Principles of Villa Design in Responding To The Tropical Climate in Indonesia

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Abstract. Villa accommodation facilities are for tourists who are on vacation and enjoy a relaxed atmosphere. As a leisure function, the villa has facilities that support holidays and relaxation, not just as a place to rest. Usually tourists enjoy holidays at the villa all day long. Therefore, the villa is designed as a tourist facility that can provide visitors comfort and wellness. The value of comfort and wellness can be achieved if the villa building can adapt and integrate with its environment. In general, villas in Indonesia choose the natural environment as a site for building villas with a tropical climate. The purpose of this study is to formulate a villa design in Indonesia using a tropical approach. The method used is descriptive qualitative by understanding the principles of tropical design and the implementation of the villa design. The study results show that spatial and building layouts that respond to tropical conditions produce villa designs that are contextual to tropical conditions in Indonesia.

Keywords: contextual; design principles; tropical architecture; villa design

Introduction

The development of the tourism sector does not only develop tourist objects and attractions; it also needs to be balanced with the construction of accommodation facilities for tourists [1], [2]. There are various types of lodging services offered to support the growth of tourist visitors. Villas can be used as a type of accommodation as well as a vacation spot, generally villas are located in areas with cool air such as suburbs, mountains or beaches. Villa is one of the tourist attractions for tourists who are on vacation and enjoy a relaxing atmosphere [3], [4]. The villa is designed as a tourist facility that is able to provide comfort to visitors. The value of comfort and wellness can be achieved if the villa building is able to adapt and integrate with the environment. In general, villas located in Indonesia choose the natural environment as a site in building villas that have a tropical climate. Villas are not only used as a place to rest, vacation and recreation, but villas can also function as meeting or counseling facilities (meetings) which also provide room service and meeting rooms [5]. Villas are not only useful for lodging services, but also for certain cities and regions that require these meeting facilities. Judging from the current developments, there are still many people who design without considering the environment or the surrounding climate and are only concerned with the beauty or view of the villa, so that the function of the villa is not optimized or utilized properly. Thus, before building a villa, it is necessary to pay attention to several aspects that support the achievement of the function of the villa itself.

Villa is a temporary residence that offers comfort and beauty around the environment [6]. In Bali, the need for villas will increase because Bali is one of the main holiday destinations for domestic and foreign tourists. Therefore, it is necessary to build villas around the city and far from urban areas in a very optimal manner. However, the design of these villas often ignores energy-saving and environmentally-friendly elements, resulting in relatively high energy wastage. Apart from that, it is also necessary to plan architectural concepts in the design so that they can adapt to Indonesia's tropical climate conditions [7], [8]. Tropical architecture is an architectural concept that adapts its concept to a tropical climate and is applied to a building function [9]–[12]. There are several problems, namely how to implement energy-saving and environmentally friendly concepts through an architectural approach tropical.

A villa is a building or house located in a cool and comfortable place which is usually not a permanent residence, but is only used as a temporary vacation stop for the owner or can also be rented out to tourists [6]. According to Muhammad (2003), villas are all forms of accommodation construction, symbols, business or commercial entities that provide accommodation services for people who stay in villas. Villas can be used as a temporary residence while on vacation and recreation and villas can be used as a means of resting [13]. From the definition of villa above, it can be concluded that villas are accommodation facilities that are not only used as a place to rest, vacation and recreation, but villas can also function as meeting or counseling facilities (meetings) which also provide room service and meeting rooms. That way, villas are not only useful for lodging services, but also for certain cities and regions that need these meeting facilities. With the various understandings that have been obtained from the types of villas, keep in mind again that even though the location of the villas is different, the climate conditions of the villas have in common, namely a tropical climate because we are in Indonesia. For that we must pay attention to building design in order to balance the climate which is an important factor in buildings.

Tropical Architecture can be said as a type of architectural design style which is a response and adaptation of a building to climatic conditions in a tropical region [10]. Every building with tropical architecture is often easily exposed to sunlight throughout the day which enters through wide windows and has cross ventilation and vegetation around the building [14]. The airflow creates a fresh space without being stuffy and damp thereby minimizing the use of fans and air conditioners. The concept of tropical buildings paying attention to building orientation, natural openings, materials, temperature, and the influence of vegetation around the building will provide good factors for buildings in tropical climates. The tropical climate is close to the equator and is characterized by high solar heat, high humidity and rainfall, wind movement, and many other effects [15]. The impact on the building will be felt if you have used a standard tropical architectural design that will make people feel comfortable in tropical buildings. Tropical architecture also pays attention to the use of materials that respond to tropical climate conditions and are able to show the characteristics of local materials that are more suitable and environmentally friendly. [10]. The purpose of this study is to formulate a villa design in the context of a tropical climate. The aspects studied in formulating the villa design are aspects of the outer and interior space, aspects of tropical materials, and aspects of tropical building forms. The output of this research resulted in a design concept that takes into account climatic conditions which are responded by the villa building in creating a comfortable and safe villa building for its visitors.

Method

This study uses a qualitative descriptive method through a conceptual study of tropical architecture in understanding its principles in the design of villas in Indonesia. Qualitative methods aim to understand an object in depth and interpret it [16], [17]. The principles formulated are interpreted in the form of design models to deepen understanding of the principles of tropical architecture. The research focuses on the concept of planning and presenting villa buildings to find out information related to the relationship between the construction of a villa and the tropical climate in Indonesia. The data used is qualitative data in the form of data processing in the field as well as several working drawings such as floor plans, views, sections, interior, exterior and good spatial design, so as to maximize the concepts used such as natural lighting, natural ventilation, vegetation in villa buildings. The data collection carried out on this villa design is collected periodically through direct field surveys.

Result and Discussion

Outer and Interior Layout

Villa buildings with tropical climates usually have gardens and ponds, thus creating a microclimate as a good indicator in designing buildings in tropical climates. By providing vegetation in open spaces, it is able to create good natural ventilation into the building. As well as the existence of a pool in the building area as one of the elements that can deliver heat and cold (adapt) to the building environment. So water has the ability to change from water to steam so that the air temperature around the building cools down. During the day, hot sunlight can be used as energy to convert water into water vapor, therefore it will cause humidity in the surrounding building area so that the air temperature is not too hot. With the application of these two indicators, this building can create comfort, beauty, health for its visitors.

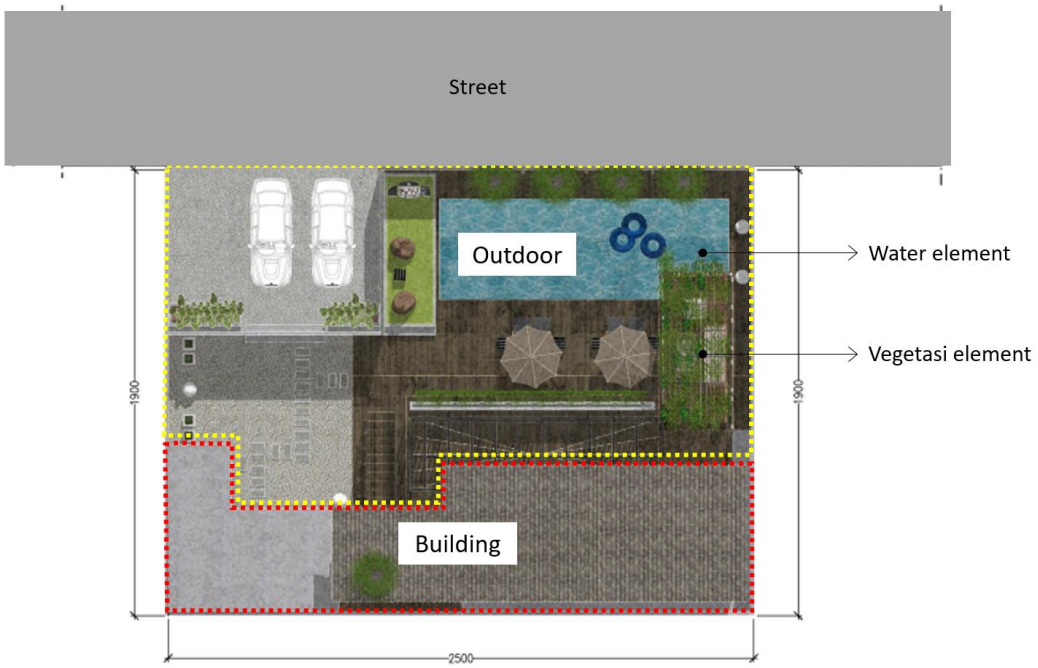


Figure 1. The Proportion Of Built-Up Space And Unbuilt Space

The next interesting thing is in the layout of tropical buildings where the relationship between the outer and inner spaces is continuous, not limiting. If on the outside there is a lot of vegetation or trees, so is the interior space, filled with potted plants which will give the impression that we are still outside and feel the same coolness. In addition to natural ventilation, natural lighting is also very important to be applied in buildings with tropical climates. Having openings in buildings makes it easier for sunlight to enter the room, the goal is to reduce the use of artificial light during the day and to be able to save energy and reduce pollution levels. In addition, natural lighting is good for the health of visitors, for example as a killer of bacteria and viruses and boosts immunity.

Principles of Materials

Materials used in buildings in tropical climates should be able to reduce light or sunlight entering the room. The materials used must have heat absorption capacity so that they can withstand the heat outside before entering the building. The longer the material can retain heat the better. The material referred to here is the material used as the wall. In tropical climates, natural stones, bricks and concrete are suitable for use as wall materials.

Walls made of natural stone materials will last longer when other materials are hot, because natural stone walls are one of the materials that store the most heat radiation. Natural stone walls are excellent for keeping the house cool and reducing or even eliminating artificial ventilation in buildings. Natural stone walls can retain heat for up to eight hours. In other words, heat from outside is stored on the wall for eight hours before the wall actually gets hot. The next material is concrete walls, concrete walls can also be used as an alternative to reduce heat because concrete materials can retain heat for up to four hours. Besides being able to withstand heat, the concrete wall material is also sturdy, which is an added value when using this material. Next is the brick wall material, although this material has the lowest ability to reduce heat, which is only two hours, this material is the easiest

and most economical to obtain which can be taken into consideration when choosing materials for building walls in tropical climates.

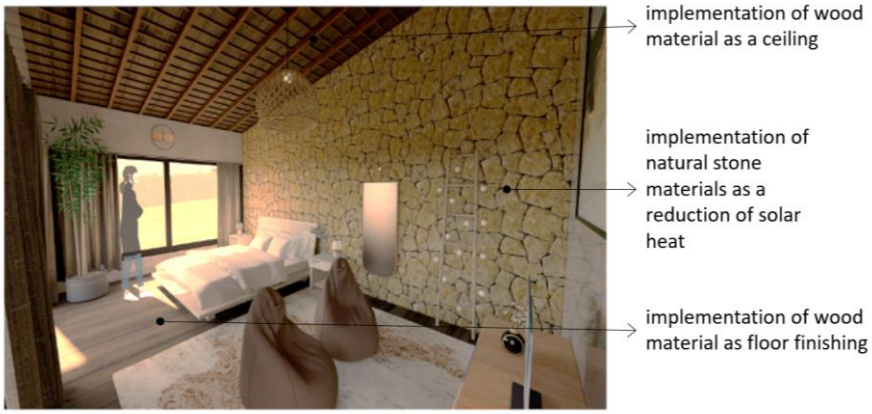


Figure 2. Implementation of Tropical Materials in Villa Building Interiors

Principles of Architectural Forms

There are various kinds of form principles in architecture, one of which is the form of architecture with the presence of a secondary skin on a building. Secondary skin acts as an additional indicator both in terms of aesthetics and the function of its use. From a decorative point of view, secondary skin is considered capable of creating a unique and attractive appearance in terms of building facades. Visually, a dwelling that uses a secondary skin is also able to present the characteristics of the occupant. The function of the secondary skin is not only as a protector so that excess light does not go directly to the building, but also as a pathway for air circulation that enters through the gap or lattice of the secondary skin. In addition, the secondary skin will also be beneficial for maintaining the owner's privacy for dwellings that have large windows that cause part of the room in the building to be exposed. Not only as a display and protector of the house, but also the owner of the building can create this secondary skin as a medium for vines, which not only adds freshness to the building but also has a positive effect on the health of the occupant.

Furthermore, the principle of the architectural form of the orientation of the building. The orientation of the building faces north, ideal for use in tropical architecture. Sunlight can enter the building optimally and use it as natural lighting during the day. However, excessive heat or solar radiation is also not good for buildings and health. Therefore, proper openings must be made to determine the intensity of sunlight entering the room or you can also minimize the light entering the room by applying secondary skin or grilles to the building.



Figure 3. Implementation of second skin and vertical garden

Conclusion

The application of the tropical architectural concept to this villa is said to be able to fulfill its principles, such as the use of materials, spatial planning, and also the proper use of land so that it can achieve the goals of using this concept. Such as maximizing natural lighting, natural ventilation, vegetation used in buildings so as to create comfort for all users of the villa building

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