

Identification of Natural Lighting Quality on Several Developing Types of Subsidy House [†]

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Abstract: The function of a house can be achieved by residential comfort. Several studies have shown that natural lighting affects the comfort of a dwelling. Previous research discussed the typology of subsidized housing development in Kupang City and Kendal Regency. The result was the addition of space according to the needs. This article discusses the analysis of natural lighting in the original form of subsidized housing and after development in Kupang City and Kendal Regency through simulations using Dialux. The simulation results show that natural lighting in the house cases does not qualify SNI 03-6197-2000 both in original plan and after development plan.

Keywords: natural lighting; subsidized house; Dialux

1. Introduction

House is a human need that needs to be met after the need for food and clothing [1]. Referring to the General Guidelines for Healthy Simple Houses in 2002, there are 3 indicators of lighting, air conditioning, temperature and humidity [2]. One indicator of comfort in a dwelling is the presence of natural lighting [3]. According to SNI 03-2396-2001 [4], natural lighting in a building can be said to be good if the building is illuminated from 08.00 to 16.00 without excessive glare. Light can enter the building through the envelope, both walls and roofs [5].

Housing problems in big cities such as low housing supply and low quality housing [6]. A subsidized house is a house intended for low-income people with affordable prices and certain specifications. Dissatisfaction with subsidized housing that has not been able to accommodate user activities raises new problems. In its development, residents of subsidized houses independently carry out a gradual and planned transformation of their homes [7]. However, the transformation of these dwellings adds to the population, structural and utility loads, as well as issues of natural lighting and ventilation [8].

This article discusses natural lighting in subsidized homes when it was first built and after it was developed by users. Measurements were made through the Dialux Evo on the lightscene feature to determine the light illumination per unit area.

2. Material and Method

2.1. Case Study Material

There two case studies based on previous research on the typology of subsidized housing development in Kupang and Kendal cities. Quoting from Hardy [8] in Kupang, a common development that occurred in the initial plan of the house was to use the vacant land at the back to become a kitchen. Then, additions to the front are fences, changes in façade elements, and additional business space. This development occurs gradually according to the user's priorities and capabilities. In addition, research conducted by

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Pratama [9] in Kendal shown that the development of the basic plan for subsidized houses in Kendal City was caused by dissatisfaction with the original plan. The addition of space functions that occur is the addition of business space in the front due to economic factors. Space transformation also occurs in the living room which increases the area of space to the front porch of the house which results in the comfort of privacy is not fulfilled.

2.2. Method

The method used quantitative-descriptive. In the first stage of this study, literature review is conducted in previous studies that examines the typography of development in subsidized housing. The initial and after development plan was described through AutoCAD to then be simulated on the Dialux (Figure 1).



Figure 1. Drawing House and Adjust Location in Dialux.

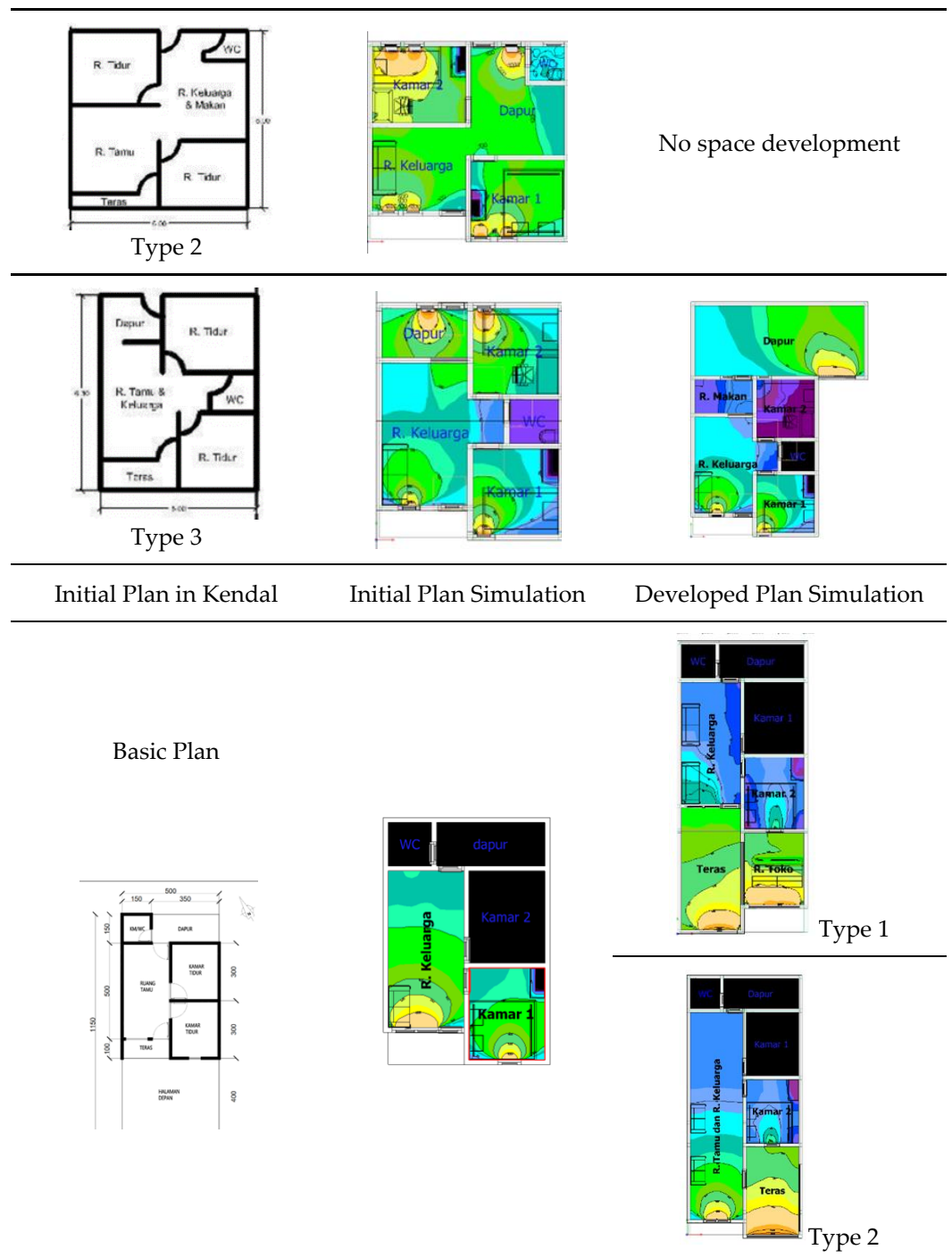
3. Result and Discussion

The simulation was carried out on the Dialux Evo application version 8.0 through the lightscene feature to measure the illumination of broad unit lighting. The discussion will explain how the initial floor plan of a residential building takes shape, then simulates the natural lighting that enters the initial floor plan (Table 1). The next stage is to make a development plan and re-simulate it. The cases studied are in two different locations. This difference in location affects the simulation input used. The similarity of the plans is that they consist of 2 bedrooms, 1 bathroom, and a living room. The difference between the three plans is in the spatial organization.

The development of initial plan is the addition of space due to the needs of user in kitchen, front and back area of the house, and changes to facade elements.

Table 1. Table of Initial Plan and Development Plan Simulation in Kupang and Kendal Study Case.

Initial Plan in Kupang	Initial Plan Simulation	Developed Plan Simulation
<p>Type 1</p>		



In the initial ground plan, the rooms at the front such as the family room, front room and back room of the subsidized house receive natural lighting that meets the Indonesian National Standard 03-6197-2000 concerning energy conservation in lighting systems. This is due to natural openings that let in light through windows and ventilation. However, on the floor plan that has been developed at the back of the kitchen, there is a decrease in the quality of natural lighting so that standards are not fulfilled SNI (Indonesian National Standard) both in Kupang and Kendal study case (Tables 2 and 3).

Table 2. Table of Simulation Result in Kupang City Study Case.

Name Room	Initial Plan			Developing Plan		
	Type 1	Type 2	Type 3	Type 1	Type 2	Type 3
Room 1 (SNI: 250 lx)	275 lx	283 lx	132 lx	284 lx		123 lx
Room 2 (SNI: 250 lx)	172 lx	672 lx	196 lx	1 lx		2.43 lx
Main room (SNI: 150 lx)	213 lx	273 lx	81.6 lx	412 lx	No Develop- ment	196 lx
Kitchen (SNI: 250 lx)	-	-	391 lx	16.6 lx		196 lx
Toilet (SNI: 250 lx)	19.4 lx	46.3 lx	1.57 lx	0.6 lx		0.5 lx

Table 3. Table of Simulation Result in Kendal Regency Study Case.

Name Room	Initial Plan		Developing Plan	
	Type 1	Type 2	Type 1	Type 2
Room 1 (SNI: 250 lx)		159 lx	0.27 lx	0.19 lx
Room 2 (SNI: 250 lx)		0.12 lx	20.6 lx	22.4 lx
Main room (SNI: 150 lx)		252 lx	22.4 lx	104 lx
Kitchen (SNI: 250 lx)		0.85 lx	0 lx	0.13 lx
Toilet (SNI: 250 lx)		0.8 lx	0 lx	0 lx

4. Conclusions

This study concludes that the quality of natural lighting in subsidized houses in several types of basic and developed subsidize house is not good. This is assessed from the simulation results regarding the lightscene in the building using the Dialux application. The results showed that some spaces in the basic typology of subsidized housing had not yet reached the target of natural lighting set by SNI 03-6197-2000 concerning energy conservation in lighting systems. Furthermore, after the basic house plans were developed, the quality of natural lighting continued to decline.

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