Analysis of Modern Store Business Opportunities Based on Geographic Information Systems with the Scoring Method

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Abstract. Kanigoro is one of the districts in Blitar Regency, located in the center of Blitar Regency and near to the Blitar City causing the development to improve faster, including in Modern Store business. To determine the area suitability for establishing a Modern Store, an analysis is needed. Geographic Information System is applied to determine the business opportunities for each village in the Kanigoro District. The research uses scoring method, provides a score for each parameter criteria to analyze the level of suitability and to determine a Modern Store location. The parameters used include population density, types of land use, access to main roads, bank or ATM facilities, distance to Traditional Markets or other Modern Store. The data of parameters are then processed, overlaid, and scored. Map is produced to illustrate the level of potential suitability for the location of the establishment of a Modern Store, with a value of 1-3 every 100 m x 100 m. Based on this final result, it can be concluded that the region with a high level of suitability is found in Kanigoro Village. This is in line with the Village Development Index in Kanigoro Village that has a category of Hierarchy I. The correlation between Village Development Index and the total area with a high level of suitability per village is 0.927 (very strong linear correlation). While the correlation between the index and the total area with a low level of suitability per village was -0.261 (weak linear correlation).

Keywords—Location Suitability, Scoring, Modern Store Geographic Information Systems, Kanigoro Subregency/District.

1. Introduction
Modern Store is a store with a self-service system, selling various types of goods in retail in the form of Minimarkets, Supermarkets, Department Stores, Hypermarkets, or wholesalers in the form of Perkulakan [1]. Generally, Modern Stores are in the form of retail stores (retail), namely joint ventures in the field of commerce in small numbers to end users or retail [2]. The rapid development of Modern Stores today has led to increasingly fierce business competition between Modern Stores and local Traditional Markets and between Modern Stores themselves. Therefore, the determination of the location of Modern Stores needs to be considered carefully so that later the selected location is the most strategic location for the Modern Store business and can attract many consumers.

Kanigoro District is one of the districts in Blitar Regency. Its location in the centre of Blitar Regency and adjacent to the Blitar City area makes this sub-district experience more rapid progress compared to other sub-districts in Blitar, including in the economic field. In 2016 there were 6 Modern Stores in Kanigoro District [3], in 2017 there were 10 Modern Stores [4], and in 2018 there were 19
Modern Stores [5]. Many Modern Stores are found in this sub-district, the number of which can be increased given the high potential for trading businesses. However, to determine the location of the establishment of a Modern Store in an area in Blitar Regency, it must refer to the Regency/City Spatial Plan, Regency/City Spatial Plan Details, including the Zoning Regulations. Article 3 Presidential Regulation of the Republic of Indonesia Number 112 Year 2007 Concerning Structuring and Fostering of Traditional Markets, Shopping Centres, and Modern Stores has stipulated the conditions for obtaining a permit to establish a Modern Store business [1]. Meanwhile, to determine the location that is allowed to establish a Modern Store in Kanigoro District, Blitar Regency, it refers to Regional Regulation Number 17 of 2011 concerning the Arrangement of Modern Stores which regulates licensing, Modern Stores, and others. The regulation has been controlled the distance between Modern Stores and Traditional Markets and the number of Modern Stores in a sub-district which is to be established. Therefore, determining the location to establish a Modern Store should be a major consideration in relation to the site suitability to establish a Modern Store business based on several aspects [6].

To determine the suitability of the area to establish a Modern Store without disrupting economic activities for the Traditional Market, analysis is needed to determine the business opportunities for each area by using Geographic Information Systems (GIS). GIS can produce an alternative set of decisions based primarily on the principle of special spatial relationships of connectivity, proximity, and overlays. The important choice phase in the use of GIS is the ability to incorporate decision maker preferences in the decision making process [7]. In this study, the parameter data which are overlaid to analyse the level of suitability and potential of Modern Store location include population density, type of land use, main road access, bank or ATM facilities, and distance to Traditional Markets or the nearest modern stores.

2. Research Location
The research location is Kanigoro District, Blitar Regency, East Java Province, located at 7° 58’- 8° 9’ 51” LS and 111° 40’- 112° 10’ BT. Figure 1 below is an overview of the map of the case study research location.

![Map of Research Locations: Kanigoro Subdistrict, Blitar Regency, East Java](https://example.com/map.png)

**Figure 1** Map of Research Locations: Kanigoro Subdistrict, Blitar Regency, East Java
Source: RBI (Rupa Bumi Indonesia) Maps Data, 2011

3. Data and Equipment
In this study, we need some data to support the implementation of research. The data are administrative boundaries of Kanigoro Subdistrict (source: RBI map scale 1:25,000), main road network data (source:
RBI map scale 1:25,000, 100 m x 100 m grid population density in 2019 (source: www.worldpop.org), distribution of locations of Modern Stores, Traditional Markets, ATMs, and Banks (source: Google Maps), and Pleiades satellite imagery that has been performed orthorectification process (spatial resolution of 0.5 meters).

The equipment used in this study are spatial data processing application, word and number processing applications, and computer.

4. Data Processing
The first step of data processing is data preparation. In this step, the location data of Traditional Markets and Modern Stores are analysed by near distance with data points (derived from fishnet results). ATM/bank location data and data points analysed with network distance (service area). The network used is the road network that has been checked for the topology. Population data is extracted to the data point. Classificate the Pleiades satellite imagery data based on land use classes and the score in Table 1, then the value was extracted to the data point. Before extracting, the accuracy calculation is done first to find out whether the results are accurate. The reference data used for accuracy calculation is based on combination data of RBI and Google Earth. The road network data is analysed by near distance analysis.

The second step is reclassify (scoring). It is the process of changing the values in the data into a score value based on Table 1.

Table 1 Parameter Score

| Parameter | Classes                          | Score |
|-----------|----------------------------------|-------|
| 1. Distance from Traditional Markets or other Modern Store [1] | 0-1000 m | 1 |
|           | >1000 m and \( \leq 1500 \) m | 2 |
|           | >1500 m                          | 3 |
| 2. Population density \((grid = 100 \text{ m} \times 100 \text{ m})\) | 0-12 (people/10^4 m^2) | 1 |
|           | 13-22 (people/10^4 m^2)         | 2 |
|           | >22 (people/10^4 m^2)           | 3 |
| 3. Land use [8] | Other land use (vegetation, waters, field, river, lake, etc) | 1 |
|           | Department Store                 | 2 |
|           | Settlement                       | 3 |
| 4. Distance to the main and local roads [8] | \(d > 50 \) m | 1 |
|           | 20 m - 50 m                      | 2 |
|           | \(d < 20\) m                     | 3 |
| 5. Distance to the Bank/ATM | \(> 100 \) m | 1 |
|           | 50 m and \( \leq 100 \) m       | 2 |
|           | 0-50 m                           | 3 |

Source:
Sahbanriah, 2012
Perpres RI Number 112, 2007

Then, the third step is overlay all scored parameters data from the step before into a tabulation. The fourth step is calculation the suitability. Calculate the value of the level of suitability based on the criteria that have been reclassified according to the score of Table 1 and the weight of each criterion based on Table 2. This is the formula used to calculate the suitability level of a Modern Store location (eq. 1) [9].
While the normalized weight is obtained by this formula (eq. 2) [10].

\[
W_i = \frac{B_i}{\sum B_i}
\]

TM = Score of Modern Store Suitability Level
W = Normalized weight
C = Parameter value
n = The number of parameter
B = Weight before normalized
i = Parameter order (1, 2, ..., n)

Table 2 Parameter Weight

| Parameter                              | Weight | Normalized Weight |
|----------------------------------------|--------|-------------------|
| Population Density                     | 3      | 0.3               |
| Landuse                                | 2      | 0.2               |
| Road Access                            | 2      | 0.2               |
| Bank/ATM Access                        | 2      | 0.2               |
| Distance to Traditional Market and Other Modern Store | 1 | 0.1 |
| **Total**                              | **1**  |                   |

Source:
Sahbanriah, 2012

The last step is layoting. It is the process of making a layoted maps for Modern Store businesses opportunities in Kanigororo District, Blitar Regency. The resulting map is a map with a scale of 1: 35000.

5. Results and Discussion
Based on the results of bank and ATM data processing and access distance obtained from the area studied in Figure 2, it was found that bank and ATM facilities were only found in Gaprang Village, Tlogo Village, Kanigororo Village, and Sawentar Village. This is marked in red (distance from the bank/ATM is less than 100 m) and yellow (distance of the bank/ATM is between 50-100 m). Whereas in other villages there were no banks or ATMs found so they were marked in green (distance from the bank/ATM is more than 100 m).
Based on the results of Figure 3 can be seen in red (20 m from the main road) which indicates that the area is on the edge of the main road. While the green color explains that the area is quite far from the main road (more than 50 m from the main road).

The results of the land use classification map of Figure 4 found two types of classes namely settlements marked in red while others (vegetation, waters, non-buildings) are marked in green. As for the shopping center class, it is not found on the map because there are no shopping centers in Kanigoro District, such as malls or other types of modern shopping centers.
From the results of distance analysis of the research area with Traditional Markets and modern stores can be seen in Figure 5 that areas of more than 1500 m from Traditional Markets or other existing modern stores marked in red are located in Gogodeso Village and Karangseno Village. In addition, red areas are also found in Papungan Village, Banggle Village, Sawentar Village, and Satrejan Village.

![Image](image_url)

Figure 5 Distance to Traditional Markets and Nearest Modern Stores
Source: Researcher (Processing Data), 2020

From population density parameters, it can be seen on the map Figure 6. It can be seen that the area marked in red (high density) is in the areas of Desa Kanigoro and Desa Kuningan.

![Image](image_url)

Figure 6 Population density (people/10.000 m²)
Source: Researcher (Processing Data), 2020

After processing the data for each parameter, then scoring and weighting are conducted. The results of data processing are then overlaid and layout to produce a map for the Establishment of Modern Stores in the Kanigoro District Area, Blitar Regency on a scale of 1: 35,000. Next is the result of
suitability analysis of the Modern Store locations in Kanigoro Village, Kanigoro Sub-district, Blitar Regency that has high suitability.

Based on Table 3, the results of an area of 120,000 m² have a high level of conformity, 4,020,000 m² has a medium level of suitability, and 41,030,000 m² have a low level of suitability. In Figure 7 it can be seen that Kanigoro District is the most suitable area or has a high potential to establish a modern store. It can be seen that the area with the red symbol is quite wide. This is because this area is quite strategic passed by the main road that is connected to Blitar City, has a lot of bank or ATM access and is located in a densely populated area. Apart from Kanigoro Village, areas that have a high degree of conformity can also be found in Kuningan Village and Gaprang Village. The area with a high level of suitability (red in color) overall is a residential area of 120,000 m² or 0.81% of the total residential area in Kanigoro District. The area around the red color also has a yellow area (moderate conformity level) that is even broader than the red area.

| Parameter | Classes | Score | Normalized Weight | Suitability Level |
|-----------|---------|-------|-------------------|------------------|
| 1. Population density (grid =100 m x 100 m) | 0-12 (people/10⁴ m²) | 1 | 0.3 | 120,000 m² (Found in Kanigoro Village, Gaprang Village, and Kuningan Village) |
| | 13-22 (people/10⁴ m²) | 2 | | 4,020,000 m² (Mostly found in Kuningan Village, Gaprang Village, and Tlogo Village) |
| | >22 (people/10⁴ m²) | 3 | | 41,030,000 m² (Mostly found in Sawentar Village, Banggle Village, and Satreyan Village) |
| 2. Land use [8] | Other land use (vegetation, waters, field, river, lake, etc) | 1 | 0.2 | |
| | Department Store | 2 | | |
| | Settlement | 3 | | |
| 3. Distance to the main and local roads [8] | d >50 m | 1 | 0.2 | |
| | 20 m -50 m | 2 | | |
| | d <20 m | 3 | | |
| 4. Distance to the Bank/ATM | >100 m | 1 | 0.2 | |
| | >50 m and ≤100 m | 2 | | |
| | 0-50 m | 3 | | |
| 5. Distance from Traditional Markets or other Modern Store[1] | 0-1000 m | 1 | 0.1 | |
| | >1000 m and ≤1500 m | 2 | | |
| | >1500 m | 3 | | |

Source:
Sahbanriah, 2012
Perpres RI Number 112, 2007
Researcher Processing Data, 2020
While for other village areas are dominated by yellow (which is found mostly near the main road) in Kanigoro Village, Kuningan Village, Gaprang Village, Tlogo Village, and Jatinom Village. The type of land use that is found in the medium suitability level is the majority of settlements and others are other types of land use (dominated by paddy vegetation and plantations).

In other villages dominated by green (low suitability). Other villages besides Kanigoro Village tend to have no ATM and bank facilities and there are still some Traditional Markets that can indeed be seen on the map that the location of Traditional Markets is fairly evenly distributed in Kanigoro District. It also can be due to the presence of rice fields that are still quite large in the area.

The Village Development Index value with the number of areas that have a high level of suitability tends to have a proportional relationship as can be seen in Figure 8 (a), namely the decreasing Village Development Index value, the number of areas that have a high level of suitability for the location of Modern Stores also tends to be less and vice versa. The linear line in both data sets shows the linear correlation between the two data. The correlation value between the Village Development Index value and the number of areas with high level of suitability is 0.927, which means that the two values have a very strong linear correlation.

Meanwhile, the Village Development Index value with the number of areas that have a low level of suitability tends to have an inversely related relationship as can be seen in Figure 8 (b), namely the decreasing Village Development Index value, the number of areas that have a low level of suitability for the location of Modern Stores tends to be more and vice versa. The correlation value between the Village Development Index value and the number of areas with a low level of conformity is -0.261 which means that the two values have a weak opposite correlation.
6. Conclusions and Recommendations

The conclusions that can be drawn from this research based on the result, area of 120,000 m² in the Kanigoro Subdistrict has a high level of suitability is found in Kanigoro Village and there are several in Kuningan and Gaprang Villages. Area of 4,010,000 m² has moderate suitability levels found in Kanigoro Village, Kuningan Village, Gaprang Village, Tlogo Village, and Jatinom Village. Other villages are dominated by areas that have a low suitability level of 41,040,000 m².

Kanigoro Village is a village that has the highest level of suitability than other villages because there are areas with moderate to high suitability levels in this village. Kanigoro Village also has a high Village Development Index value so that it supports the opportunity to set up Modern Stores in several areas in this village. The correlation between the Village Development Index value and the number of areas with high level of suitability is 0.927, which means that the two values have a very strong linear correlation. While the correlation between the index and the total area with a low level of suitability per village was -0.261 (weak correlation).

The suggestions that can be given for further research with the same topic include are:
1) The parameters used can be added for example regarding consumption activities of residents so that the analysis is more accurate.
2) Direct survey to the field is needed so that the data of the location of Modern Stores, markets, and banks/ATM obtained is more complete and accurate.
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