The study of application of the green architectural design concept at residential area in Jakarta

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Abstract. The developers of residential areas generally promote a theme in marketing their residential units. Likewise, one of many developers in West Jakarta markets its residential area with the Green theme. The purpose of this study is to identify the application of the green architectural design concept in building design and neighborhood at residential area. This research uses descriptive method through survey and field observation. The results showed that almost all criteria of the green concepts have been applied on building design and neighborhood with classical modern style related with theme of the cluster. The criteria are Appropriate Site Development, Energy Efficiency and Conservation, Water Conservation, Indoor Health and Comfort, and Building Environment Management. The use of renewable local materials (bamboo and wood) is not widely applied in home design. But the selection of modern materials follows the green standard, which is material that is already eco-material certified. The supply of building materials also comes from the area around the housing, so it does not use a lot of fossil energy.

1. Introduction
At present most of the world's population lives in cities, and will continue to increase rapidly. Of course, the development of this population requires residential areas. The development of new residential areas on the border of the city of Jakarta and surrounding areas sells many residential units with new concepts that meet current needs, namely the design of residential areas that are part of environmental conservation efforts. Because of this need, the concept of Green began to be widely promoted in new residential areas.

Architecture plays a role in the development process that occurs on the face of the earth, because architecture occupies space on natural land. So that architecture can be seen as a cause of deterioration in environmental quality or natural damage in a developing city, through the establishment of various buildings for settlements and industries, as well as other supporting facilities that do not pay attention to environmental and ecological conditions. The phenomenon of global warming caused by the effects of greenhouse gases on the earth is also believed by researchers to be due to development activities carried out on the surface of the earth [1].
At the beginning of the concept of sustainable development, architectural design only focuses on one issue, namely the efficiency or use of used materials. But since the 1980s and 1990s, planners and designers began to realize that the integration of all factors can produce good sustainable design. So that currently, many sustainable buildings have been combined into several focus discussions such as; land selection, energy efficiency, water conservation, material source efficiency, and environmental quality in space [2].

The study of the assessment of the physical quality of buildings and residential areas in Jakarta with the Green concept has not been done much. The research that has been done is an assessment of the application of the concept of green architecture in homes in the city of Medan [3] and in Jakarta [4], which concludes that the design of houses is not fully applying all aspects in the criteria of green architecture.

Currently the green architecture design concept has begun to be applied not only to the design of residential units, but also to the design of the environment with the Green concept. With the application of the Green concept it is expected that residents in these residential environments can be more comfortable and better with the carrying capacity of a quality environment. To identify the physical conditions of new residential areas in Jakarta that state themselves applying the Green concept to their residential design, and whether the physical quality of the residential area is in accordance with Green criteria that must be met, the study of application of the green architectural design concept at residential area in Jakarta should be done.

2. Research Methodology
The research was conducted by descriptive method through surveys and field observations at one cluster of Green Lake City in West Jakarta.

The data were analyzed by parameters of Greenship Homes to answer the research problem. The criteria are Appropriate Site Development, Energy Efficiency and Conservation, Water Conservation, Material Resource and Cycle, Indoor Health and Comfort, and Building Environment Management.

Conclusion is prepared to answer questions about the application of green architecture concept on building design and neighborhood in residential area to preserve the natural environment and to improve the quality of life.

3. Results and Discussion
Green Lake City residential area in West Jakarta is a residential area with a Green theme. This area is located in a residential area with a fairly high density (see figure 1). There are several residential clusters in this area where each cluster has its own supporting facilities. Focus for this study is the design of West Europe cluster and the design of houses in this cluster (see figure 2 and figure 3).

![Figure 1. The location of Green Lake City residential area.](image-url)
Figure 2. Master plan of West Europe cluster at Green Lake City.

Figure 3. The plan of Milan type.
The design of a Milan type of residence in Cluster West Europe - Green Lake City applies the concept of modular space with the division of the ground floor and upper floors having almost the same size (see figure 3). This gives the advantage of facilitating the development process, and being efficient-effective regarding its structure and construction. The ground floor is focused on semi-public activities (multi-function family room and dining room), and supporting rooms / services (kitchen / pantry, warehouse / household assistant room, laundry room and drying room), while the upper floors are focused on private activities (sleeping rooms and bathrooms for residents). Transparent windows with large openings provide the opportunity for natural lighting to enter the house, so that the house gets enough light from morning to evening, without using artificial lighting.

Based on the results of an analysis of Milan type house architectural design in Cluster West Europe - Green Lake City, this house design has the same character with the design of the house Omah Harimurti [4] and Rumah Hijau design [5] namely the spatial design utilizes natural lighting, has multifunctional space on the ground floor, and building materials use more prefabricated materials from the location closest to the house that was built, the design of the room and its construction with a modular concept, and finishing materials that are environmentally friendly [6].

In terms of the assessment of the Greenship Homes criteria which consists of 6 criteria, namely Appropriate Site Development, Energy Efficiency and Conservation, Water Conservation, Material Resource and Cycle, Indoor Health and Comfort, and Building Environment Management. Milan type house architecture design meets 6 criteria that must be met.

Appropriate Site Development: the location of the house is in accordance with its designation for housing. The design has a garden area in front and behind as a green open space as required. Accessibility from the road environment in front of the house to the house terrace is designed to be comfortable for users, including for users who are disabled. The slope of the carport surface facilitates the flow of rain to the drainage in front of the house.

Water Conservation: Water conservation carried out in residential areas in this cluster and in the design of his house is implemented by providing infiltration wells in each house to accommodate rainwater runoff, there is a simple waste treatment tank in each house so that kitchen liquid waste will be processed first before being discharged into the drainage in environment. The treated liquid waste is directed to the water treatment plant and artificial ponds around the cluster, which are designed as well as water recreation areas.

Energy Efficiency and Conservation: the residential design adapts to the local climate (tropical climate) with passive design innovations in the design of the facade of the house building. The use of walls that have holes for airflow in the service area on the side and back of the house, as well as door openings and wide windows for air flow and natural light, these two design strategies also help in saving the use of electricity for Air Conditioning (AC) and lights.

![Figure 4. The building elevation of Milan type.](image-url)
Material Resource and Cycle: The use of renewable local materials (bamboo and wood) is not widely applied in home design (see picture 4). But the selection of modern materials follows the green standard, which is material that is already eco-material certified. The supply of building materials also comes from the area around the housing, so it does not use a lot of fossil energy. The design of the house with a classic modern architectural style follows the characteristics and style of architectural houses in Europe causing concrete material and plaster-brick walls to be used more in this house. Some houses are combined with natural stone with colors matching the color of the walls of the house, so that the appearance of this house becomes more natural and environmentally friendly.

Indoor Health and Comfort: the design of modular homes with spatial layout according to the function and nature of space also helps create spatial comfort. Large open spaces around the house help provide clean and natural air circulation, and reduce pollutants. Large door and window openings maximize the entry of natural lighting and comfort visually.

Building Environment Management: the management of maintenance of buildings and the environment in this residential area is carried out by the Building Management from the developer, who issued a guidebook for maintenance and development activities in the region. With a clear guidebook, the environmental preservation of residential areas can always be maintained so that it can create a sustainable green environment and provide comfort for residents.

The high occupancy density and the large number of residents using supporting facilities in this residential area show that there is satisfaction and comfort for residents to live in their homes and supporting facilities. From the results of interviews with residents of the house also obtained information that they can save enough electricity. From this, it can be seen that the efforts to create green and sustainable architecture must be fought for by many parties, not only by the architect, but also by the government and society who can play a role in realizing a green and sustainable built environment.

4. Conclusion
The application of the green concept to buildings and residential environments in Green Lake City - West Jakarta using green architectural design parameters shows that almost all criteria of the green concepts have been applied on building design and neighborhood with classical modern style related with theme of the cluster. The criteria are Appropriate Site Development, Energy Efficiency and Conservation, Water Conservation, Indoor Health and Comfort, and Building Environment Management. The use of renewable local materials (bamboo and wood) is not widely applied in home design. But the selection of modern materials follows the green standard, which is material that is already eco-material certified. The supply of building materials also comes from the area around the housing, so it does not use a lot of fossil energy.

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