

STUDY OF ECOLOGICAL ARCHITECTURE CONCEPT IN THE RESIDENCE OF KAMPUNG GLINTUNG, MALANG

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ABSTRACT

Settlement, whether its in the form of residential or commercial, or in the form of real estate or kampung, is one of the urban development key aspects. The settlement sometimes grows not harmonically with the environmental ecosystem. This paper believes ecological concept is one of the architectural sciences that can be applied in planning and designing any kind of settlement including kampung. This research was conducted with the aim of understanding and identifying the application of the principles of ecological architecture in a residential area named Kampung Glintung, also known as Kampung 3G (Glintung Go Green). The research method used is descriptive qualitative method. Data collection was carried out by observing, taking pictures, mapping, and conducting literature reviews related to the ecological concept applied in Kampung Glintung. This papers finds Kampung Glintung has fulfilled some basic principles of ecological architecture for example reusing building materials and applying bio-pore well management. However, another aspect such as density still need to fixed.

Keywords: settlement, ecology, ecological architecture, urban development, environmental ecosystem

INTRODUCTION

The residential area is one of the important components in urban development. According to Purnamasari in Larasati (2021) it is stated that based on the legislation no. 1 of 2011 concerning housing and it is stated that it is part of the environment consisting of facilities, infrastructure, supporting utilities and supporting activities in [1].

Zheng Xie (2019) states that urban development requires overall development that needs to pay attention to ecological principles by considering the sustainability of settlements, users and the surrounding environment [2]. A residential area can be said to be ecological if it has fulfilled the application of ecological principles in it. The ecological approach in the field of architecture will cover the harmony between humans and nature and the ecosystems that surround it [3]. Based on this statement, ecological architecture is a science that studies the harmony of buildings and their built ecosystems by maximizing the natural potential and minimizing the negative impacts of the consequences of these buildings. Because

basically the science of architecture is one of the fields that can cause environmental damage at this time if it does not go through a series that is in accordance with the environment.

The main elements of ecological architecture consist of air (maintaining air quality from pollution), water (elements of sustainability and the most important human needs), land (media in carrying out life and building buildings), and fire (supporting elements in meeting human needs) [4]. The need for energy is one of the things that must be realized in optimal use and utilization so that innovation development is needed on the basis of harming resources and minimizing the use of resources.

Ecological settlements are settlements that have attempted to apply architectural principles in them. Settlements are formed as a consequence of human instincts who tend to live in groups [5]. Therefore, the linkage of social life with the development of settlements is one of the factors that need to be considered in planning and developing settlements, so that urban growth will run on a sustainable basis.

One of the settlements that has innovated one of the ecological principles is Kampung Glintung, which is located in Malang, East Java, Indonesia. The village is an urban village that previously had many problems. The problems that arise are slum and always flooded in the rainy season because they are close to a river which is located lower than the road [6]. However, in 2012 the village created a movement to overcome this problem so that Kampung Glintung has now become one of the ecological pilot villages in Malang. This can be a consideration that the level of concern and community participation plays an important role in the sustainability of an ecological settlement.

Based on this description, the purpose of this paper is to understand the importance of applying the concept of ecological architecture to a residential area so that it can reduce the negative impact of development and improve the quality of the residential environment to be more sustainable.

METHODS

This research was conducted using a qualitative descriptive method. The method of data collection is carried out with primary data i.e. observing the *kampung* and secondary data by conducting literature studies based on scientific articles that discuss similar problems [7]. The analysis was carried out by identifying the condition of the case study with parameters related to the standard of ecological settlements in a qualitative descriptive manner.



Figure 1. Glintung Go Green Malang.
Source: Indonesia Expat, 2019.

The study of the concept of ecological architecture in residential areas was carried out in Kampung Glintung focuses on the Glintung

Go Green (G3) program which is run by the community RW 23 and RW. Kampung Glintung is surrounded by densely-built areas such as residential, commercial, industry. It is located at the intersections of primary and



secondary streets.



Figure 2. Kampung Glintung Location Map.
Source: Google Satellite ($7^{\circ}56'55''S$ $112^{\circ}38'23''E$).



Figure 3. The Condition of the Past and Present of an alley in Kampung Glintung.

Source: Directorate General of Human Settlements Ministry of Public Works and Public Housing, 2017.

RESULTS AND DISCUSSIONS

The discussion will be carried by using 2 main concepts. One by Frick & Suskiyatno (1998) who state the ecological approach is an architectural concept that pays attention to the harmony between buildings and ecosystems by

minimizing the impact caused by both development and the humans who live in it [3]. Another is by the Minister of Public Works Regulation No. 2 of 2016 [8] says there are ecological, economics, social, and institutional aspects of ecology architecture.

Ecological Aspect

1. Healthy housing/healthy building.

A healthy house / building is a building that does not cause problems for the environment and ecosystem. One of them is the use of building materials. Building materials can be categorized based on their ecological parameters as in the following table [9].

Table 1. Ecological Building Materials Grouping.

Ecological Material Parameters	Examples of Building Materials
Regenerative building material	Wood, bamboo, rattan, thatch, reeds, coconut fibers, bark, cotton, kapok, animal skins and wool
Reusable building materials	Soil, clay, loam, tras, limestone, river stone, natural stone
Recycled building materials	Waste, scraps, trash, dregs, packaging materials, sawdust, pieces of glass
Natural building materials that undergo simple transformations	Plastics, synthetic materials, epoxy
Composite building materials	Reinforced concrete, fiber cement plates, composite concrete, chemical paints, adhesives

Source: Frick (2016) in Dewi (2019) [10].

The development of the city in Kampung Glintung has caused the use of materials used in residential buildings to use natural materials that have undergone a simple transformation. The identification of materials that can be seen is the use of wood material in the main structure of the roof and the use of clay tiles as a roof covering, the use of red bricks on the walls which are finished with colored cement and colored paint or natural stone, then there is the use of ceramics on the building floor.

The residential building of Kampung Glintung utilizes the front side of the building with several openings that have dimensions of 65 x 110 cm. There are no openings on the right and left sides of the building due to conditions that stick together and are not spaced. Natural lighting and ventilation are optimized through the front side of the building. The condition of the building that does not directly intersect with the road in the area causes an open area to be used as a house building. The yard is filled with greening areas such as ornamental plants or shady trees.

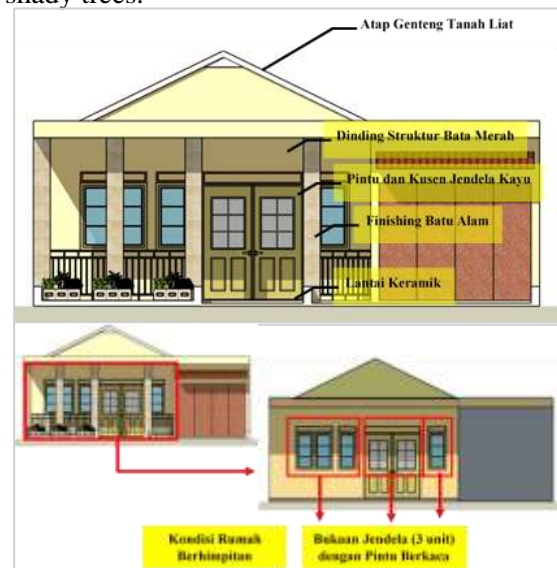


Figure 4. Usage of Materials and Laying Openings in Kampung Glintung House

Source: Author documentation, 2021.

Apart from making use of the facades of the residential buildings, it can be seen that the buildings are dominated by the application of the 'L' mass form. This is related to the existence of an open area on the front side of the building that is large enough so that air circulation and natural lighting can enter optimally into the building. Utilization of the open area on the front side of the building is used by planting vegetation to create rainwater catchment areas as well as air exchange generated by trees or plan



Figure 5. One of the Houses with an Open Area in Kampung Glintung.

Source: Author documentation, 2021.

2. Building Density.

The building density is based on the Standards for Identification of Slum Settlement Areas in Metropolitan City Support Areas: high > 100 units/Ha, moderate > 60-100 units/Ha, and low > 60 units/Ha.

The mass of the buildings that can be identified from the settlement of Kampung Glintung is the influence of high density levels and the distribution pattern of the dwellings which are not evenly arranged. This will have an impact on the building on the effect of its acclimatization. The level of density and the distribution pattern is influenced by the conditions of the settlements in the middle of the city. Settlement land conditions have been used as residential land with buildings as a whole, leaving only a few green open areas as rainwater absorption areas.

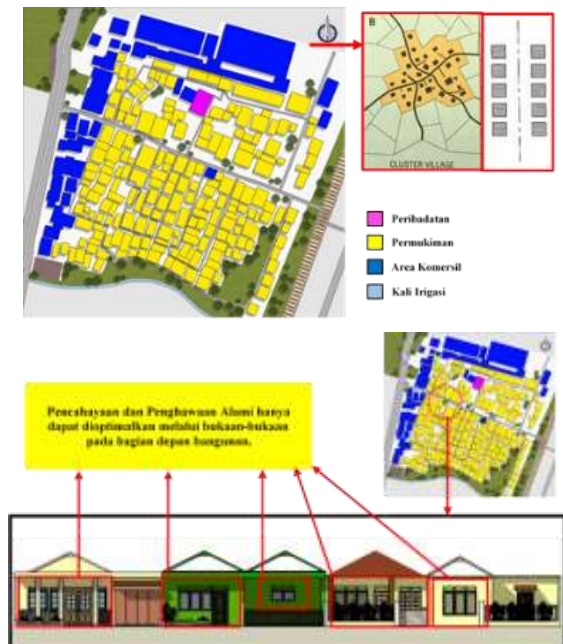


Figure 6. Building Density at Kampung Glintung House (Source: Author documentation, 2021)

3. Environmental Road Conditions.

Based on the level of accessibility in Kampung Glintung, there are primary roads, secondary roads, and tertiary roads. The primary road in the form of the main access has a width of 8 dots with the condition of the road infrastructure that already uses asphalt pavement. The primary

road is public because it is the main access to Kampung Glintung. Secondary roads and tertiary roads in Kampung Glintung are the access in the settlement which has various road widths. Some of the road specifications can be seen in the table below.

Table 3. The condition of road Kampung Glintung

RT	Road	Condition
1	1,5 Meter	Good
2	1.5 Meter	Good
3	1 Meter	Good
4	0,7 Meter	Good
5	2,4 Meter	Good

Source: Author documentation, 2021



Figure 7. Building Density at Kampung Glintung House.

Source: Author documentation, 2021.

Based on the road infrastructure that has been generally identified, it does not meet the application of the principles of ecological architecture. The road conditions are narrow and there are no special roads available for pedestrians to differentiate the use of driving and non-driving roads. The use of asphalt material on primary roads is only able to absorb 10% of rainwater, while at several points of secondary and tertiary road locations that use porous congestion have the ability to absorb rainwater by 20%.



Figure 8. Road Conditions in Kampung Glintung.
Source: Author documentation, 2021.

4. Environmental Drainage Conditions.

Availability of settlement drainage channels, both tertiary and local. In addition, the availability of clean water (the need for clean water is met). The need for meeting clean water is at least 60 liters/person/day.

Rozikin (2018) said that the Kampung Glintung has innovations in managing environmental drainage, namely by carrying out the Water Savings Movement (GEMAR) which is managed at Glintung Water Street (GWS) [11]. Management is carried out by making rainwater infiltration wells which are reused as fish cultivation areas and hydroponic plants managed by a group of people.



Figure 9. Infiltration Wells in Kampung Glintung.
Source: Brawijaya University Blog, 2017.

In addition, there is a small injection well (bio pores) in which there is a lot of leaf and vegetable waste to be reprocessed into compost. These injection wells (bio pores) are scattered at several points on the Kampung Glintung road.



Figure 10. Bio Pore and Compost in Kampung Glintung.
Source: Author documentation, 2021.

5. Waste Management.

Waste management in accordance with the technical requirements of residential waste management, namely, domestic/household-scale waste sorting sites, TPS (Temporary Disposal Sites) or TPS 3R (Reuse, Reduce, Recycle) environmental scale, area for garbage carts/garbage trucks on environmental scale, and TPST (Integrated Waste Management Site) environmental scale.

Household waste is the most common waste in residential areas with the management system still by collecting waste, transporting waste, and going directly to final disposal [12]. In Kampung Glintung, the waste processing process is carried out jointly by a group of people and PKK women which is carried out at the Kampung Glintung waste bank. The waste bank is located in RW 05, Purwantoro Village. Waste is sorted based on economic value and utilization, while waste that cannot be processed will be given to garbage collectors or disposed of to landfills.

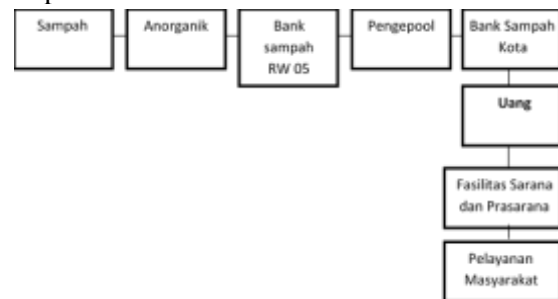


Figure 11. Waste Bank Management Diagram in Kampung Glintung.
Source: Author documentation, 2021.

Waste management in Kampung Glintung is not only managed individually, but there are also several garbage dumps at certain locations. The trash cans will be used publicly so that no trash is dumped on the road and maintain the cleanliness of the environment around the settlement. Every week, the garbage will be distributed and processed in the RW 05 hall as well as the garbage bank area for the people of Kampung Glintung.



Figure 10. Bio Pore and Compost in Kampung Glintung.
Source: Author documentation, 2021.

5. Waste Management.

Figure 12. Waste Management in Kampung Glintung.

Source: Author documentation, 2021.

6. Availability of Green Open Space.

Based on Law no. 5 of 2008 concerning Guidelines for Provision and Utilization of Green Open Space (RTH) based on the population of the urban type of 0.3 m²/capita Permen PU No. 5 of 2008 [13].

In the availability and utilization of Green Open Space (RTH) in Kampung Glintung, there are areas for planting such as vegetable crops in the eco park area. In addition, ornamental plants are scattered in several areas as well as planting of hydroponic vegetable crops which are applied to each residential building to support the survival of the community.



Figure 13. Availability of Green Open Space in Kampung Glintung.

Source: Author documentation, 2021.

Economy Aspect

Regional development, especially in residential areas, is influenced by the planning process by developing its potential so as to encourage sustainable development. Therefore, Local Economy Development (LED) is considered as

an alternative in solving residential area development problems. Sandercock (2003) in Sumantyo [14] explains that Local Economy Development (LED) is a community-based planning with the aim of empowering and reducing state intervention so that planning focuses on the interests of the community and local communities. Ownership of micro businesses in residential areas with the development of innovations that can develop the economy.

Local Economy Development is an effort to improve the community's economy which is carried out in a participatory manner by the community itself by considering all aspects and potentials that exist in the residential area [15].

In carrying out waste control, the people of Kampung Glintung carry out waste processing by collecting waste in each dwelling with waste that has been divided into two types of waste, namely organic waste and inorganic waste. Organic and inorganic waste is then collected in the waste bank to be processed into something useful. Organic waste is used as compost which will then be used for the village or sold to generate funds for the development of the settlement. Inorganic waste is also processed into handicrafts as material for sales production. The various proceeds from the sales will be channeled into the construction of housing facilities and infrastructure, such as the construction of Integrated Health Center and repairing damaged public facilities.



Figure 14. Waste Management Diagram in Kampung Glintung.

Source: Author documentation, 2021.



Figure 15. One of the Waste Management to Be Managed As Selling Goods.

Source: Author documentation, 2021.

Social Aspect

One of the social aspects that participate in the development of residential areas is community participation in the settlements themselves. Ecology in a residential environment is a basic human need and has an important role in character building in a residential area. Therefore, community participation is one of the important strategies in the development of settlements as a factor in considering the environmental sustainability to be developed.

One of the efforts made by Kampung Glintung in developing its settlements is to strengthen the social spirit of the community by forming a social movement called Glintung Go Green (3G). The activities carried out are very simple, namely carrying out greening of the environment as well as supporting the Malang City Government program in carrying out the "Malang Ijo-Royo" reforestation movement [17]. The community's performance is proven by the selection of Kampung Glintung as the top five participants with the highest score in the cleanliness assessment in Malang City.



Figure 16. Gotong Royong Residents in Kampung Glintung to Make Infiltration Wells. Source: NUSP2, 2020.

CONCLUSION

Based on the results of the research that has been done, it can be concluded that Kampung Glintung Malang has fulfilled the basic principles of ecological architecture. This is proved by the application of healthy buildings, using reusable building materials, environmental road conditions that have taken into account rainwater infiltration areas, environmental drainage with infiltration wells, and waste management in the form of bio pore

well management and conducting waste management. However some ecological variables such as building density cannot fulfill the ecological aspect because the high level of density.

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