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Applications of Eco-friendly Materials in the Design of the Parking Lot and Gate at Pesantren Al Hikmah II Karangmojo Gunung Kidul

Windarta[1], Fadwah Maghfurah[1] ,Ratna Dewi Nur'aini[2]

[1] Mechanical Engineering Department, Universitas Muhammadiyah Jakarta, Indonesia
[2]Architecture Department, Universitas Muhammadiyah Jakarta, Indonesia
Email address of corresponding author: windarta@umj.ac.id

ABSTRACT

The purpose of this study was to determine the types of eco-friendly materials that can be applied to gates and gardens around the boarding school mosque. The research method used was a qualitative research method with a descriptive approach. The data that will be analyzed as the main research instrument was data that has been adjusted to the required criteria, in this study was the design of parking lots and gates that apply environmentally friendly materials or Material Resource and Cycle 2 (MRC 2), namely Environmentally Friendly Processed Materials. The studies founds that the use of materials in the construction of the parking lot and the gate of this pesantren, some materials do not have an environmental management system certificate are used in the production process. This building uses recycled materials, namely teak wood and used bricks which are applied to the gardens and gates of the Pesantren Al Hikmah II. This building uses materials whose main raw materials come from renewable resources.

Keywords: Eco-friendly materials, Al Hikmah II, Pesantren, Islamic boarding schools

1. Introduction

Pesantren Al Hikmah II is located in Branjang Ngawis Kapanewon Karangmojo, Gunung Kidul Regency, Yogyakarta, Indonesia post code 55891 about 50 km from Yogyakarta, 10 km from Wonosari the district capital. Pesantren Al Hikmah II provides education on religious basics for students who are mostly orphans. Since its inception about 10 years ago, the Islamic Boarding School has provided free education to underprivileged children according to the commitment of its founder, the late. KH. Drs. Supomo. The same spirit was also continued by Nuryadi, SPd. as a Kyai of Pesantren.

The Pesantren currently occupies 2000m^2 of land with 2 study rooms, a mosque, two male and female student dormitories, a boarding house for the caretaker of the Pesantren (plan shown in Figure 1.) Based on Figure 2, It appears that the existing gate is inadequate and requires a front and side garden.

The concept of tropical ecology which is a combination of architectural concepts for the tropics with additional ecology (Leksanata et al., 2018). This concept offers residential comfort in densely packed Islamic boarding schools for a long time by paying attention to ecological aspects as an answer to the problem of temperature and humidity in the tropics. Furthermore, Andiyan & Fauziah (2021) stated that the application of ecology in the architectural design of Islamic boarding schools

is reflected in the use of materials used, including wood and bamboo.
Eco-friendly materials are materials which, when used and when disposed of, do not have the potential to damage the environment and interfere with human health (Shahriyah, 2017). The selection of the right building materials, namely by using green materials or environmentally friendly materials, can produce quality buildings as well as environmentally friendly, especially the use of ecological materials or environmentally friendly materials. Green Material has a broader meaning than just environmentally friendly materials. The definition of environmentally friendly materials itself generally concerns the product side of the material itself. Environmentally friendly materials are materials that, when used and disposed of, do not have the potential to damage the environment and interfere with health.

Meanwhile, Green Material has a bigger meaning than only in terms of material products that are environmentally friendly. However, it also reviews the sustainability of the material source, production process, distribution process, and installation process. And can support energy savings (electricity and water energy), improve health and comfort, and efficiency of building maintenance management.
The purpose of this study was to determine the types of eco-friendly materials that can be applied to gates and gardens around the boarding school mosque.

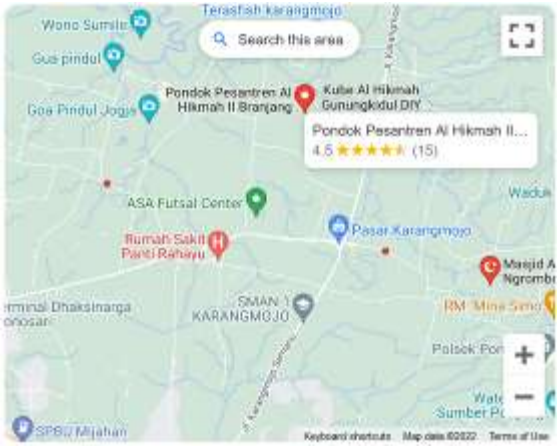


Figure 1: Maps of Pesantren Al Hikmah II in Karangmojo Gunung Kidul

Figure 2: Gate of Pesantren Al Hikmah II Karangmojo Gunung Kidul

2. Material and Methods

The research method used was a qualitative research method with a descriptive approach where the research describes the actual phenomena found in the data collection process which will then be analyzed and evaluated so as to obtain appropriate results to be applied to the case study being studied.

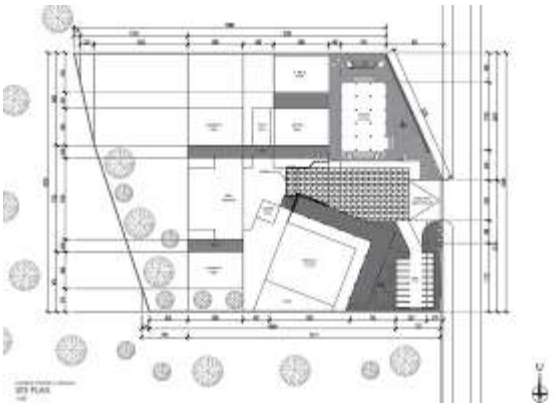
The materials used in the design of the parking lot around the mosque consist of bricks, teak wood, concrete, plants, plastic pots, while the materials used in the design of the gate consist

of steel frames, bricks, concrete, plants, plastic pots.

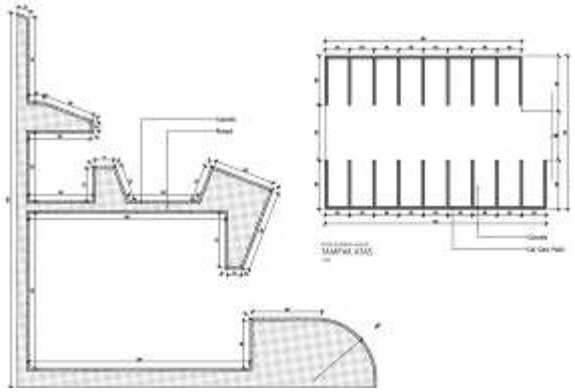
3. **The data that will be analyzed as the main research instrument was data that has been adjusted to the required criteria, in this study was the design of parking lots and gates that apply environmentally friendly materials or Material Resource and Cycle 2 (MRC 2), namely Environmentally Friendly Processed Materials. The precedent studies will be analyzed and adapted to the literature review so as to obtain results that will be evaluated and can be implemented in case studies of Pesantren. Results and Discussions**

According to the Greenship regulations for New Buildings Version 1.1, the criteria for environmentally friendly materials are: (a) fundamental refrigerant, (b) building and reuse materials, (c) environmental friendly materials, (d) non USD usage, (e) certified wood, (f) prefab material, and (g) regional material (Ayuningtyas et al., 2020).

The term green building materials, namely building materials that use natural resources in an environmentally responsible manner, respects the limitations of non-renewable resources such as coal and metals (Liauw, 2013). These building materials follow natural cycles and interrelationships in the ecosystem. This material is non-toxic. Green building materials are made from recyclable materials and these materials themselves are recyclable, saving energy and water. Friendly to the environment during the production process, when used, and when reused. Green building materials are materials that get high marks in recognition of resource management, influence on the quality of the indoor environment, and their performance for example in terms of energy saving, water saving, and so on (Spiegels & Meadows, 2011). In addition, there are also known categorizations of materials on the level of "greenness", resource management, toxicity, and performance. This category is a tool for assessing and comparing the greenness of one product with another. The size of the "greenness" of building materials varies, for example, energy saving, no waste, good indoor air quality, non-polluting materials, and others. Assessment criteria by considering the life cycle are also widely used to assess the greenness of building materials. Many companies also claim that their products are environmentally friendly, with various terms, such as sustainable building materials, eco materials, green building materials. Eco Options Products, for example, offer several products that are referred to as energy saving, conserving water, producing healthy homes, clean air, and sustainable forests (Spiegels & Meadows, 2011). Based on the design results of the Community Service Team from the Universitas Muhammadiyah Jakarta, several parts have been designed in the form of a cottage entrance gate, motorbike parking for the cottage mosque and gardens around the mosque. To design the needs of the cottage, a site plan and landscaping were made as shown in Figure 3. Based on Figure 3. the motorbike parking lot is in front of the mosque and close to access in and out.



(a)

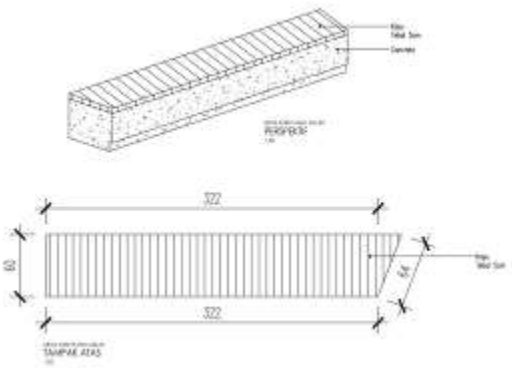


(b)

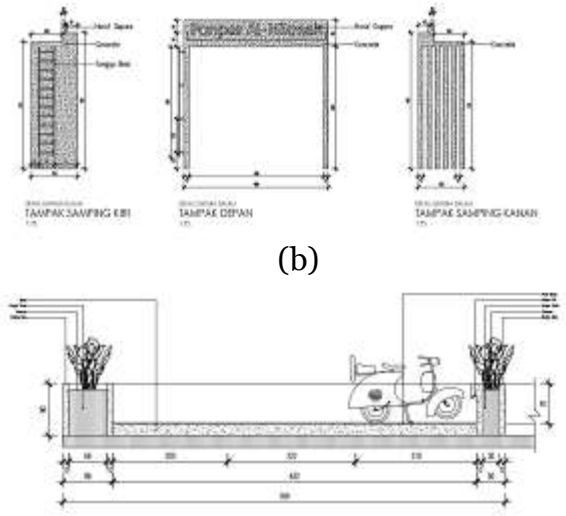
Figure 3: (a) site plan and (b) landscape of Pesantren Al Hikmah II Branjang Karangmojo

Figure 4. Explains the details of the design part of the Pesantren. The garden is located in front of the cottage (limasan) consisting of garden chairs and plants as well as a vertical garden. Garden chairs use environmentally friendly materials in the form of concrete and wood. The

gate consists of a cottage nameplate using painted iron material and concrete supports. Meanwhile, motorcycle parking uses concrete and grass.



(a)



(b)

(c)

Figure 4: (a) Mosque garden chairs; (b) Gate; and (c) Motorbike parking section at Pesantren Al Hikmah II Branjang, Karangmojo, Gunung Kidul

The materials used in the design of the parking lot around the mosque consist of bricks, teak wood, concrete, plants, plastic pots. Plastic pot materials and plants are used for gardens.
The gate design consists of a steel frame and a vertical garden. The materials used consist of steel frames, bricks, concrete, plastic pots and plants.

The purpose of implementing MRC 2 is to reduce the ecological footprint of the raw material extraction process and material production process. The benchmarks for MRC 2 are: first, using materials that have an environmental management system certificate in the production process of at least 30% of the total material costs. The certificate is considered valid if it is still valid within the time span of the purchase process under construction. second, using materials that are the result of the recycling process of at least 5% of the total material costs. Based on the analysis conducted, the results obtained are: a. In the construction of the parking lot and the gate of

this pesantren, some materials that do not have an environmental management system certificate are used in the production process. b. This building uses recycled materials, namely teak wood and used bricks which are applied to the gardens and gates of the Islamic Boarding School. c. This building uses materials whose main raw materials come from renewable resources.

Local materials are often considered more sustainable, perhaps with the idea that they don't have to cost a lot of transportation and don't cause as much pollution as they do (Li, 2015). This local material must come from local natural resources, which have a certain speed to grow or recover. This speed must be compared with the speed of use by humans. If the speed of use by humans is higher, then nature will lag behind in its recovery, and nature will begin to decrease and be damaged. At this point, local materials that were previously widely regarded as sustainable materials, will not be so anymore. This requires calculation and monitoring of natural resource management.

For example, in this area there are teak wood forest, bamboo forest, which are used as a building material. Initially, when the population of the area was small, the use of teak wood did not exceed the rate of production of the teak wood forest. Teak wood forests can always meet human needs. Teak wood is a sustainable, environmentally friendly building material.

As the number of people in the area grew, and the need for buildings increased rapidly, more and more teak wood was cut down, used to build houses (Findik & Turan, 2017). Houses increase, usually displacing forests or other green areas. If only the forest area remained, with a constant production speed as well. So one day, the volume of demand for teak wood as a building material will exceed the speed of teak wood forest production. At that time, teak wood was no longer an environmentally friendly building material.

At that time, the use of teak wood as a building material would threaten the survival of the teak wood forest, as well as all other species that depend on the teak wood forest for their lives. The eco-friendly nature of teak wood building materials is therefore not absolute, depending on the speed of natural production, and the amount and speed of use. The trend of increasing the number of people, thus, will tend to make all natural building materials no longer environmentally friendly. It takes calculations to determine the speed of growing bamboo, as well as the level of need for building materials from teak wood. When the demand for teak wood exceeds the speed of its growth, the use of teak wood should be limited to the maximum speed of growth.

The application of technology to increase the strength and durability of teak wood will make teak wood building materials durable, so it does not need to be replaced with new material too often. This will reduce the extraction of teak wood from nature, reducing the speed at which the carrying capacity of the teak wood forest is exceeded. The assumption that local materials are more sustainable needs to be accompanied by awareness, what conditions can support this assumption.

4. Conclusion

Environmentally friendly materials that comply with MRC 2 standards are materials that have meet criteria accordance with the standards set by the Green building Council Indonesia (GBCI). These materials are basically when used and disposed of, they do not have the potential to damage the surrounding ecosystem and interfere with health.

Based on the analysis conducted, the results obtained are: a. In the construction of the parking lot and the gate of this pesantren, some materials that do not have an environmental management system certificate are used in the production process. b. This building uses recycled materials, namely teak wood and used bricks which are applied to the gardens and gates of the Pesantren. c. This building uses materials whose main raw materials come from renewable resources.

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