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Density of Buildings in Grogol District, Sukoharjo District, 2018

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ABSTRACT

Grogol sub-district is an area that used to be agricultural land, over time, a lot of agricultural land has been converted into housing, industry and so on. The objectives of this study were to: (1) determine the number of buildings in Grogol District, Sukoharjo Regency; (2) Knowing the Building Density in Grogol District, Sukoharjo Regency. This study uses remote sensing with the Visual Quickbird interpretation method obtained from Google Earth Pro, namely using interpretive elements such as hue / color, shape, texture, and location / association. Visual interpretation is used to determine the number of buildings and building density. The data collection techniques used were image interpretation and field surveys. The data analysis technique used is geographic descriptive, which describes the spatial data analysis. The results of this study are: Cemani Village is the village with the highest density of buildings 96.85%, while Parangjoro is the village with the lowest density of buildings with 28.41%.

KEYWORDS

Remote Sensing
Visual Interpretation
Building Density

1. Introduction

The increase of the large number of residents and the concentration of population activities in the city center will result in intensive development to fulfill residential land or increase in service facilities. Intensive development was not matched by the availability of adequate land, resulting in more dense buildings. The continued density of buildings can cause negative impacts such as a decline in public health, a decrease in the quality of housing, and inconsistencies with spatial planning (Shanti Puspitasari & Suharyadi, 2015). Grogol sub-district is an area that used to be agricultural land, over time, a lot of agricultural land has been converted into housing, industry and so on. The development in Grogol District which continues to increase significantly, of course there are positive and negative impacts, from a positive point of view, economic activity in Grogol Subdistrict is getting better, from a negative point of view, the air quality has decreased and is not in accordance with the regional spatial layout. Utilization of information from remote sensing is a solution for monitoring building compaction because it can be done quickly, multi-temporal, and covers a large area, for example using Aster and Landsat satellite imagery as has been done by Suharyadi (2011), Nugraha (2014) and Puspitasari (2016)).Building density maps can be obtained from terrestrial surveys or surveys with remote sensing approaches. A terrestrial survey takes a relatively long time, compared to a survey with a remote sensing approach. Density maps used to monitor building densification can also be used as input in the planning process for facilities and utilities in urban areas (Suharyadi, 2010).

2. Method

This study uses a remote sensing approach, namely using quickbird satellite imagery obtained from Google Earth Pro (03 May 2018) by visual interpretation to obtain data on the number of buildings and building density. This has several advantages, including the data can be relatively fast and the validity can be trusted. The use of Google Earth Pro to display digital maps and a series of remote

sensing imagery provides a deeper capability in geospatial technology. Data collection techniques are a technique or method used by researchers to be able to use data related to the problems of the research they take. The data collection techniques in this study are as follows:

1. image interpretation, namely analyzing the quickbird image obtained from Google Earth Pro (03 May 2018), which is to digitize buildings in Grogol District.

2. field survey, namely conducting a field survey to ensure the accuracy of digitizing the building parcels.

In this study to calculate the density of the building using the method Building Coverage Ratio (BCR) as a reference for calculating building density (Puspitasari, 2016). The building density formula with this method is shown in formula 1 and the classification is shown in Table 1:

$$\text{Formula 1 BCR} = \frac{\text{Total Roof Cover Area Mapping Unit}}{\text{Mapping Unit Area (building blog)}}$$

Table 1. The Building Density Class

No.	Density Class	Value Density	Information
1.	I	> 70%	Solid
2.	II	50-70%	Moderate
3.	III	10-50%	Rarely

3. Results and Discussion

3.1. Number of Buildings

Grogol districtis a very strategic district which is the route from various cities such as Boyolali, Klaten, Solo and Karanganyar. This strategic area causes a lot of rice fields to be used for buildings such as settlements, factories and so on. The results of the research are as follows:

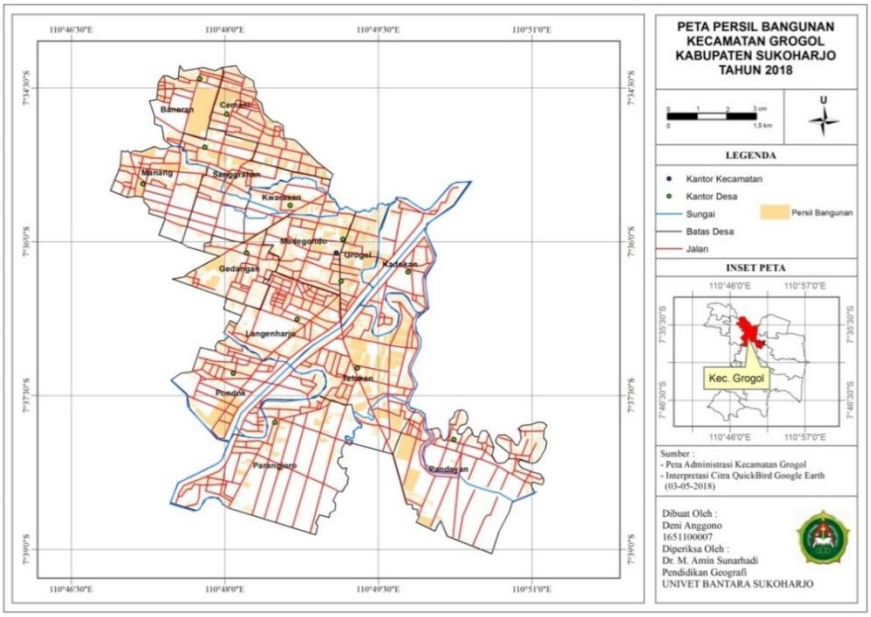

Fig. 3.1. Map of the plot of buildings in Grogol District

a. Telukan Village
Based on the research above, in 2018 data has been obtained that Telukan Village is the village with the most buildings with the order of number 1 with the most buildings, namely with a total of 7,505 buildings.
b. Cemani Village
Based on the research above, in 2018 data has been obtained that Cemani Village is a village with the number 2 sequence, namely with a total of 6,503 buildings.
c. Sanggrahan Village
Based on the research above, in 2018 data has been obtained that Sanggrahan Village is a village with the order of number 3, that is, with a total of 4,685 buildings.
d. Pondok Village
Based on the research above, in 2018 data has been obtained that Pondok Village is a village with the order of number 4, with a total of 4,242 buildings.
e. Langenharjo Village
Based on the research above, in 2018 data has been obtained that Langenharjo Village is a village with the order of number 5, that is, with a total of 4,221 buildings.
f. Madegondo village
BerdBased on the research above, in 2018 data has been obtained that Madegondo Village is a village with the order of number 6, that is, with a total of 4,009 buildings.
g. Grogol Village
Based on the above research, in 2018 data has been obtained that Grogol Village is a village with the order of number 7, that is, with a total of 3,665 buildings.
h. Gedangan Village
Based on the above research on In 2018, data has been obtained that Gedangan Village is a village with the order of number 8, that is, with a total of 3,353 buildings.
i. Kwarasan Village
BerdBased on the research above, in 2018 data has been obtained that Kwarasan Village is a village with the order of number 9, that is, with a total of 3,013 buildings.
j. Manang Village
Based on the research above, in 2018 data has been obtained that Manang Village is a village with the order of number 10, that is, with a total of 2,838 buildings.
k. Parangjoro Village
Based on the research above, in 2018 data has been obtained that Parangjoro Village is a village with the sequence number 11, that is, with a total of 2,589 buildings.
l. Pandeyan Village
Based on the research above, in 2018 data has been obtained that Pandeyan Village is a village with the sequence number 12, that is, with a total of 2,164 buildings.
m. Banaran Village
Based on the research above, in 2018 data has been obtained that Banaran Village is a village with the sequence number 13, with a total number of 1,817 buildings.
n. Kadokan Village
Based on the above research, in 2018 data has been obtained that Kadokan Village is a village in the order of the number of the last buildings, namely with a total of 1,759 buildings.

3.2 Building Density

Land changes that occur in Grogol District have always experienced significant developments. Monitoring building density is one way to overcome building compaction as well as area planning. The results of the research are as follows :

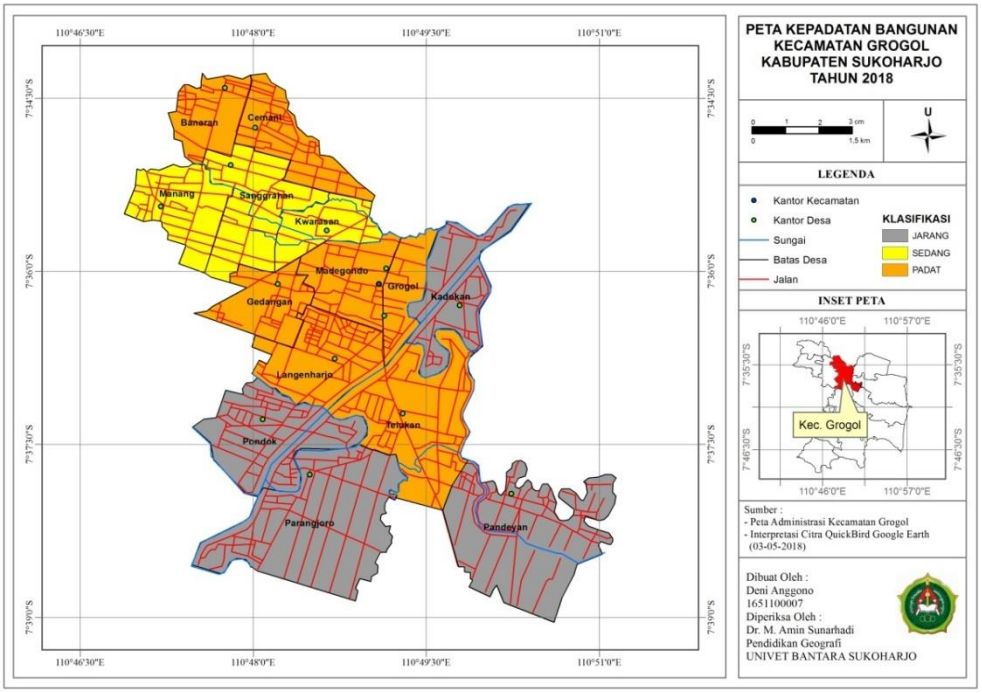

Fig. 3.2. Building Density Map of Grogol District

a. Telukan Village
Based on the research above, in 2018 data has been obtained that Telukan Village has a total village area of 349 hectares (ha) and a building area of 261 hectares (ha) with a building density of 74.78%. With a density above 70% it is classified as a solid building with an orange color description.

b. Cemani Village
Based on the research above, in 2018 data has been obtained that Cemani Village has a total village area of 159 hectares (ha) and a building area of 154 hectares (ha) with a building density of 96.85%. With a density above 70% it is classified as a solid building with an orange color description.

c. Sanggrahan Village
Based on the research above, in 2018 data has been obtained that Sanggrahan Village has a total village area of 223 hectares (ha) and a building area of 128 hectares (ha) with a building density of 57.39%. With a density between 50 - 70% it is classified as medium density with yellow information.

d. Pondok Village
Based on the research above, in 2018 data has been obtained that Pondok Village has a total village area of 268 hectares (ha) and a building area of 127 hectares (ha) with a building density of 47.38%. With a density above 10 - 50%, it is classified as a rare density with a gray color description.

e. Langenharjo Village
Based on the research above, in 2018 data has been obtained that Langenharjo Village has a total village area of 211 hectares (ha) and a building area of 156 hectares (ha) with a building density of 73.93%. With a density above 70% it is classified as a solid building with an orange color description.

f. Madegondo Village

Based on the research above, in 2018 data has been obtained that Madegondo Village has a total village area of 156 hectares (ha) and a building area of 142 hectares (ha) with a building density of 91.02%. With a density above 70% it is classified as a solid building with an orange color description.

g. Grogol Village
Based on the research above, in 2018 data has been obtained that Grogol Village has a total village area of 99 hectares (ha) and a building area of 95 hectares (ha) with a building density of 95.95%. With a density above 70% it is classified as a solid building with an orange color description.

h. Gedangan Village
Based on the research above, in 2018 data has been obtained that Gedangan Village has a total village area of 136 hectares (ha) and a building area of 123 hectares (ha) with a building density of 90.44%. With a density above 70% it is classified as a solid building with an orange color description.

i. Kwarasan Village
Based on the research above, in 2018 data has been obtained that Kwarasan Village has a total village area of 125 hectares (ha) and a building area of 82 hectares (ha) with a building density of 65.60%. With a density between 50 - 70% it is classified as medium density with yellow information.

j. Manang Village
Based on the research above, in 2018 data has been obtained that Manang Village has a total village area of 166 hectares (ha) and a building area of 101 hectares (ha) with a building density of 60.84%. With a density between 50 - 70% it is classified as medium density with yellow information.

k. Parangjoro Village
Based on the research above, in 2018 data has been obtained that Parangjoro Village has a total village area of 468 hectares (ha) and a building area of 133 hectares (ha) with a building density of 28.41%. With a density between 10 - 50% it is classified as a rare density with a gray color description.

l. Pandeyan Village
Based on the research above, in 2018 data has been obtained that Pandeyan Village has a total village area of 422 hectares (ha) and a building area of 147 hectares (ha) with a building density of 34.83%. With a density between 10 - 50% it is classified as a rare density with a gray color description.

m. Banaran Village
Based on the research above, in 2018 data has been obtained that Banaran Village has a total village area of 125 hectares (ha) and a building area of 88 hectares (ha) with a building density of 70.40%. Densities above 70% are included in the building density classification with an orange color description.

n. Kadokan Village
Based on the research above, in 2018 data has been obtained that Kadokan Village has a total village area of 209 hectares (ha) and a building area of 79 hectares (ha) with a building density of 37.79%. Densities between 10 - 50% are classified as rare densities with a gray color description.

4. Conclusion

Telukan Village is the village with the most buildings with a total of 7505 buildings while Kadokan Village is the village with the least buildings with a total of 1759 buildings. Cemani Village is the village with the highest density of buildings with 96.85%, while Parangjoro is the village with the lowest density of buildings with 28.41%.

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