MAINTENANCE GREEN WALL IN SMART PARKING BUILDING MINISTRY OF PUBLIC OF WORKS OF HOUSING, JAKARTA

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ABSTRACT

Implementation of sustainable building is currently a top priority of the government, based on the government's determination to reduce CO2 emissions to 26% - 41% by the end of 2020. The use of green wall technology in Green building is now one of the characteristics of buildings with green concept. However, maintenance issues, especially in its design are very seldom explored whereas this is important to achieve the purpose of building efficient and sustainable. This study aims to examine how the application of green wall in buildings that have a Green certificate and problems that occur on the application of green wall technology and what solutions can be taken to overcome them. The methodology used is qualitative in combination with case studies and review literature. The result of this research is to give a picture of green wall maintenance in green building in Indonesia.

KEY WORDS: Maintenance , green wall, green building

INTRODUCTION

Since the growing awareness of the importance of the development of environmentally and minimize the negative effects of construction, there have been several meetings of high-level world discussing climate change issues ranging from the Rio Earth summit 1992 up to the climate change Summit in Paris in December 2015. In Paris, the parties reached a compromise and set the temperature limits to rise under 2 degrees up to 1.5 degrees Celsius. The results of the other are suppressing greenhouse gas emissions is done as soon as possible by way of developing the technology and absorb carbon. Development of environmentally become a major commitment of the Government of Indonesia. It is contained in document Construction 2030 Indonesia namely grand design and construction of the grand strategy that Indonesia should be oriented not to donate the environmental damage but instead became a pioneer of improvement and quality improvement the environment of the entire habitat in Indonesia, inhabited by humans and other living beings in the whole symbiotic mutualism (LPJKN, 2007). The development of the concept of sustainable development requires a complex interaction of environmental processes, include cultural, economic and human activity. Green building is one of the concepts of the environmentally friendly building because of the use of an efficient and healthy materials and proven capable of suppressing energy consumption compared to conventional buildings e.g. in the building of the Ministry of PUPR are able to save 40% of the electrical energy and 80% of the energy of water. The other building is the Green Office Park Lot 6 (GOP 6), BSD Green Office Park Complex is able to save 40% of the electrical energy. Vertical garden has been used as part of the construction for a long time because it is considered as one of the strategies to improve the building. But unfortunately, research on vertical garden tend to discuss beneficial issues compared to how to develop technology in addressing the problems of the vertical garden watering systems such as crop selection, etc. Whereas the green wall has many advantages to a building and towards green building, green wall is an environmentally friendly building. The study of the green wall in the country of Singapore by Michael, et al (2016) discovered that technical problems and environmental problems are very common in the operation and maintenance of the green technology wall. Based on the current study will explore how applying green wall in the building which has a green certificate in Jakarta. Formulation of the problem research on the maintenance of the green wall is very important because the existence of optimal maintenance then will be able to maximize performance, minimize risk, minimize negative environmental risks, minimize costs and minimize energy consumption.

Based on the research problems are formulated as follows: (1) What are the obstacles that occur in the maintenance of the green wall? (2) is the system of

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maintenance of the green wall is already going well? (3) If there is already a standard raw by the Green Building Council in the maintenance of the green wall on a building that has a standard '.

REVIEW OF RESEARCH

Green building in the defined by the American Society of Testing Materials (ASTM) that a building said to be green if the building meets the specifications required in which minimize the disruption to the environment and to improve the functioning of the ecosystem of local, regional and global both in the process of construction or thereafter. On the process of construction by reducing the impact on the environment through eco-friendly materials, land use, energy, waste management and construction operations. The practice of green building design and efficient material sourced from nature, create secure human health and increasing productivity, reducing the production of waste and pollution (Usman et al, 2012). This can occur if the building uses electrical energy and water are low, using materials that can be recycled and produce low CO2 gas.

Green Building Council Indonesia (GBCI) is a non-profit corporation that provides green building certification. The measurement tool used is the 6 criteria that contain GREENSHIP, i.e. Appropriate Site Development (ASD), Energy Efficiency and Conversation (EEC), Water Conservation (WAC), Material Resources and Cycle (MRC), the Indoor Health and Comfort (IHC) and Building Environment Management (BEM). These criteria were given weights each in her assessment (GBI, 2015). Green walls in several studies, also known as a vertical garden, vertical greening system or green vertical system. Green wall also serves to protect the walls of the building. With the modular wall system 'live' all components have certain dimensions that include a planting medium that strengthen the growth of plants (Koumoudis, 2010).

Manso and Castro Gomes (2015) states that the green walls have advantages such as improving energy efficiency by improving the quality of light coming into the room to control the heat. Feng and Hewage (2014) stated that the green walls can increase the lifespan of the facade by way of protecting the facade structure itself. Green walls filter out ultraviolet light volatile and capable of reducing the air pressure so that increasing the age of the material and save on maintenance costs.

The Green wall is planted in a vertical structure and can be grown on a wall or panel media. According to Heffernan (2013), green walls or vertical garden can live for 25 years if properly maintained. There are 3 types of green walls

namely: planter system, a cassette system, the system climber. The system consists of a box or planter placed on a modular wall structure. Cassette system is also modular plants that stick to the wall where the plants grow horizontally. Climber system using plants that grow and hang from the top of the base to a certain height.

Fig 1. The Green Walls Type (Heffernan, 2013)

RESEARCH METHODOLOGY

This study uses qualitative methods begins with doing a review of the literature to find and study the reference materials about green walls. Next steps include the observation and data collection in the field. The questions tested data with field surveys to find out whether the same events occurred with previous research. The building will be observed is building smart parking in the Ministry the PUPR in Jakarta where the building has had platinum and is a pilot project in Indonesia. It is intended to obtain data on maintenance as well as problems in the application of the green walls. Data collection is done with the interview with the Manager of the building, and after that data will be documented like photos or articles. Next validation will be performed against the results of the observation results of the analysis can determine the existing problems.The other interview was also conducted to staff the research and Development section of the Green Building Council to find out if there is a standard raw in the maintenance of the green wall.

RESULTS AND DISCUSSION

On the building of the Ministry of PUPR using 2 types of green wall planter systems and systems i.e. climber. As for building a smart parking system uses its own unique planter. The results of field observation data as follows: The building will be observed is building smart parking in the Ministry who were in Jakarta PUPR. This building got the green certificate year rated Platinum by the year 2013. Financially, the building is more

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expensive than a conventional building 15% but for the service and economic aspects of environmental 40-50, the coming year costs obtained more cheaply because it can save water consumption amounting to 83% in the rainy season and 61% in the dry season. Then the building was able to conserve energy in the amount of 35% carbon of 1,650 tons/year and 44% in electricity.

Building Smart Parking is one of the supporting facilities able to accommodate 350 4-wheel vehicles. In Fiq 2 and Table 1 below are smart parking building data and technical specifications of the green wall.

Fig 2. Planter System

Table 1. Building's data

Building's Name	Types	Irrigation System	Types of Plant
Smart Parking Building	Exterior green wall, Planter system	Dripping	Variety of plants like ferns, ophiogon

Source : Field observation, 2017

Data problems in literature will be used as a reference for initial identification of the list of issues. The list of questions based on literature review and after observations and interviews are the main problems namely the weather, design, and maintenance. Some of the problems that occur include:

- Plants that look dry and lush found.
- The walls were dirty as watering green wall
- Maintenance green wall using the Gondola

Problems are identified technical problems Design, Structure, and stability of the material, drainage systems, weather conditions, growth biology, control of animals and Maintenance.

Of the eight criteria derived from such identification is needed to set the parameters for the design and planning that is useful in the future.

Table 2. Result of Observation the Building

No	Problems	Caused	effect
1	Design & Aesthetics	Plant to much sun	The plant is not durable and needs a replacement plant
2	Construction & Installatio	Lack of knowledge about plants suitable for	Construction and installation is not appropriate
3	Structure, Sta bilit y mat	The presence of heavy rain and strong winds make corrosion and mildew	Corrosion on the wall
4	Watering System	Conventional irrigation systems and watering should	Wasted water
5	Drainage Systems &	Drainage underestimate d in the	The walls were dirty such as water spots
6	Weather conditions	Heavy rain, high winds which result in plant	The leaves fall, the plant is damaged
7	Growth biolog y and control animal s	-The plant does not cut -The lack of design considerations to prevent the	-Lush and dangerous to the structure of the box -Reducing the beauty of the green wall
8	Maintena nce	There is no standard for the	Making the high cost of trial & error

1. Design & Aesthetics
Selection of plants for the green wall is very important because it is associated with the installation, maintenance, and cost. Resistant plants in outdoor have different properties with indoor plants.
2. Construction & Installation
Related to the risk management system in sustainable building construction as it relates to safety in construction work.

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3. Structure, Stability material

Design correlate the structure and stability of the material because the design box/planter attached to the facade certainly have a special design object than a facade without sticking.

4. Watering System

One of the goals of green building is to save energy consumption of energy such as water. Water energy savings have a relationship with the design of the building.

5. Drainage Systems & waterproofing

drainage system ensures that water will not be assembled at the plant and does not damage the structure of the facade so that the waterproofing is necessary to prevent damage to the facade of the water seepage. The design must consider water and drainage management.

6. Weather conditions

Green wall facade serves as a protective wall in order to generate energy efficiency. Design green wall must consider the level of solar radiation and other weather parameters such as rain and wind.

7. Growth biology and control animals

To prevent the plant into a bird's nest and the mice then the design should take into account the growth of algae and fungi on plant roots

8. Maintenance

Maintenance needs to be done is to maintain and sustain a permanent building design should be based on regular maintenance and repair of the facade.

CONCLUSIONS

Green wall so far in its application to the green building assessment is part of the compliance landscape. In GREENSHIP itself to be completely available is a green base area that is a free land surface area of the structure by 10%. Given the many buildings that do not provide green land, then tricked with green green wall or roof. The Green wall here in its function to help meet the criteria for site landscaping. The existence of several problems found in green wall proves that the green wall needed maintenance standards related to risk management where safety a major part of the risk management objectives.

This study had similar results with a previous study conducted in Singapore where the green wall maintenance problems occur in the absence of standard maintenance green wall. The lack of standards in the assessment of the maintenance of green wall causes the sustainability of buildings cannot be at a proper value. This study showed that green wall requires special maintenance. Design for planning future green wall must be based on several parameters such as the weather, materials, drainage, irrigation, plant selection, and maintenance. The framework proposed in this study can be used as a basis for creating a green building maintenance of effective and efficient.

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