port .

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