Effect of smart environmental elements on occupancy rates of subsidy housing in North Balikpapan District

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Abstract. In line with the decline of mining and oil business since 2015, the purchasing power of the middle and upper class houses of Balikpapan City residents has also decreased. Property developers change strategy by developing low-cost and subsidies housing. However, often the end result of the construction of cheap housing is still not built environmentally. It is very important to consider environmentally friendly housing. Many of these subsidy housing developments are built in North Balikpapan District. Based on the existence of subsidy housing in Balikpapan Utara that is already built and inhabited, it is necessary to identify the influence of smart environment elements on the occupancy rates of existing subsidy housing in order to improve environmental quality. The analysis of the occupancy rate of subsidy houses based on smart environmental elements is carried out through a linear regression model. The results of the analysis show that there are only 2 significant variables, distance of arterial roads and the affordability of religious facilities. If the affordability of arterial roads increases by one unit, then the number of houses occupied will increase by 15%. If the affordability of religious facilities increases, the number of houses occupied will increase by 74%.

1. Introduction

Housing is one of the basic human needs as an asset for business development and increasing economic value. The limited purchasing power of people who are classified as low-income people prefer to fulfil their housing needs independently and build more on illegal land nearest the city centre and their workplace [1]. Housing problems are not only limited to the physical feasibility of a house, but also environmental problems such as pollution, pollution, location of settlements, and natural disasters [2].

Other factors that can determine the selling price of a house to be purchased by the community are based on the benefits and value obtained, such as land area, building area, house facilities, accessibility to the city centre, and etc [3]. Housing needs are fully determined by the market mechanism with profit oriented behaviour by the private housing sector, then the house price will be higher [2] Therefore, the government must to provide the basic needs of the community, namely houses, especially for Low-Income Communities and Middle Economic Communities or also known as subsidized housing [3].

The increasing number of residents of Balikpapan, both natives and immigrants, causes natural population growth to increase housing needs [4]. According to data from the Central Statistics Agency (BPS) of Balikpapan [5], the population of Balikpapan City in 2017 was 636,012 people with a density level of 1,251 people/km\textsuperscript{2} and it is projected that in the next 10 years this number will increase by 50\% of that number. In addition, along with the decline in the mining and oil business since 2015, the purchasing power of the middle and upper class houses of Balikpapan City residents has also decreased.
Because of that, property developers change strategies by developing cheap houses and subsidies. However, often the end result of the construction of cheap housing or subsidies is still not environmentally. In implementing sustainable housing development, it is very important to consider environmentally friendly housing. The concept of implementing environmentally development is ecological preservation, green technology, and overcoming environmental pollution [6].

In the Regional Regulation (Perda) of Balikpapan Number 12 of 2012 [7] concerning the Regional Spatial Plan (RTRW) of Balikpapan 2012–2032, it is stated that the strategy for developing productive and environmentally friendly cultivation areas is one of which is to develop residential areas with a balanced residential concept and affordable to service centres. One of the strategies to strengthen the function of these service centres is to develop sub-centres for urban services in undeveloped areas.

The construction of subsidized housing is mostly carried out in North Balikpapan District in accordance with existing policies and is used by the government and the private sector in realizing subsidized housing development projects for low-income housing. According to the Balikpapan City Housing and Settlement Service, 15 Low-Income Community (MBR) housing areas are located in the North Balikpapan District. Therefore, with the existence of subsidized housing in North Balikpapan District that is already built and occupied, it is necessary to identify the influence of smart environment elements and environmental factors on the occupancy rate of existing subsidized housing to be able to improve the quality of the environment.

2. Methodology
The existing subsidized housing population is 15 houses to be analysed. Researchers make the entire population of subsidized housing the object of research by taking samples of the existing inhabited houses. To analyse the influence of environmental factors on the occupancy rate of the community in subsidized housing in North Balikpapan District, multiple linear regression analysis tools will be used with the Statistic Program for Special Science (SPSS) software. In conducting multiple linear regression analysis, there are several steps that must be done, namely: Normality Test, Correlation Analysis, Classical Assumption Test, and Multiple Linear Regression Analysis.

![Figure 1: Research framework](image-url)
3. Results and discussion

3.1. Occupancy rates of subsidy housing

Through the results of the identification result, there are 15 subsidized housing scattered in North Balikpapan District (figure 2):

| Name                      | Location | Number of Housing | Number of Occupancy | Percentage of Occupancy (%) |
|----------------------------|----------|-------------------|----------------------|-----------------------------|
| Pondok Sakinah            | Km 13    | 100               | 8                    | 8                           |
| Green Valley              | Km 5     | 1352              | 103                  | 8                           |
| Pesona Bukit Batuah       | Km 8     | 1258              | 921                  | 73                          |
| Villa Permata & Permata Firdaus | Km 9  | 127               | 126                  | 99                          |
| Shofa Marwah Residence    | Km 6     | 130               | 38                   | 29                          |
| Himalaya Residence        | Km 10    | 51                | 32                   | 63                          |
| Kumala Residence 4        | Km 10    | 77                | 36                   | 47                          |
| Graha Wiyata Asri III     | Km 12    | 249               | 64                   | 26                          |
| Mentari Village           | Km 23    | 1516              | 157                  | 10                          |
| JSB Residence             | Km 18    | 2586              | 43                   | 2                           |
| D’ Pondok Al Ikhlas       | Km 8     | 217               | 118                  | 54                          |
| Nusantara Permai 18       | Km 18    | 161               | 60                   | 37                          |
| Griya Karang Joang Asri 2 | Km 11    | 450               | 303                  | 67                          |
| Gelora Gunung Mandiri     | Km 11    | 72                | 12                   | 17                          |
| Batu Ratna Indah Residence| Km 11    | 170               | 100                  | 59                          |

The average percentage of subsidized housing that has been occupied is 40% (table 1). The housing at Villa Permata & Permata Firdaus has the largest percentage of houses occupied at 99%. Meanwhile, JSB Residence housing has the lowest percentage of houses that are inhabited, which is only 2%.

Figure 2. Map of occupancy rate.
3.2. Characteristics of smart environment elements

3.2.1. Accessibility around housing. Accessibility around housing is the distance to the nearest road network and the closest distance to the availability of public transportation. The average distance required for subsidized housing in North Balikpapan to reach arterial roads is 1109 meters and local category roads is 233 meters. Furthermore, for public accessibility to public transportation services in the form of city transportation with route number 8 is 2078 meters.

3.2.2. Accessibility in housing. It is necessary to identify accessibility in housing. This is related to the convenience of the community in housing to move from one place to another. Accessibility in housing is identified through the width of the road network and the pavement of the road network. The average width of the road network inside the subsidized housing area in North Balikpapan is 7 meters with the lowest road network width is 2.5 meters. As for the width of the road network inside the housing, the widest one is in JSB Residence with a size of 12 meters. The pavement network for each housing consists of 2 types of pavement (figure 3).

3.2.3. Availability of drainage infrastructure. The drainage infrastructure is receiving run-off discharge and liquid waste. In this study, the availability of drainage infrastructure is identified through the shape, type and size of drainage. It can be seen that of the 15 subsidized housing, 14 houses have a drainage infrastructure (figure 4). The drainage infrastructures in 14 subsidized housing in North Balikpapan are all box-shaped and open drainage. Meanwhile, the dimensions of the existing drainage width sizes from 30 to 100 centimetres and depth size from 30 to 60 centimetres.

Figure 3. Map of accessibility pavement.  
Figure 4. Map of drainage infrastructure.
3.2.4. **Availability of clean water infrastructure.** The availability of clean water infrastructure is identified through clean water sources located in a housing and the capacity of clean water sources (figure 5). Only 3 of 15 houses can be served by the PDAM pipeline. The PDAM pipeline network as a whole area has been served but still requires an independent water storage in the form of a water reservoir with a capacity of 1200 L. Pesona Bukit Batuah housing is the only housing that applies the Water Treatment Plant, which has a capacity of 5500 L. Meanwhile, other housing suffices the existing needs of clean water by purchasing clean water and collecting rainwater both individually and communally.

3.2.5. **Availability of sewage and waste management infrastructure.** The availability of waste and solid waste infrastructure is identified through the availability of Wastewater Treatment Plants (IPAL) and Temporary Shelters (TPS) located around the housing complex. There are no IPAL or TPS in the area around the housing. So that in carrying out liquid waste disposal activities, the community generally uses a drainage infrastructure. Meanwhile, in waste disposal activities, people burn the waste. As for other alternatives besides burning, waste disposal thrown away at the nearest TPS, this is at least 1.5 km away.

3.2.6. **Availability of educational facilities.** The availability of the educational facilities studied was measured by the closest distance from housing to educational facilities for Kindergarten, Elementary School, Junior High School, and Senior High School. The average distance of subsidized housing to each level of education varies. As for the distance to Kindergarten is 1344 meters (figure 6), to Elementary School is 1365 meters and to Junior High School is 1848 meters and the distance to Senior High School is 3474 meters. As for educational facilities, none of them are in the residential area. The closest distance between housing and educational facilities is 360 meters for Elementary School facilities.

3.2.7. **Availability of health facilities.** The availability of health facilities is identified through the affordability of housing to the posyandu and health centre facilities (puskesmas). As for other housing,
reaching the nearest health facility requires an average distance of 2620 meters and must access the health centre facilities located in North Balikpapan.

3.2.8. Availability of religion facilities. Religion facility identified through the affordability of housing distances to the provision of prayer rooms, mosques and churches (figure 7). The average affordability of housing for religion facilities is 632 meters, mosques are 399 meters and churches are 1418 meters.

3.2.9. Availability of economic facilities. The availability of economic facilities is identified by the number of special economic facilities provided by the housing developer. There are no economic facilities in the 14 housing areas provided by the developer. So that the economic facilities that are formed are stalls or shops that are opened individually by the community as a means of trade. Meanwhile, for the Mentari Village housing, there is 1 block of shops as economic facility.

3.2.10. Availability of green open spaces, sports fields and parking lots. The availability of green open space in a housing area has a function as a water catchment area and as an aesthetic component in supporting the image of housing. Furthermore, the sports field becomes one of the supporting facilities in providing housing because it can be related to the availability of facilities for entertainment for the community (figure 8). Meanwhile, public parking lots can function as facilities for accommodating vehicles owned by residential residents. In this study, the availability of facilities for green open spaces, sports and parking lots is identified through the area of facilities available in housing. Only 3 houses were identified as having green open space; green open space, bendali (lake) and a playground. Furthermore, the kind of sports field is volleyball field. Meanwhile, public parking lots are not identified in all subsidized housing in North Balikpapan.

3.3. The influence of smart environment elements on occupancy rates

3.3.1 Classic assumption test. The classic assumption test aims to identify discrepancies in the data used for the study. The classical assumption test is used to determine the occurrence of normality, autocorrelation, multicollinearity, and heteroscedasticity. Based on classic assumption test, there were 6 variables that normally distributed and there were no autocorrelation, multicollinearity, and heteroscedasticity.

3.3.2 Goodness test. The analysis shows that the variation of the response variable data can only explain the data on the number of occupancy rates by 57% and the remaining 43% is explained by other variables outside of this research model.

3.3.3 F test or test simultaneously. In the F test or test simultaneously, the output that needs to be considered is the F significance value. From the analysis, it is known that it has an F significance value of 0.03. The value is <0.05, so it can be said that the variable can simultaneously explain the number of houses inhabited in the observation area.

3.3.4 T test or partial test. In the T test or partial test, the output that needs to be considered is the significance value of each variable. From the analysis, it is known that there are only 2 significant variables because they have a value <0.05. These variables are the arterial road affordability distance variable with a significance value of 0.04 and a variable for the affordability of religious facilities of 0.05. Based on the linear regression stage test that has been carried out, the regression modelling which is significant to the number of houses inhabited is as follows:

\[
\text{Number of houses occupied} = -202.24 + 0.15 \text{ (distance to arterial road)} + 0.74 \text{ (affordability of religion facility)}
\]

From the results of the spatial regression equation above, it can be explained as follow:
1) A constant of 202.24 means that if the reach of arterial roads and the affordability of religious facilities is 0, then 202 occupancy will be decreased.

2) The regression coefficient of the arterial road affordability variable is 0.15, which means that if the variable value for the affordability of religious facilities is fixed and the arterial road affordability increases by one unit, the number of occupancy houses will increase by 15%.

3) The regression coefficient of the variable facility affordability of worship is 0.74, which means that if the variable distance of arterial road affordability is fixed and the variable of the affordability of religious facilities has increased by one unit, the number of occupancy houses will increase by 74%.

4. Conclusion

Smart environment elements have impact to increase the occupancy rates. The results of the analysis show that there are only 2 significant variables: distance to arterial roads and the affordability of religious facilities. If the affordability of arterial roads increases by one unit, then the number of houses occupied will increase by 15%. If the affordability of religious facilities increases, the number of houses occupied will increase by 74%. The analysis show that the variation of the response variable data can only explain the data on the number of occupancy rates by 57% and the remaining 43% is explained by other variables outside of this research model.

Acknowledgments

We wish to acknowledge Research Institution Centre (LPPM) of Institut Teknologi Kalimantan on Penelitian Stimulus Unggulan program, for funding this research and lead to the article production.

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