Sustainable concept in colonial residential in Lasem

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Abstract. Indonesia has lots of colonial heritage buildings, scattered in several cities. One of the old buildings is in Lasem city, not only functioning as residential, but also as a batik business place. Problem statement of this research is how colonial old residential building has sustainable system? The objective of this research are to know what kind of sustainable system applied in old colonial building, and to know how Lasem old building analysed by Vitruvius theory. This research is using qualitative method, using one Lasem colonial residential as a study case. The house as will be analysed whether it meets the requirements as sustainable building, or it also meets the criteria of a good building according to Vitruvius theory by meeting the firmity, utility and venustas. The result of this study, this building is both a sustainable building and also meets what is contained in Vitruvius theory.

Keywords: sustainable concept, colonial building, residential, Lasem, Vitruvius theory

1. Introduction

Buildings in some Indonesia area are adapted to the tropical climate and humidity. Adjustments are made like the selection of doors and windows forms with big opening combination of width and height for air circulation function. This is the way to adapt in rainy season or dry season. Architectural character of tropical building, can be seen with characteristic such as: symmetrical floor plan with one-story building, big opened area, pillars. Inside the main building, there is a central porch that leads to the bedroom and other rooms. Pillars usually inspiring from Greek style pillars and has gavels or crowns on the front and back porches roofs. The results of the facade in the form of Indies Dutch style or known as colonial style. Colonial-style buildings, generally adapted to the local environment, climate and materials available at that time.

Dutch colonial style buildings in Indonesia have been adapted to the local climate and culture. Adjustment is in the use of gavel (gable) on the front building, there are towers and dormers, the building is slim made for cross ventilation or for air flow. The openings, there is a canopy attach to the
buildings to anticipate the rain and sun, that is often called double gevel, at the north-south area to avoid direct sunlight. During this period, other styles such as Art Nouveau, Art Deco, Art and Craft, and De Stijl also developed. Art Nouveau grown in 1890-1905 in Western Europe [4].

Colonial buildings in each region in Indonesia have their own period and their own characteristics and style. This research was conducted to answer the question, whether colonial-style buildings in Indonesia qualify as a sustainable buildings? Sustainable building can be associated with buildings that carries Green Design, or Green Architecture. Buildings that carry Green Design can be interpreted as buildings that are sustainable, eco-friendly (environmentally friendly), and as high performance building (buildings with very good performance). Buildings that are oriented to Green Architecture have facilities that concerned to environmental issues. Concerned about environmental issues, also related to the ethics of architects in anticipating global warming, energy savings, and more responsible to environmental management.

Green building criteria are: 1. Using natural energy such as the sun or wind, 2. Utilization of building materials that tend to be environmentally friendly, easily obtained and renewed, 3. Has a sustainable concept so that this building can continue to survive in the long run and it does not damage the surrounding environment. 4. Has a healthy future concept, from the use of plants to make the air cooler and healthier. 5. Has the concept of climate support, where the concept of greening is very suitable for tropical climates, during the rainy season it can be a water absorption and when dry season as air cooler. 6. Have esthetic usefully [5].

2. Method
This research is a qualitative research using one residential as case studies. The case study was taken from a colonial-style house located in Lasem city. This house owned by Mr. Henry’s family. Data collection is done by direct observation of the object, interview with the house owner, photo documentation and study literature. In analyzing and observing the building facades, building shapes, room organization, spacial elements, interior and exterior elements of the building, will be associated with sustainable building and Vitruvius theory. Literature data study collection from books and journals, recording information and theories about objects and the history of the development of Dutch colonial architecture obtained from books, online sources, as well as written works from previous researchers.

2.1 Theory
The theory taken to support this research is from the Vitruvius. He is a famous architect good architecture must meet 3 aspects, namely firmity (solidity), utility (function), and venustas (beauty/aesthetic). The first aspect of firmness is related to the resilience of a building when it has been used or functioned. A good building should be able to survive in climate situations and natural changes such as earthquakes [6].

3. Result and Discussion
An ideal architectural building in Vitruvius's theory must fulfill all three requirements: Utility, Firmity and Venustas. Utilities are met if Architects can answer design problems that can function according to the needs of their users. Firmity is related to the durability of the building whether it can function properly. Able to withstand weather, climate, or certain natural conditions. For example in Indonesia has two seasons, summer and rain. The third aspect is Venustas or beauty, on how the building looks aesthetically.

3.1 Research Object
The object of this research is a colonial-style building owned by Henry's family, a batik entrepreneur from Lasem - Central Java. This house has been inhabited for generations. Besides being inhabited as a residence, this building is also a place of business for producing batik. Batik in Lasem city is known to be running by family as family business, with their unique motifs and color compositions. Batik specific motifs and colors skills are passed on from father to child, to grandchild and so on.
3.2. Analysis

This colonial building has art deco style in its façade. Art deco style applied in stained glass form, in the column details, floor pattern, and door details. There are three-doors on the entrance/ front porch area. The opening of the doors quite high and wide, using double doors, the second layer using frosted glass as lighting functions during the day. The first door using solid wood with art deco details. This porch building has high ceiling and big opening but covered with stained glass surrounding it to avoid heavy rain drops in tropical raining season. The front porch function as guest room. When we step into the house, from the centre door we can find centre of the main house, lies more private living room than the front porch.

![Figure 1. Front view colonial house in Lasem](image)

The room programming as seen from floor plan, after entering the main door there is a transition room that is used as a more private living room equipped with family photos adorning the walls. This house has 4 rooms with large window openings. After that the family room also has 3 large twin doors overlooking the back porch. The back terrace functions as a dining room and kitchen with views towards the open garden/ courtyard.
The main door has a double door with a high size, the function of the door as well as a window, to simplify fresh air into the building. The main door is made of two layers. The outer layer is solid wood, while the inner layer uses frosted glass, so that sunlight can enter and illuminate the room during the day. The bedroom doors also use a double door, the inner door is a solid wood door, while the outer door, the upper part wire netting. To accommodate air circulation. On the top of the door is always accompanied by air holes which are decorated with wrought iron trellis.
On the lay out plan, there is a large room that functions as a warehouse or batik storage room. On the left side of the building, it is functioning as a batik process area such as: giving colors, dipping, sagging (or the process of releasing the night on batik cloth) and so on. Batik areas on the left side of the building have no doors, utilizing natural lighting and fresh air circulation.

Back porch in this building is function as kitchen and dining room. The back porch is an open space with open air circulation, so that the smoke from the rest of cooking can be directly channeled out. From back porch to batik production area, separate by a garden. On the left side, there is a batik worker room, they do the nyanting process, rinse, dyeing, drying and all batik process. Next to batik production area, there is batik storage room. On the right side of the storage room, there are toilets and well. This batik working area, and kitchen has fresh air circulation from garden. At the back porch almost similar as in the front porch, there are some art deco ornamental on the floor, plafond, balustrade, and door details.

![Figure 4. Front porch as guest room](image)

![Figure 5. Back porch, function as kitchen and dining room](image)

Ornament the top of the column using art deco details, with a combination of blue Dutch ceramic plates. Detail ornament of art deco designs are characterized on mathematical geometric shapes, trapezoidal, zigzagged, and triangular shapes, chevron patterns, stepped forms, sweeping curves and sunburst motifs.
4. Conclusion

Mr. Henry's colonial-style building in Lasem city, mostly has the colonial building characteristics. These features include: symmetrical main building façade, brick material, entrance has twin doors, symmetrical in main building plan, has large wooden-framed windows or doors, and there is a courtyard or openings garden without roof at the back of the building.

This colonial-style building also qualifies as a sustainable building, because the building still in its good shape and well function until the grandchildren of the first owner's generation. requirements, with the opening of doors and large windows, thus using natural lighting and fresh air circulation. The third aspect of Vitruvius theory is venustas or aesthetic aspects, this building uses an aesthetic ornament with art deco themes that can be found in the form of columns, details of floor tiles, stained glass details, and door details.

In terms as sustainable building, this house also qualifies as an environmentally friendly building. This house has a good system in: 1/ air circulation system with big window or big door openings. 2/ The using of natural lighting system is also very well utilized. Every bedroom has window, even bedroom doors using frosted glass, in an attempt to bring natural light during the day. 3/ The sanitation system is separated from the main building. Its located on the right rear side of the building. Working area of batik production also separate from the main house. This Lasem Colonial residential building is a good example for that meets both sustainable and also good building according to Vitruvius Theory (utility, firmitas, venustas).

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