The application of energy saving to the Kali Adem Muara Angke Port design

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Abstract. The level of sea transportation use in Indonesia is getting higher and higher, so it must be balanced with the improvement in the quality of port supporting infrastructure. The Provincial Government of DKI Jakarta will revitalize Kali Adem Port, which will also be assisted by the Thousand Islands Regency Government, considering that Kali Adem Port is one of the gateways to the Thousand Islands. Kali Adem Port is a passenger port located on Jalan Dermaga, Pluit, Penjaringan, North Jakarta, Special Capital Region of Jakarta. Kali Adem Harbor serves tourists who want to visit several islands in the Thousand Islands, and residents of Pulau Seribu who want to buy some daily necessities from Jakarta. Passenger density, problems with access and circulation, and several other problems require this Port to improve its quality and quantity. This port should have designed to pay attention to the environment, such as applying the eco-tect theme to this building, as well as the waterfront concept to maximize the potential of the existing sea. In this design the concept of shading is applied to the facade to maximize comfort and the application of energy-saving lighting in buildings and the Port and its plazas

1. Introduction

The development of an area is influenced by various factors, one of which is transportation. Transportation is a tool that was created to facilitate human mobility, it can be used for the purposes of transporting goods or for transporting people from one place to another. Transportation is divided into three types, namely air, water and land. Indonesia is a maritime country which has 17,504 islands [1]. With this diversity of islands, Indonesia has various problems that must be solved, one of which is transportation. The continuity of the development of an area is influenced by the smooth transportation that accommodates it [2]. Transportation that is suitable for connecting between island groups in Indonesia is sea transportation. This is based on Indonesia's geographical data which has tens of thousands of islands and must be affordable for equitable development.

The level of use of sea transportation in Indonesia is getting higher, it must be balanced with the increasing quality of port supporting infrastructure. The Provincial Government of DKI Jakarta will revitalize Kali Adem Port, which will also be assisted by the Thousand Islands Regency Government, considering that Kali Adem Port is one of the gates to the Thousand Islands [3]. Kali Adem Port is a
passenger port located at Jalan Dermaga, Pluit, Penjaringan, North Jakarta, the Special Capital Region of Jakarta. Kali Adem Port serves tourists who want to visit several islands in the Thousand Islands, as well as residents of Seribu Island who want to buy some daily necessities from Jakarta. Overcrowding of passengers, problems with access and circulation, and several other problems require this port to improve its quality and quantity. This port should have a design that considers the environment, such as applying an eco-tect theme to this building [4]. In this design, the concept of shading is applied to the facade to maximize comfort and the application of energy-saving lighting to buildings and to the port and its plazas [5,6].

Based on reports from port operators, the number of passengers departing on national holidays reaches 7,000 to 8,000 people. Meanwhile, on weekdays there are 200 to 500 people, and on weekends as many as 1,000 to 4,000 people. And this number has continued to increase in recent years, so that the ships at this port experience passenger density and require new shipments as well as improved ship quality.

In addition, the lack of circulation and access to the port makes this port need more attention to improve its quality. Including the construction of several other supporting facilities such as hotels for tourists who want to stay overnight, restaurants with a waterfront concept for residents of Jakarta and its surroundings, and most importantly a shopping center for residents on Seribu Island who want to shop for their daily needs.

Our earth has started to be threatened by its kelestariaanya. So we should change our mindset that is still indifferent to the environment to be more concerned about the environment [7]. One of the ways to restore the condition of our earth which is currently being done intensively is greening [8]. Apart from that, making energy saving efforts in one local / local community, because it is impossible for us to do it all at once for a large community, for example nationally. This effort is started in each building in terms of energy saving by applying the principles of eco-tech [9,10].

The purpose of this research is to provide effective, comfortable and environmentally friendly facilities for visitors and port managers, as well as to solve various problems that exist today at Kali Adem Port so that this port can continue to develop.

2. Methods
The study process used in designing the Kali Adem Port was carried out using a quantitative-correlative analysis method, which is to find and determine the correlation between the research variables. This method is in the form of descriptive descriptions of the current phenomena accompanied by literatures that support the theory used quantitatively, using descriptive methods that discuss the techniques of collecting, processing or analyzing and presenting data sets.

Qualitative or correlative data analysis by carrying out several stages through surveying the site and objects to obtain data relating to the design object. Data sources are divided into two, namely primary data and secondary data. Primary data is work in the form of field studies, while secondary data is literature studies. The literature study used is a reference for all types of references such as books, journals, papers, articles and other scientific works The methods used in data collection techniques are survey/observation, interview, and literature study.

3. Results and discussion

3.1. Function analysis and activity analysis
The function in a building is very necessary and should be made according to the purpose of the existence of a building. Kali Adem Port is one of the places used to serve transportation to and from the Thousand Islands. Thus, Kali Adem Port certainly requires a specific function in the building. The various functions required by Kali Adem Port are the main and supporting functions, as can be seen in table 1 below.
### Table 1. Analysis of building functions.

| Function Type | Primary function | Secondary function | Supporting function |
|---------------|------------------|--------------------|--------------------|
| 1. Port       | 2. Shopping and culinary center | 1. A place to relax | 1. Toilet |
| 2. Capsule hotel | 2. Culinary place | 2. ATM center | 2. Toilett |
|               |                  | 3. 24 hour security | 3. 24 hour security |
|               |                  | 4. The vehicle parking | 4. The vehicle parking |
|               |                  | 5. Recreation area | 5. Recreation area |

Various types, characteristics and behavior of user activities in a Kali Adem Port building are presented in Table 2 below.

### Table 2. Activity analysis.

| Function clarification | Type of Activity | Nature of Activity | Activity Behavior |
|------------------------|------------------|--------------------|-------------------|
| Primary                | 1. Island crossing | Routine, public | Travel |
|                        | 2. Shopping centre | Routine, public | Buy and sell |
|                        | 3. A place to stay | Routine, private | Rest |
| Secondary              | 1. A place to relax | Routine, public | Relax |
|                        | 2. Culinary place | Routine, public | Eat |
|                        | 1. Toilet | Routine, private | Urinate |
| Supporting             | 2. ATM center | Routine, private | Taking money |
|                        | 3. 24 hour security | Routine, private | Maintain security |
|                        | 4. The vehicle parking | Routine, private | Parking |
|                        | 5. Recreation area | Routine, public | Relax |

3.2. Analysis of environmental aspects and analysis of mass composition

Siteplan is located in the North Jakarta area which is directly adjacent to the Java Sea. These waters are usually passed by ships connecting the Thousand Islands with Java Island. In addition, this area is also directly in line with housing and community shops. At this site there is also a fish market and Muara Angke Fishery Port. Meanwhile, several fishing boats belonging to the surrounding community also leaned on several locations on the waterfront around the site. See figure 1 below.

![Figure 1](source: private analysis)

**Figure 1.** Land analysis (left) and building mass (right).
3.3. Application of concepts in design
To reduce solar heat from the seaside and to maximize the comfort of building users, a shading façade is used so that solar radiation does not directly touch the building glass. In addition, the shadow of this façade will help make the rooftop comfortable. Meanwhile, openings are designed on the skylights, so that at night, the skylights can be opened to expel the hot air in the building during daytime activities. The existence of a cooling pool is intended to reduce the heat on the rooftop during the day. This pool is designed like a waterfall that is dropped from above to make it feel cooler than an ordinary pool with static water. In addition, this water can also be used as a heat sink for the adjacent room.

3.4. Quality objective
The parking lot is available for cars, motorbikes, and buses in sufficient quantity, and there is a special parking for online motorcycle taxis. Separation of access between port visitors and access for management offices and capsule hotel users. Meanwhile, elevation of the land as high as 1 meter to anticipate the problem of tidal flooding in the area ini.

Propagation of water infiltration, including at the plaza to improve water infiltration in this area. Apart from that, it is also provided location or place for street food in order to street vendors who are local people so they can sell regularly. Utilization of the potential for sea views is carried out with a beachside restaurant and sky lounge on the 4th floor of the building. Meanwhile, plaza design for gathering and recreation areas

In this design also made fisherman restaurant with the concept of providing a place to eat on the pier served by fishermen families who are right on the left of the land by using a boat (such as a floating restaurant). Meanwhile, the existence of watch tower for those who want to see the potential of the sea better from a height. See figure 2 below.

3.5. Interior perspective dan exterior perspective
The interior and exterior perspectives of the Kali Adem Port design concept can be seen in Figure 3 and Figure 4.

(source: private analysis)

**Figure 2.** Quality objective.
4. Conclusions
In order to resolve the density of visitors at Kali Adem Port, Muara Angke, a new design plan is highly recommended to accommodate visitors and improve the quality and quantity of the port. This development will support the resolution of a number of problems including visitor density, transportation circulation and access, environment and water infiltration, and flooding, as well as street
vendors that will be well organized. Increasing the quality and quantity of ports is a concentration in planning. To solve this problem, various theories have been adjusted according to the field findings to determine the appropriate port planning guidelines.

From the observations, it is known that the application of eco-tech is something that is suitable for use in planning this Kali Adem Port. The port of Kali Adem is planned to provide facilities in the form of a port terminal, shopping and culinary centers, several capsule hotels, as well as a port management office, and open spaces for gathering. The application of eco-tech in these buildings emphasizes the use of renewable energy using a solar panel system as well as designing a shading façade that is in accordance with climatological analysis.

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