A Proposed Solution for Riverbank Slum Problems through Respect for User Approach

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***Abstract*—In urban areas like Jakarta, the rapid urbanization increases the high level of housing needs that leads to the emergence of slums. The way the governments solve this problem is seen as inhumane and not viable at all. The solution proposed by the government actually creates new slum problems. The objective of this project is to upgrade the riverbank slum into a green settlement with improved housing by implementing six principles of Green Architecture into the design. Field measurement and interview were conducted to obtain data for simulation using Ecotect Analysis and ANSYS Fluent software. The result emphasized that "respect for user" has a major role in achieving compatibility between user and environment.**

***Keywords*—Green Architecture, Respect For User, Riverbank Settlement, Slum.**

I. PENDAHULUAN

AS the largest metropolitan area in Southeast Asia, Jakarta is experiencing the persistent urban problem; over population [1]. Rapid urbanization has created problems of land and housing scarcity, and as these scarcities increase and housing prices rise, economic constraints force the poor to inhabit land that no one else wants [2]. These are the main causes of the growing number of urban residents living in informal settlements, or should we call, the emergence of slums.

Slums are often formed in city waste disposal sites, railway tracks, riverbanks; and private unoccupied land [3]. In Jakarta, riverbanks slums can be found along the side of Ciliwung River (Figure 1). The city's sustainability will be disrupted and the riverbanks slum dwellers are blamed.

The most common solution proposed by the government for this issue is forced eviction followed by the resettlement program [4]. However, these solutions do not solve the problems [5]. In fact, they will cause new problems such as social and economic disruption [6].

To respond the issues explained above, the design aims to provide upgrade the riverbank slum into a green settlement with improved dwellings quality that meets the needs and suits the behavior of the residents of the riverbank slum in order to accommodate them. The site of this project is located in RW 12 of Bukit Duri, Tebet, South Jakarta (Figure 2). The climatic condition is uncomfortable, the buildings are in an awfully bad condition, the are is very dense, and flood happens almost everyday in wet seasons.

Figure 1. Slums of Ciliwung River.

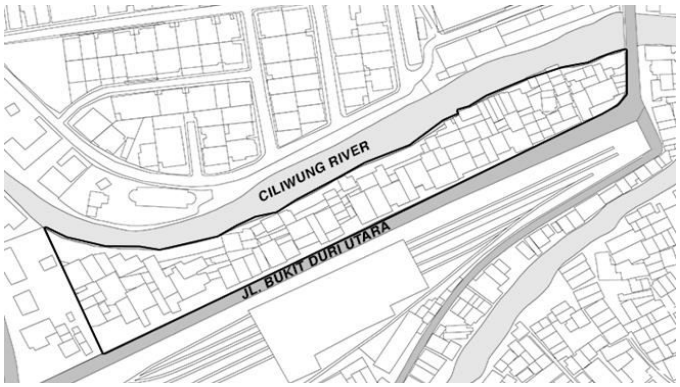

Figure 2. Existing Plan of RW 12 Bukit Duri.

Figure 3.Wood worker's workshop.

II. DESIGN METHOD

Green architecture is going to play a major role in the approaching process. Green architecture aims to establish natural surrounding and the user [7]. In this project, six principles of Green Architecture will be implemented to the design:

1. Conserving energy
2. Working with climate
3. Minimizing new resources
4. Respect for user
5. Respect for site
6. Holism [8]

Respect for user is going to be the highlight of this project. The dwellings in the settlement are designed to accommodate the user of the settlement based on the behavior and needs of the user. Field measurement and interview were conducted to obtain user and environment data for simulation using Ecotect Analysis and ANSYS Fluent Software.

III. RESULT AND EXPLORATION

The settlement design will focus on 'respect for user' principle, with the users' behavior and needs as the main concern of the design exploration. From the discourse above, two concepts that can be implemented into the dwellings are generated; user accommodation and thermal comfort. These two points will be explained below.

A. *User Accommodation*

There will be nine types of dwellings provided in the settlement. These dwelling types are determined by the type of occupation of the user and the number of user living in the dwellings.

1. Types of Occupations
   There are three types of occupation of the inhabitants: wood worker, informal trader, and casual laborer. The dwellings' design is based on the needs of the occupation; the woodworkers need workshops (Figure 3) and the informal traders need shops (Figure 4).
2. Capacity
   Data obtained from survey and interview stated that in the existing settlement one house is inhabited by one to three families (2 to 6 persons).
3. Location
   The location of the dwellings determines the type of structure of the building. The site is divided into three flood risk zones; high-risk zone, moderate zone, and safe zone. Instead of trying to beat back the rising water, it would be wiser to work with it through floating structure [9]. Therefore, the dwellings in high-risk zone use amphibious structure, while the dwellings in moderate zone use stilt structure, and the dwellings in safe zone use the conventional ground structure.
   From three points above, nine types of dwellings are designed; Wood worker 1, wood worker 2, wood worker 3, informal trader 1, informal trader 2, informal trader 3, casual laborer 1, casual laborer 2, and casual

Figure 4. Informal trader's shop.

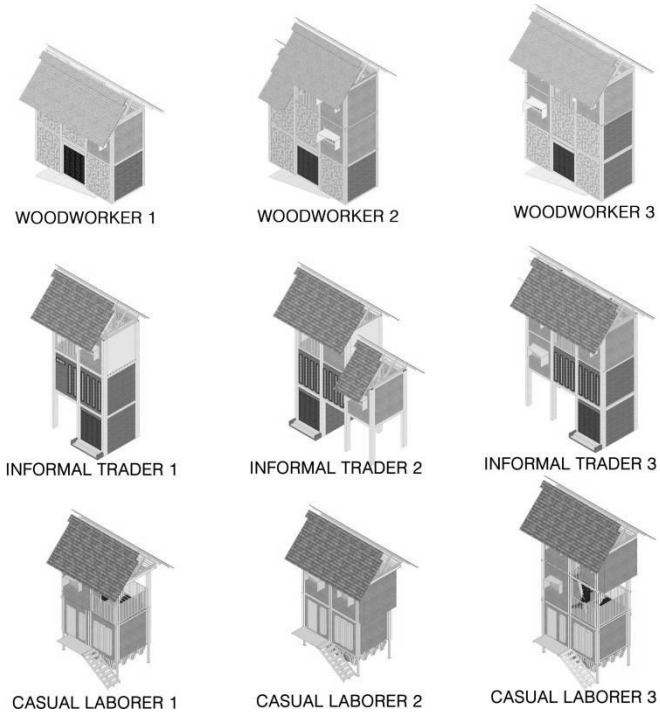

Figure 5. Nine types of dwellings.

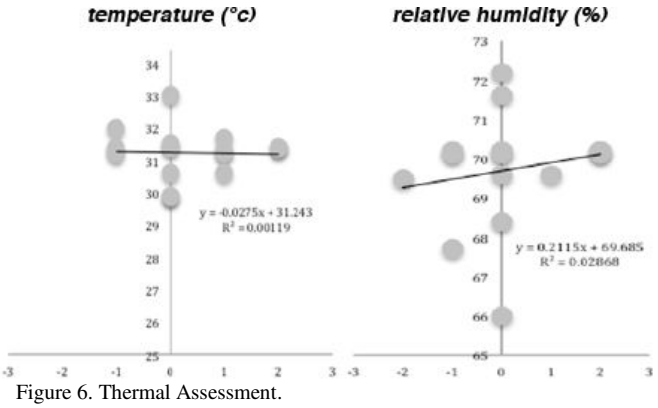

Figure 6. Thermal Assessment.

laborer 3 (Figure 5)

B. *Thermal Comfort*

Based on the field measurement and interview that were held in September 2016 and March 2017, the climatic condition of the existing settlement was rather poor (temperature: 31°, relative humidity: 70%). Consequently, strategies to provide thermal comfort according to the thermal assessment (Figure 6) in the dwellings are needed. There are a few concepts offered:

1. Material selection
   Material plays a significant role in how the building gives thermal comfort to the user. The material used in the dwellings have to meet with certain requirements in order to give thermal comfort to the building. Though, it depends on the needs of the user. In the wood worker's dwellings and informal trader's dwellings, rooms like living room, bathroom, shop, workshop, kitchen, use bricks as material. The thickness of the brick traps the heat from getting inside of the building, the heat will be released at night. With the nature of bricks, bedroom should not be made out of bricks. Since bedrooms are used at night time, it needs a light weight material such as woven bamboo panels. Woven bamboo panel will not trap heat and it will also let wind penetration into the room. The dwellings of casual laborers also use this material because casual laborers only use their dwellings at night, they spend their day working (Figure 7).
2. Ideal window to wall ratio
   The ideal window to wall ratio is 25%. The optimum window to wall ratio will minimize cooling load, it will also enhance the cross ventilation of the room. The ratio is used to design the window and the vent block arrangement (Figure 8).
3. Efficient overhang length
   The length of the overhang is determined by a shadowing simulation. The effecient overhang length will shade the window thus reducing the radiation from the sun (Figure 9).
4. Positioning of clerestory
   If properly designed, clerestory will enhance indoor wind speed. A simulation by ANSYS Fluent software was held to determine if the clerestory should be the air inlet or the air outlet (Figure 10). The result shows that clerestory should be positioned as the outlet. Because when a clerestory is positioned as outlet, it will accelerate the wind speed better than when it's positioned as inlet (Figure 11).

IV. CONCLUSION

The scheme formed will suit the needs and the behavior of the users. In line with [7], this proposed design has capability to achieve compatibility between user and environment. The objective of the design research can be achieved through respect for user approach. The concept of user accommodation and thermal comfort are combined into an ideal dwelling for the users who live in RW 12, Bukit Duri.

Figure 7. Casual Laborers' Dwelling.

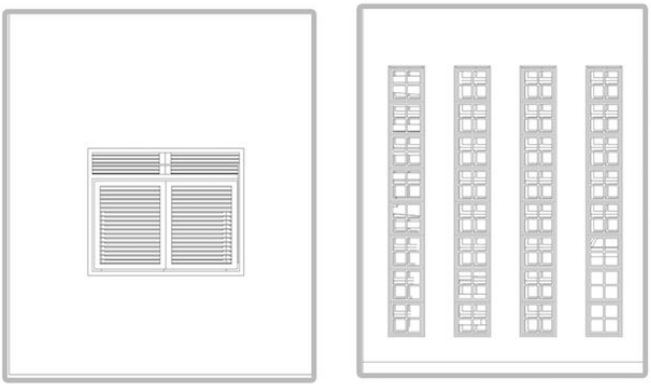

Figure 8. Illustration of the ideal Window to wall ratio.

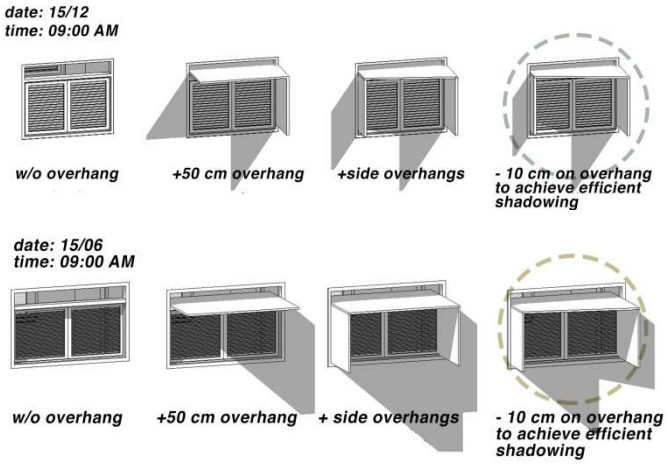

Figure 9. Shadow Simulation: Overhang

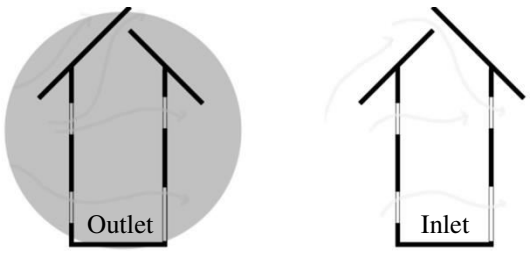

Figure. 10. Clerestory position.

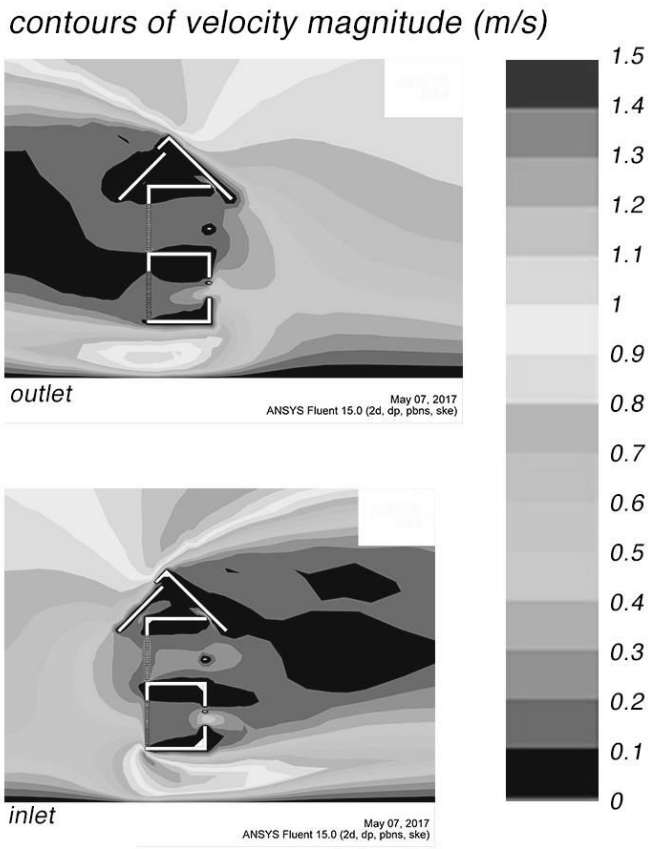

Figure. 11. ANSYS Fluent Clerestory simulation

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