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THE SPATIAL ANALYSIS OF JNE AGENT DISTRIBUTION IN CIBINONG DISTRICT

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Abstrak

Perkembangan jual beli online semakin meningkat setiap tahunya. Hal tersebut juga berdampak kepada peningkatan jumlah pengiriman paket pada agen pengiriman barang termasuk JNE. Maka dari itu mendirikan bisnis agen JNE menjadi pilihan yang menjanjikan di masa depan. Syarat mendirikan agen JNE adalah lokasi harus berjarak minimal 1 Km dengan lokasi agen JNE other. Tujuan dari penelitian ini adalah untuk mencari alternative lokasi pendirian agen JNE. Penelitian ini menggunakan analisis spasial untuk melakuka analisa tentang distribusi agen JNE di kecamatan Cibinong. Beberapa analisis spasial yang digunakan antara lain Nearest Neigbor Analysis (NNA), Normalized Difference Built-Up Index (NDBI), Buffer dan weighted overlay. Hasil yang diperoleh menunjukkan bahwa persebaran agen JNE di kecamatan cibinong cenderung menyebar. Beberapa agen JNE berjarak kurang dari 1 Km dengan agen JNE other. Sebagian besar JNE berada di jalan yang memiliki status jalan lokal dan radius sekitar 500 meter di sekitar JNE rata rata terdapat sekitar 52% built up area. Menurut penelitian ini hanya terdapat sedikit lokasi yang sesuai untuk mendirikan agen JNE di Kecamatan Cibinong.
***Kata Kunci**: JNE, NNA, NDBI*

Abstract

The development of buying and selling online is increasing every year. This also resulted in an increase in the number of package deliveries to freight forwarders, including JNE. Therefore, establishing a JNE agent is a potential business. The requirement to establish a JNE agent is that the location must be at least 1 Km from the location of other JNE agents. The purpose of this study was to find alternative locations for the establishment of JNE agents. This study uses spatial analysis to analyze the distribution of JNE agents in Cibinong District. Some of the spatial analyzes used include Nearest Neigbor Analysis (NNA), Normalized Difference Built-Up Index (NDBI), Buffer and weighted overlay. The results obtained indicate that the distribution of JNE agents in Cibinong District tends to spread. Some JNE agents are less than 1 Km from other JNE agents. Most of the JNE are located on roads with the status of local roads and a radius of about 500 meters around JNE on average there are about 52% of the built area. According to this study, there are only a few suitable locations to establish a JNE agent in Cibinong District.
***Key words**: JNE, NNA, NDBI*

INTRODUCTION

Online shopping has now become a trend in society. This encourages the development of a marketplace that is growing more rapidly. Marketplace is an electronic market that sells goods or services, the marketplace is considered an online mall service provider, but the seller is not a site provider but a member who registers on the marketplace manager website (Humaizi et al., 2020). Some of the biggest marketplaces in Indonesia are Tokopedia, Shopee and Bukalapak.

According to the 2nd Quarter 2021 data sourced from the iprice.co.id website. Tokopedia is visited by around 147,790,000 visitors every month which makes the Marketplace ranked first in Indonesia. In second place is Shopee which is visited by around 126,996,700 visitors per month and in third place is Bukalapak with a total of 29,460,000 visits per month. According to data sourced from Bank Indonesia, the total value of marketplace transactions in 2020 reached 266.3 trillion. This value has increased more than 5 times compared

to the transaction value in 2017 which was only around 41.2 trillion (Jayani, 2021).

Figure 1. Increase in Marketplace Transactions (Source: Katadata.co.id)

The development of the marketplace affects shipping agents such as JNE, JNT, Sicepat, Anteraja, Wahana and other shipping agents. The growth in this freight forwarding sector in 2017 grew by 14.35 percent compared to 2016, in 2018 it grew by 9.61 percent compared to 2017, and in 2019 it grew by 16.7 percent compared to 2018 (Noor et al. , 2019). For example, in 2019 JNE was able to send more than 1 million goods per day (Merdeka.com, 2019). Even the income of one JNE agent in Jakarta alone can reach 2 billion per month (jnews, 2020). Therefore, the business of shipping goods is one of the business opportunities that are in demand by the public.

The role of shipping agents in buying and selling online is very important. Shipping agents have the function to distribute packages throughout Indonesia. The average shipping agents has many branches spread all over the country. For example, JNE has around 6,000 agents spread across the archipelago (JNE, 2016). Although many other shipping agents have emerged, JNE is still stable by recording an average growth of around 30% per year (Dianka, 2021). In this study, the authors took the theme of the JNE agent because it was considered the most stable in the last few decades in the field of freight forwarding services.

The selection of a JNE agent establishment location must meet several requirements, one of which is the distance interval between JNE Partner agents. The minimum interval distance between JNE Agents is 1 Km (JNE, 2021). The location not only takes into account the distance between JNE agents but also has to take into account the potential customers in an area. Although the location of the agent is not the only factor that can affect the growth of JNE agents. But at least the strategic location of the agent can reach more customers. Several other factors that influence the development of JNE agents are price and service quality (Novia & Sutrisna, 2017).

The problem is most people do not have the ability to analyze spatially so they are unable to find a strategic place to establish a JNE agent. Mistakes in choosing a location can result in the bankruptcy of JNE agents due to the lack of income from customers. Therefore, this research was conducted as an effort to apply spatial analysis in determining the location of JNE agents so as to be able to provide the best alternative location.

In this study, several spatial analyzes related to the distribution of JNE agents will be carried out. One of the spatial analysis used is Averest Nearest Neighbor (ANN). ANN is very commonly used to find out the distribution pattern of certain objects. (Saraswati et al., 2016) used ANN to analyze settlement patterns. (Nirwansyaha et al., 2015) used ANN to analyze landslide patterns. (Setiawan et al., 2019) used ANN to analyze the distribution of trade and service locations.

The search for alternative locations will be carried out using the weighted overlay method. This method is quite commonly used to find alternative locations with specific goals. (Astuti & Pamungkas, 2020) used the weighted overlay method to determine the location of the minimarket. (Mintarsih & Sardjito, 2019) used the weighted overlay method to determine alternative terminal locations. (Yedidia, 2016) used the weighted overlay method to determine the location of the landfill.

Weight Overlay method uses raster data which has the smallest unit in the form of pixels so that from this data it can be scored and weighted for each pixel that has its own value (Nurfaiz Fathurrahman Yasien et al., 2021). One of the functions of the weighted overlay is to solve multi-criteria problems such as optimal site selection or suitability modeling (Fahrunnisa et al., 2016).

This research is important to do so that the public knows the application of spatial analysis in determining the location of goods delivery agents. This research was conducted as an effort to find the best alternative location for the establishment of JNE agents in Cibinong District. This study will also provide information on whether in the Cibinong sub-district it is still possible to establish a JNE agent. Cibinong was chosen because it is the location of the author, so it is easy to verify the data.

RESEARCH METHODS

This study uses JNE agent location data obtained from google map. The author use the location reviews on the google map to ensure

that the JNE agent locations from google are valid. Location reviews are an assessment of Google account users for a location, in this case the JNE agent. JNE agents with dubious status are verified by direct surveys to the field.The research location can be seen in Figure 1

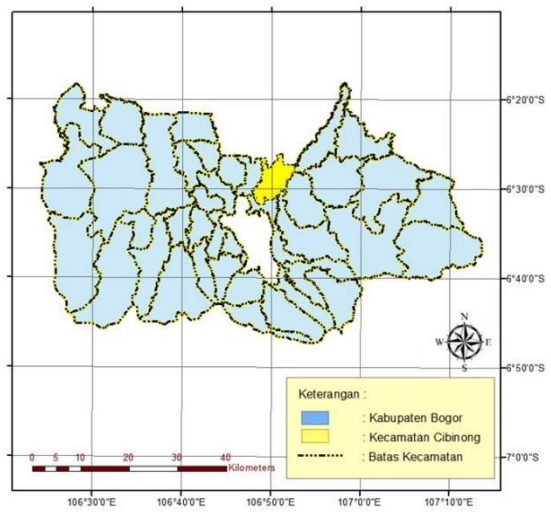

Figure 1. Research Location

Especially for the Bogor area, JNE has 221 agent partners spread across various Bogor areas. This research was conducted in the Cibinong District, which is located in Bogor Regency as well as the capital city of Bogor Regency. The following is a list of JNE agents in Cibinong sub-district that have been collected:

Table 1. List of JNE in Cibinong District

NO	NAME
1	JNE AL FALAH
2	JNE BOGOR GADING/SUKAHATI
3	JNE CEMERLANG
4	JNE CIBINONG 004
5	JNE CIBINONG GRIYA ASRI
6	JNE CIKARET 029
7	JNE GRACE
8	JNE GULTOM 024
9	JNE HANKAM
10	JNE HAUNAZ
11	JNE KANDANG RODA
12	JNE KP CILODONG
13	JNE PINTU AIR
14	JNE PURI NIRWANA 3
15	JNE PUTRA TUNGGAL
16	JNE QIANNA
17	JNE REZEKI
18	JNE RUKO CCM
19	JNE RUMASAKIT CIBINONG
20	JNE STASIUN CIBINONG
21	JNE SUKAHATI
22	JNE VBI2

Source: 2021 analysis results

The number label on the figure 2 represents the name of the JNE agent as shown in table 1. Other data used in this study are the Indonesian Earth Map Scale 1: 25,000 in 2000 and the Sentinel 2 Satellite Image in 2020. This sentinel image will later be used for analysis. built-up area. Meanwhile, the RBI Map will be used as a reference for road network data used in the research.

Objects analyzed using ANN will be classified into 3, namely clustered (clustered), random (irregular) and dispersed (spread). If the Z-Score value is less than 1, the pattern indicates grouping. If the index is greater than 1, the tendency is towards dispersion. The calculation of NNA is carried out using the following formula:

$$ANN = \frac{\bar{D}_O}{\bar{D}_E} \quad (1)$$

Where Do is the average distance observed between each feature and their closest neighbors

$$\bar{D}_O = \frac{\sum_{i=1}^{n} d_i}{n} \quad (2)$$

Whereas DE is the expected average distance for features with random patterns

$$\bar{D}_E = \frac{0.5}{\sqrt{n/A}} \quad (3)$$

n is the number of objects and A represents the area. Z Score is the result of ANN calculation.

$$z_{ANN} = \frac{\bar{D}_O - \bar{D}_E}{SE} \quad (4)$$

$$SE = \frac{0.26136}{\sqrt{n^2/A}} \quad (5)$$

This research also uses buffer analysis. Buffer analysis can be used to solve various problems. (Utami et al., 2019) used buffer analysis to assess road accessibility to relocation sites. (Joewono & Andrianto, 2019) used the Buffer method to measure the distance from the place of residence to the location of shopping so that the extent of the shopping area could be known.

One of the conditions that must be met when setting up a JNE agent is that it must be at least 1 km away from other agents. Buffer analysis will be carried out to ensure that the presence of JNE agents does not coincide with each other. The location of the JNE agent will be buffered for later viewing which agents have overlapping areas or certain areas that can still be established by JNE because it is not covered by any JNE.

Determination of potential locations to establish JNE is done using weighted overlay analysis. The weighted overlay method is a spatial analysis using the overlay technique of several maps related to the factors that influence the vulnerability assessment. The results of the weighted overlay analysis are strongly influenced by the variables and weights used. The author uses 2 variables, namely the built up area and the road with a weighting of 40% and 60%. The author views road access as more important because the requirements for opening a JNE agent are required to have an agent location that can be accessed by car. Meanwhile, it is not stated that the agent's location must be in a residential area.

Road infrastructure development has a positive influence on economic development (Prapti et al., 2015). The easier a location is to access, the greater the opportunity to bring in visitors. The more visitors the transaction value will also increase. This assumption is also used in determining the location of minimarkets. According to research conducted by (Pigawati, 2011) minimarket locations tend to be clustered on the main road.

According to Law Number 38 of 2004, based on its function, roads are divided into Arterialal roads, collector roads, local roads and environmental roads. In this case the author uses a road sourced from the RBI map. The roads used are only Arterialal roads, collector roads and local roads with the assumption that if environmental roads are used for the establishment of JNE agents, the market that is affordable is not much.

RESULTS AND DISCUSSION

The distribution of the locations of JNE agents in Cibinong can be seen in Figure 2. The figure shows the distribution of 22 JNE agents in the Cibinong sub-district. The number label on the map represents the name of the JNE agent as shown in table 1

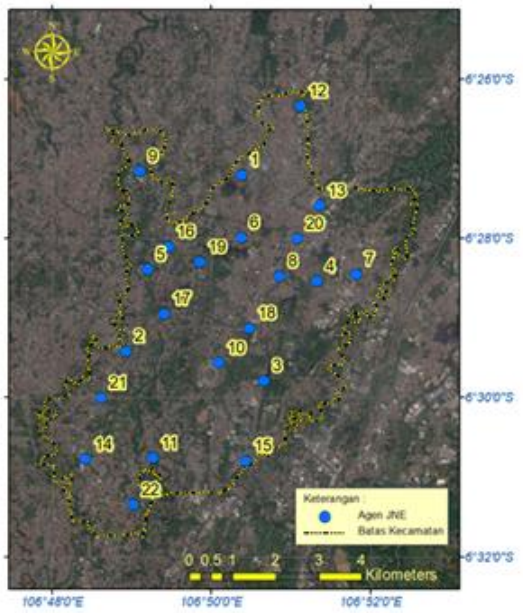

Figure 2. Distribution of JNE Cibinong agents

NNA

First of all, the author conducts an analysis to determine the distribution pattern of JNE agents. The method used is Nearest Neighbor Analysis (NNA). The result is that the distribution pattern of JNE agents in Cibinong belongs to the Dispersed category with a Z value of 4.655344 as can be seen in Figure 3. This is reasonable because the policy of each JNE agent must be within a radius of 1 Km from other JNE agents.

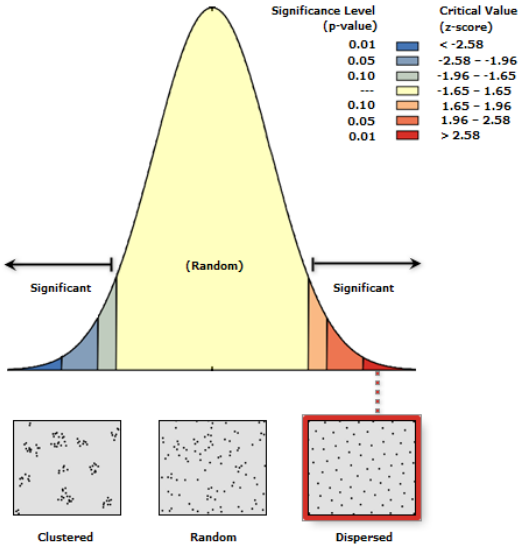

Figure 3. NNA JNE

Buffer Analisys

Furthermore, a buffer analysis was used to ensure that the distance of each JNE agent was more than 1 Km. The distance used in this analysis is a straight line distance, not the distance based on the path taken. The location of the JNE point is buffered as far as 500 meters, if there is a buffer line that intersects, it means that the JNE is less than 1 Km away.

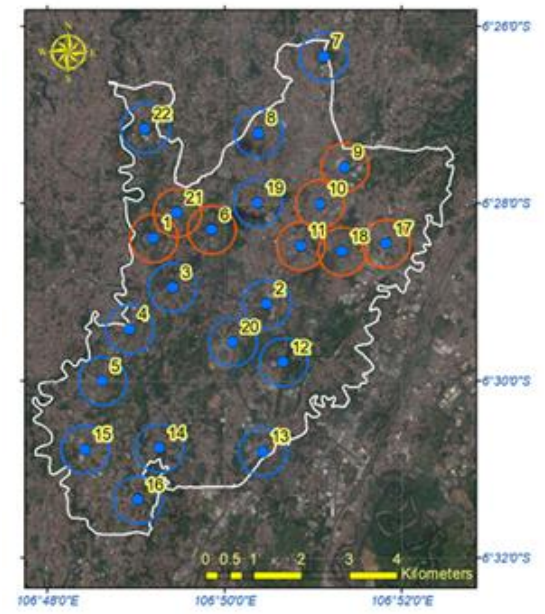

Figure 4. Buffer Analysis

The results of the buffer analysis are shown in Figure 4. The dots with red circles are JNE agents that have a distance of less than 1 Km from other JNE agents in the vicinity. The dot with the blue circle is the JNE agent which is more than 1 Km away from other JNE agents in the vicinity. There are 8 JNEs that are less than 1 Km away, namely Agents Number 1, 6, 21, 9, 10, 11, 17 and 18. The closest distances are agents Number 1 and 21 with a distance of about 735 meters.

NDBI Analisis

The location of settlements is also important because where there are many settlements there is the potential for the number of shipments of goods by the community to be high. According to research conducted by (Pigawati, 2011) the location of minimarkets also tends to follow the density of settlements. When JNE which was established in an area far from residential areas would not be able to develop due to the lack of customers. The distribution of settlement locations is obtained from the RBI map with a scale of 1: 25,000 which is updated with Sentinel Image 2 in 2020.

Sentinel imagery is used as the basis for the Normalized Difference Built-Up Index (NDBI) analysis to create a built-up environmental coverage area in the research area. NDBI is very sensitive to built-up land or open land. This algorithm was chosen because it is the most frequently used transformation to assess the built up land index (Hidayati et al., 2018). The NDBI index will focus on highlighting urban areas or built-up areas where there is usually a higher bounce in the Shortwave Infrared (SWIR) area, when compared to the Near-Infrared (NIR) area (Handayani et al., 2017). The NDBI equation is as follows :

NDBI = (SWIR – NIR)/(SWIR + NIR)

In sentinel 2 images, SWIR uses band 11 and NIR uses band 8. The results of the NDBI analysis are in the form of raster data. Furthermore, the data is classified into 2, Cells with a value of <0 are considered not a Built-up area and cells with a value> 0 are considered a Built-up area. The results obtained are raster maps with a resolution of 10 m.

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Based on the results of the NDBI analysis, a calculation of the percentage of the built-up area in each polygon area that has been made previously is calculated. As a result, JNE which is located in the most densely populated Built-Up area are JNE Grace, JNE Gultom 024 and JNE Cibinong station. The JNEs with the least built-up area are JNE Cemerlang and JNE Rumasakit Cibinong, one of the reasons is the existence of Situ Cikaret which is near JNE Rumasakit Cibinong. Based on the table, it can be seen that on average JNE, in a radius of 500 meters around it, must cover about 52% of the Built-Up area. This means that most of the land coverage in the area is the built environment.

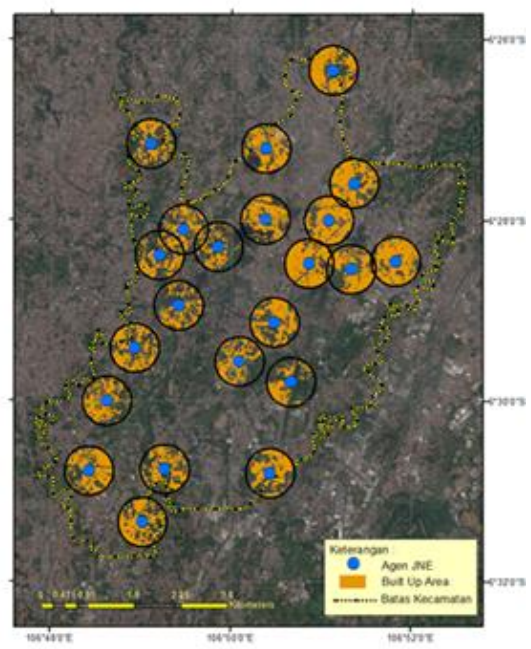


Figure 5. NDBI analysis results

Road Level Analysis

In the next stage, an analysis of the road class where the JNE agent is located is carried out. The road class used is derived from the RBI map. The author only uses 3 classes of roads, namely Arterialal roads, other roads and local roads. The footpath is not used because there is no way for a JNE to be standing around the path. This is because the conditions for establishing a JNE must be on a road that can be passed by cars. The road class where the JNE agent is located is very important because it concerns how high the traffic of passers-by is. The higher the traffic of people passing through, the greater the potential income based on the number of packages sent by customers.

Table 1. Characteristics of JNE Agents

No	Agent Name	Area(K m^2)	Built-Up Area	Road Level
1	JNE AL FALAH	0.418	53%	Local
2	JNE BOGOR GADING/SUKAH ATI	0.392	50%	Local
3	JNE CEMERLANG	0.231	29%	Arterial
4	JNE CIBINONG 004	0.442	56%	Local
5	JNE CIBINONG GRIYA ASRI	0.336	43%	Local
6	JNE CIKARET 029	0.44	56%	Local
7	JNE GRACE	0.594	76%	Arterial
8	JNE GULTOM 024	0.605	77%	Arterial
9	JNE HANKAM	0.267	34%	other
10	JNE HAUNAZ	0.334	43%	Local
11	JNE KANDANG RODA	0.345	44%	Local
12	JNE KP CILODONG	0.486	62%	Arterial
13	JNE PINTU AIR	0.52	66%	Arterial
14	JNE PURI NIRWANA 3	0.466	59%	Local
15	JNE PUTRA TUNGGAL	0.383	49%	Arterial
16	JNE QIANNA	0.352	45%	Local
17	JNE REZEKI	0.278	35%	other
18	JNE RUKO CCM	0.441	56%	Arterial
19	JNE RUMASAKIT CIBINONG	0.234	30%	Local
20	JNE STASIUN CIBINONG	0.576	73%	Local
21	JNE SUKAHATI	0.372	47%	Local
22	JNE KAUM PANDAK	0.438	56%	Local
RATA RATA		0.378	52%	

Source: 2021 analysis results

Based on the table above, it can be seen that as many as 7 JNEs have Arterialal-level road access, while 13 JNEs have local road-level access roads and only 2 JNEs have other road-level access. It should be noted that based on the order of road class, the Arterialal road is the first, the local road is the second and the other road is the third. From this analysis, it can be seen that on average JNE has access to local roads because there are indeed more local roads. Establishing a JNE agent with other road access may need to be considered because it is feared that road traffic will be less crowded.

JNE Location Alternative Analysis

Furthermore, an analysis of the location where a new JNE agent can be opened by observing the rules is more than 1 Km away from other agents. The analysis is carried out by buffering as far as 1 Km from the existing JNE location so that the existing JNE agents can find places that have not been reached by existing JNE agents. In conducting this analysis, the authors include JNE which is outside the Cibinong sub-district which is located less than 1 Km from the administrative boundary of the Cibinong District. The number of JNE agents included in this analysis increased to 31 JNE agents.

The results of the analysis are presented in Figure 6. The blue area is an area where it is not possible to establish a JNE agent because it is less than 1 Km away from other JNE agents. While the orange area is an area that is still possible to establish a JNE agent. The percentage of the area that is still possible for JNE agents to open is around 12.85% of the total area of Cibinong

District.

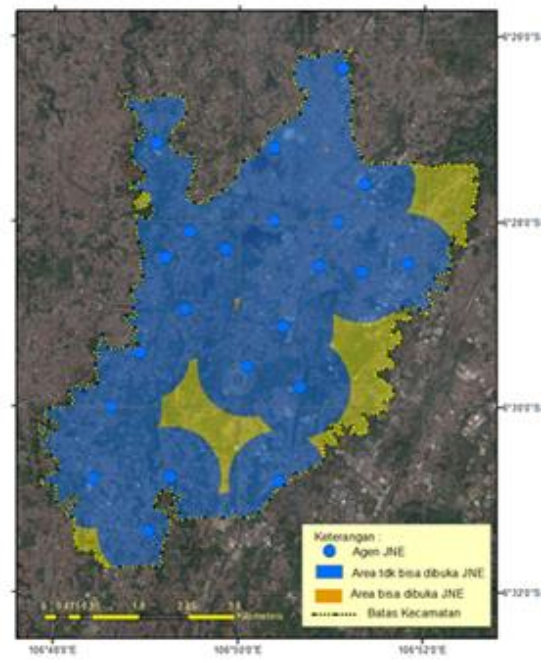
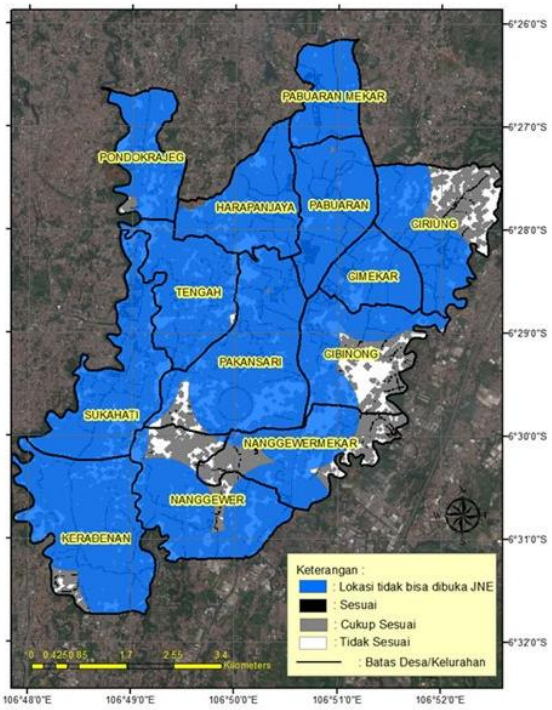


Figure 6. Analysis of alternative JNE locations

Furthermore, a weighted overlay analysis was carried out in areas where it was still possible to open a JNE agent. The variables used are the built up area and the road network. The analysis is carried out using raster data so that the basic data in vector form must first be converted into raster form. In this study, the conversion to raster data was carried out using the Euclidean distance concept in ArcGIS software. The analysis gives a different value for each pixel depending on its proximity to the main object in this case the built up area and roads.

After that, overlay is done with 60% road weighting and 40% Built Up area. The author assumes that the role of the road is more dominant than the built up area. This is because about half of JNE agents in the Cibinong sub-district have a built-up area of less than the average in a 500 meter radius. Meanwhile, most of the JNE agents are located around Arterialal roads and local roads, indicating that the role of roads as access to locations is considered more important. Furthermore, the results of the analysis are classified into 3 classes, namely according to moderate and not appropria te. The results can be seen in the image below.



Gambar 7. Weighted Overlay Analysis

In Figure 7 it can be seen that the black area represents the most suitable location for establishing a JNE agent. The gray area is a suitable location and the white area is an inappropriate location. Even though the location fulfills the spatial aspect, it is not possible to establish a JNE agent at the location of the location.

CONCLUSION

The number of JNE agents in the Cibinong sub-district is 22 units with evenly distributed locations. Although the requirements for establishing a JNE agent should not be less than 1 Km from other agents, based on the analysis, there are several agents who are less than 1 Km away from the agent next door. There are not many area options that can still be used to establish a JNE agent in the Cibinong sub-district . In areas where it is still possible to establish a JNE agent, they must also pay attention to the suitability area in order to be able to reach the market as expected. Another thing that must be considered is whether or not there are buildings that can be purchased or rented to be used as JNE agents.

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