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Determination of Service Centre in Parakan Urban Area of Temanggung Regency

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ABSTRACT

Service centers are new centers of activity in an area that will encourage the development of the area, the emergence of activity centers will be followed by an increase in community activity. One of the activity centers in Temanggung Regency is the Parakan Urban Area, which is designated as a Local Activity Center. In order to optimize its urban development, it is necessary to determine the service center. The method used is kernel density. This method is a processing method based on point or line data that calculates density. The types of data in this study are primary and secondary data, namely facilities, road infrastructure, trade and services, buildings and policies. The research analysis was carried out density scoring and weighted overlay to determine the service center of Parakan Urban Area. The final results show that service centers in the Parakan Urban Area are divided into three hierarchies, namely city/urban service centers, sub-city/urban service centers and sub-district/village neighborhood centers by considering the existing and estimated development of the area.

Keywords: Service Center, Urban Area, Parakan

ABSTRAK

Pusat pelayanan merupakan pusat-pusat aktivitas baru di suatu wilayah yang akan mendorong perkembangan wilayah tersebut, kemunculan pusat-pusat kegiatan akan diikuti dengan peningkatan aktivitas masyarakat. Salah satu pusat kegiatan yang terdapat di Kabupaten Temanggung yaitu Kawasan Perkotaan Parakan yang ditetapkan sebagai Pusat Kegiatan Lokal (PKL). Dalam rangka mengoptimalkan perkembangan perkotaannya perlu dilakukan penentuan pusat pelayanan. Metode yang digunakan yaitu kernel density. Metode ini merupakan metode pemrosesan berdasarkan data titik atau garis yang memperhitungan kepadatannya. Jenis data pada penelitian ini adalah data primer dan sekunder yaitu sarana, prasarana jalan, perdagangan dan jasa, bangunan serta kebijakan. Analisis penelitiaan tersebut dilakukan skoring kepadatan dan weighted overlay untuk menentukan pusat pelayanan Kawasan Perkotaan Parakan. Hasil akhir menunjukkan pusat pelayanan di Kawasan Perkotaan Parakan dibagi menjadi tiga hirarki yaitu pusat pelayanan kota/kawasan perkotaan (PPK), sub pusat pelayanan kota/kawasan perkotaan (SPPK) dan pusat lingkungan kecamatan/ desa (PPL) dengan mempertimbangkan eksisting dan perkiraan perkembangan wilayah.

Kata Kunci: Pusat Pelayanan, Kawasan Perkotaan, Parakan

1. INTRODUCTION

The spatial structure based on Law No. 26 of 2007 concerning Spatial Planning is the arrangement of settlement centers and the determination of a network of infrastructure and facilities that serve as a support for the socio-economic activities of the community which hierarchically have a functional relationship (Government, 2007). The spatial structure affects the shape of the space, this is due to various networks, especially transportation networks that can determine the direction of urban development and experience a faster increase in economic activity compared to rural areas (Surya, 2015). This is due to the larger urban population and the lifestyle of people in urban areas who are more oriented towards non-agricultural activities (Wang et al., 2023). In addition, the condition of the spatial structure also influences people's behavior patterns, especially on movement patterns because the spatial structure is closely related to the available movement network (Ikhwan, 2010).

One part of the spatial structure is the determination of service centers. The determination of service centers are new centers of activity in an area that will encourage the development of the region, the emergence of activity centers will be followed by an increase in economic activity, utilities, supporting facilities in the socio-economic activities of the community (Government, 2007). This determination has a hierarchical and functional relationship that can direct or form the structure and network of service centers in the region, as well as transportation networks and other infrastructure that support service centers. The goal is to form an integrated determination that is able to utilize the potential of the region, so that in the end it can increase the competitiveness of the region (Fasa & Revayanti, 2021).

The existence of service centers is expected to provide more equitable services to urban communities, so it is important to conduct studies on urban service centers (Gao et al., 2017). The determination of service centers in the Parakan Urban Area in this study uses the kernel density method which aims to assist the planning and development of service centers in urban areas. Several similar studies to identify centers of community activity using the kernel density method with public facility variables in Medan City Urban Area (Lathifah & Aulia, 2024). In addition, the determination of service centers in Pangkalpinang City also uses the kernel density method with variables of health facilities, education, worship, offices,

shops, green spaces and road networks (Fitriansyah & Zulkia, 2023). Research on the determination of service centers in the Pattalassang Urban Area is also taken from several analytical studies such as centrality index analysis and kernel density analysis which for kernel density analysis uses facility building point variables and produces the density of each building in the planning area (Hidayat et al., 2022). The research conducted a process of determining service centers in Urban Areas with the same method, namely spatial analysis with the kernel density method which produces a hierarchy through variables of facilities, roads, trade and services and buildings. The difference in determining the research service center in the Parakan Urban Area with the results of several other studies is the existing considerations and estimates of regional development and the scope of the study area taken Parakan Urban Area in Parakan District, Temanggung Regency.

Activities in the Parakan Urban Area are concentrated in Parakan Kauman and Parakan Wetan Villages (city center); this impacts high mobility in the city center and causes congestion. Therefore, there is a need for a new service center located on the outskirts to reduce mobility to the city center. The determination of service center needs to pay attention to the plan to determine the spatial structure of Temanggung Regency and the development of the city, population distribution, activities, and existing conditions in Parakan District. Parakan Urban Area is one of the urban areas in Temanggung Regency. In addition, the Parakan Urban Area is one of the Local Activity Center areas based on the Regional Regulation of Temanggung Regency Number 1 of 2024 concerning the Regional Spatial Plan of Temanggung Regency for 2024-2044 with the aim of serving district-scale activities or several sub-districts. The determination of service centers aims to increase the effectiveness of services in the study area.

2. METHODS

The focus of this research is the Parakan Urban Area with an area of 1,433.93 hectares or 1.65% of the area of Temanggung Regency. The Parakan Urban Area is divided into 2 (two) urban villages and 11 (eleven) villages, namely Parakan Wetan Neighborhood, Parakan Wetan Neighborhood, Traji Village, Wanutengah Village, Caturanom Village, Mandisari Village, Tegalroso Village, Depokharjo Village, Dangkel Village, Campursalam

Village, Ringinanom Village, and Watukumpul Village. Parakan Urban Area is located in the geographical position of 7.2508°- 7.3016° N and 110.0901°- 110.0731° East.

Some of the methods used to determine service centers are looking at the number of facilities in an area, but this method is more appropriate in determining the order of the city for a larger area level (Apriana & Rudiarto, 2020), such as the Marshal Centrality Index and the Gravity Index. The use of this method also looks at the diversity of facilities and the distance between some areas (Patrik et al., 2021). However, for the determination of service centers within urban areas, a combination of variables can be used, such as the density of facilities, roads, trade and services, and buildings to produce more detailed results. The method used to determine detailed scale service centers is the kernel density method. This method is a processing method based on point or line data that takes into account their density (Nanda et al., 2019). Kernel density can also be used to measure the spatial distribution of points or lines by calculating how dense or sparse the distribution is in an area, resulting in a high to low classification as in the research of determining investment in the Ambarawa Urban Area (Yesiana et al., 2023).

The research method for the service center of the Parakan Urban Area is quantitative research compiled with data collection used consisting of two types, namely primary data and secondary data and combining the two. Primary data is data from field observations by collecting data such as the number of facilities, trade and services, as well as road and building infrastructure (Hidayat et al., 2022). The data collection was carried out by Ground Check using the Avenza Maps application to match the existing coordinate location. Meanwhile, secondary data in this study was obtained through document review and institutional surveys such as statistical data of Parakan District, spatial planning policy of Temanggung Regency and other documents relevant to development plans and planning in the Temanggung Regency. Secondary data in the form of statistical data from Badan Pusat Statistik was validated by conducting a ground check.

The method of analysis in this study used several methods to determine the hierarchy of areas and service centers. With the analysis carried out including the density of facilities, road density, trade and service density and building density to determine the hierarchy based on its indicators in determining the essence of activity centers and accessibility objects with

spatial analysis techniques, namely kernel density and weighted overlay of the scoring results of each density variable using Arcgis 10.8 software. Kernel density is a processing method based on point or line data that takes into account its density.

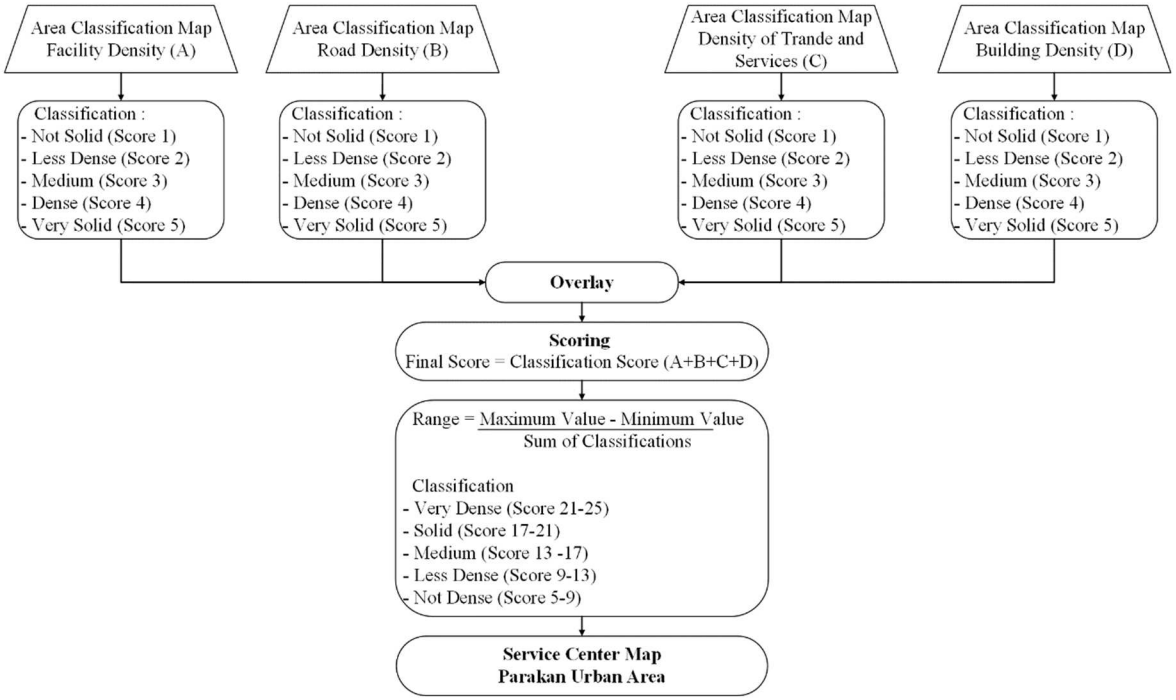

Figure 1. Stages of Analysis *Kernel Density*
Source: 2024 Compiler

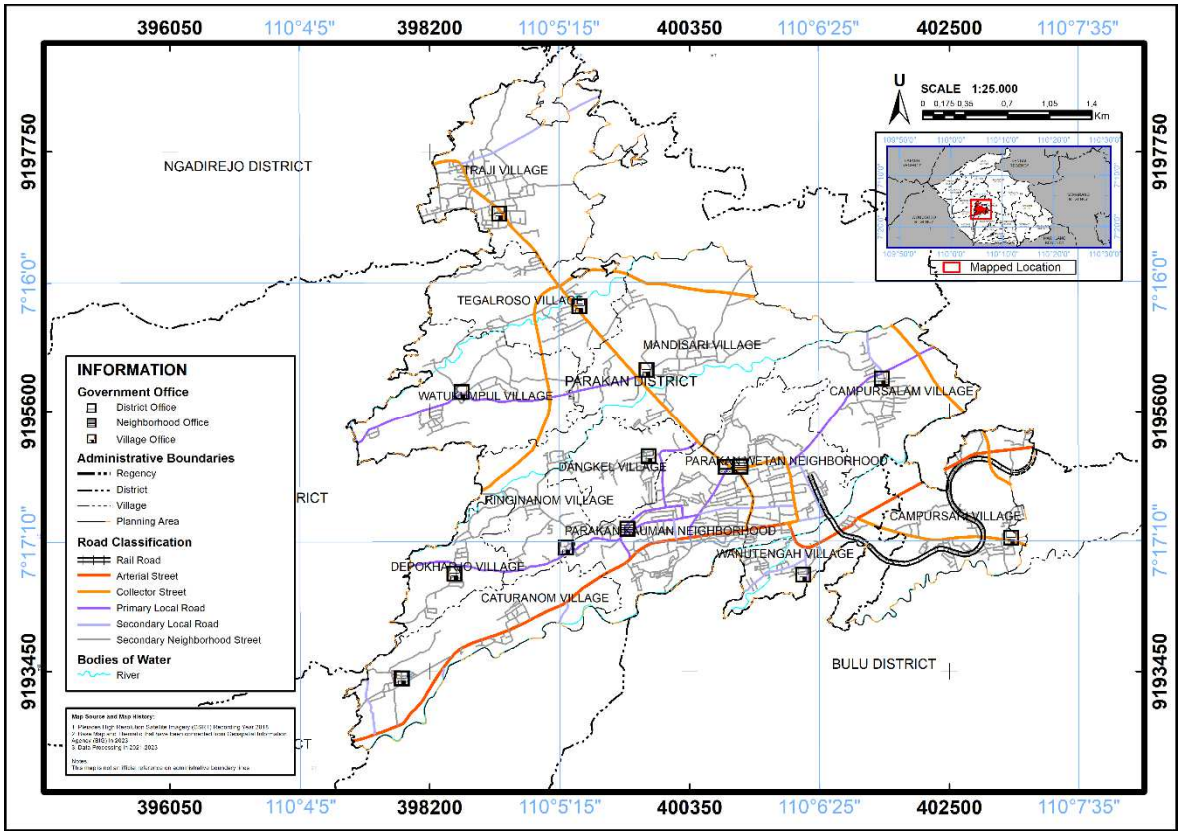

Figure 2. Adimistrative Map of Parakan Urban Area
Source : 2024 Compiler

3. RESULTS AND DISCUSSION

Service center determination analysis is carried out to formulate a hierarchy of service centers in the Planning Area. The preparation of service center determination analysis requires data on the availability of existing facilities. The amount of availability of facilities will affect the hierarchy or level of service centers, the more availability of facilities, the area can become a service center.

A. Density of Facilities

Facility density analysis is conducted to obtain an overview of the level of service of a village/sub-district based on the existence of existing facilities in the Parakan Urban Area. The density of facilities uses data on education facilities, trade and services, government, health, or other public facilities in the Parakan Urban Area. Facilities are services that can fulfill the needs of the community and are affordable for all groups of residents (Rumengan et al., 2019). This kernel density analysis method can show the existence of a concentration

of facility density that can serve the needs of the community. The following is a map of the density of facilities in the Parakan Urban Area.

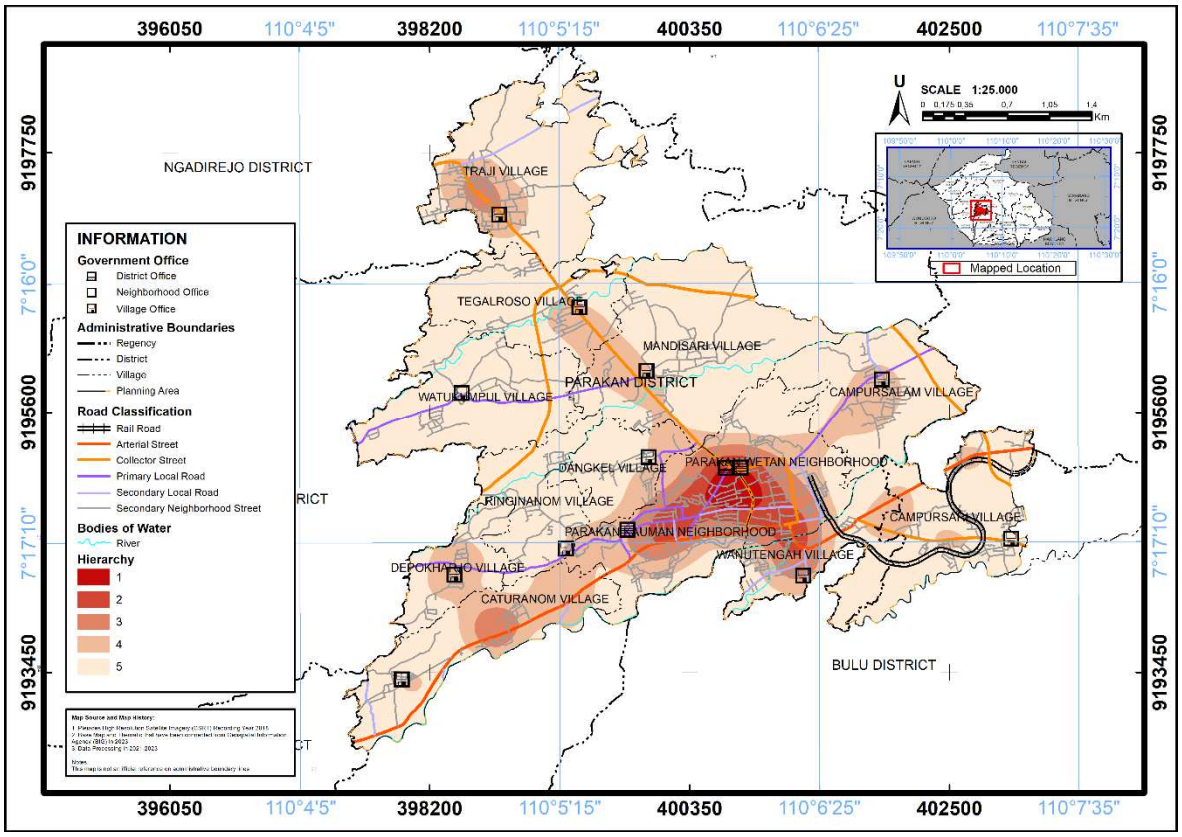

Figure 3. Facilities Density Map of Parakan Urban Area
Source : 2024 Compiler

The map above shows the value of 1 to 5 which has a different meaning, at hierarchical value 1 means the highest density of facilities which is to determine the service center in the Parakan Urban Area as a service center with facilities that serve the community and are easily accessible by the community in the Parakan Urban Area. Based on the results of the analysis, the resulting interval of each hierarchy is as follows.

Table 1. Hierarchy based on Density of Facilities in Parakan Urban Area

Hierarchy	Score	Neighborhood/ Village
I	5	Parakan Kauman
II	4	Parakan Wetan
III	3	Wanutengah, Traji, Caturanom
IV	2	Mandisari, Dangkel, Campursalam, Campursari, Tegalroso, Depokharjo, Ringinanom, Watukumpul
V	1	-

Source : 2024 Compiler

B. Density of Road

Road network density analysis is carried out to obtain an overview of the level of service of a Village when viewed from the existence of a road network in the Urban Area. The road network is a unity of roads that connects and binds growth centers with areas that are within the influence of their services in a Hierarchys relationship (Fithra, 2017). The kernel density method in road density analysis can help in areas that have good access to main roads that can be used as a consideration to determine strategic locations in building city service centers. The following is a road density map of the Parakan Urban Area.

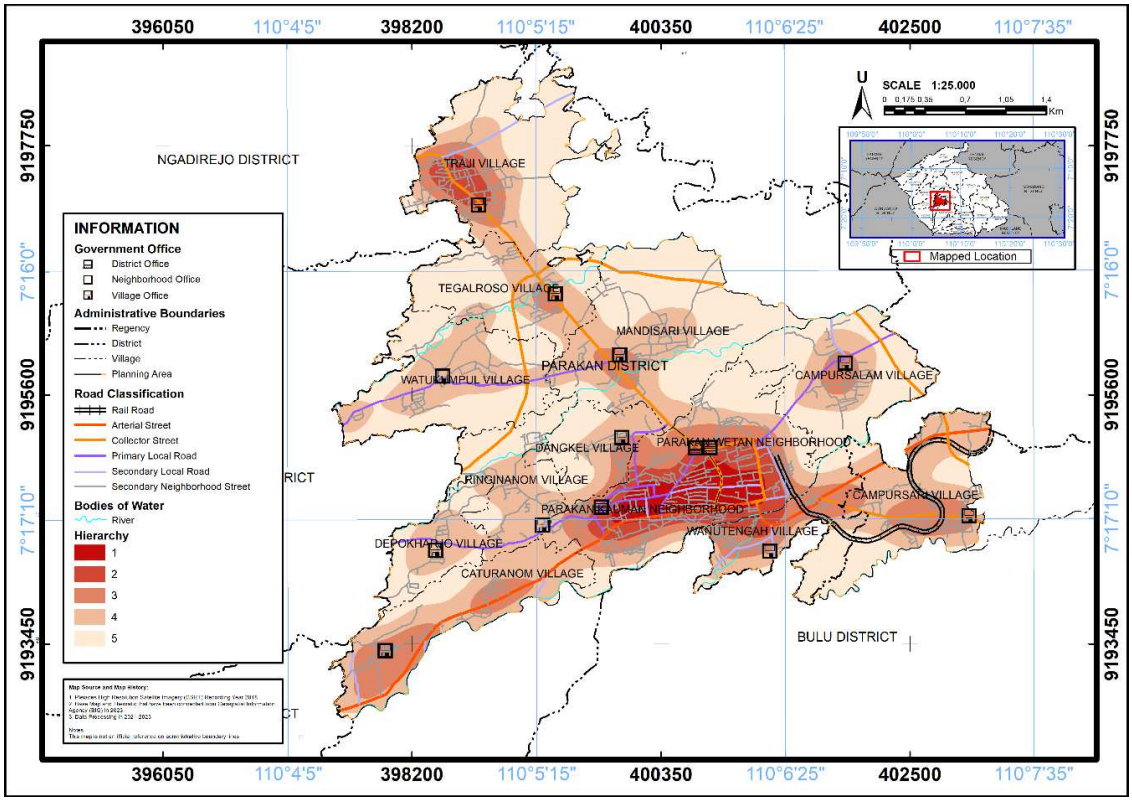

Figure 4. Road Density Map of Parakan Urban Area
Source : 2024 Compiler

The map above shows areas with different road densities. A Hierarchy 5 value indicates a very high road density which means it has easy road accessibility. Whereas a Hierarchy 1 value indicates low road density. Based on the results of the analysis, the intervals for each Hierarchy are as follows.

Table 2. Hierarchy based on Road Density of Parakan Urban Area

Hierarchy	Score	Neighborhood/ Village
I	5	Parakan Kauman, Parakan Wetan
II	4	Wanutengah, Traji
III	3	Caturanom, Mandisari, Dangkel, Campursalam, Campursari, Tegalroso
IV	2	Depokharjo, Ringinanom, Watukumpul
V	1	-

Source : 2024 Compiler

C. Density of Trade and Services

Analysis of the density of trade and services is carried out to obtain an overview of the level of service of a Village when viewed from the presence of trade and service facilities in the Urban Area. Based on the position of the Parakan Urban Area in Temanggung Regency as a local activity center, which means that it is the center of the Parakan District and surrounding sub-districts. Then the existence of Pasar Legi Parakan as a city-scale trade and service that makes Parakan District the center of trade and service activities in Temanggung Regency. The following is a map of the density of trade and services in the Parakan Urban Area.

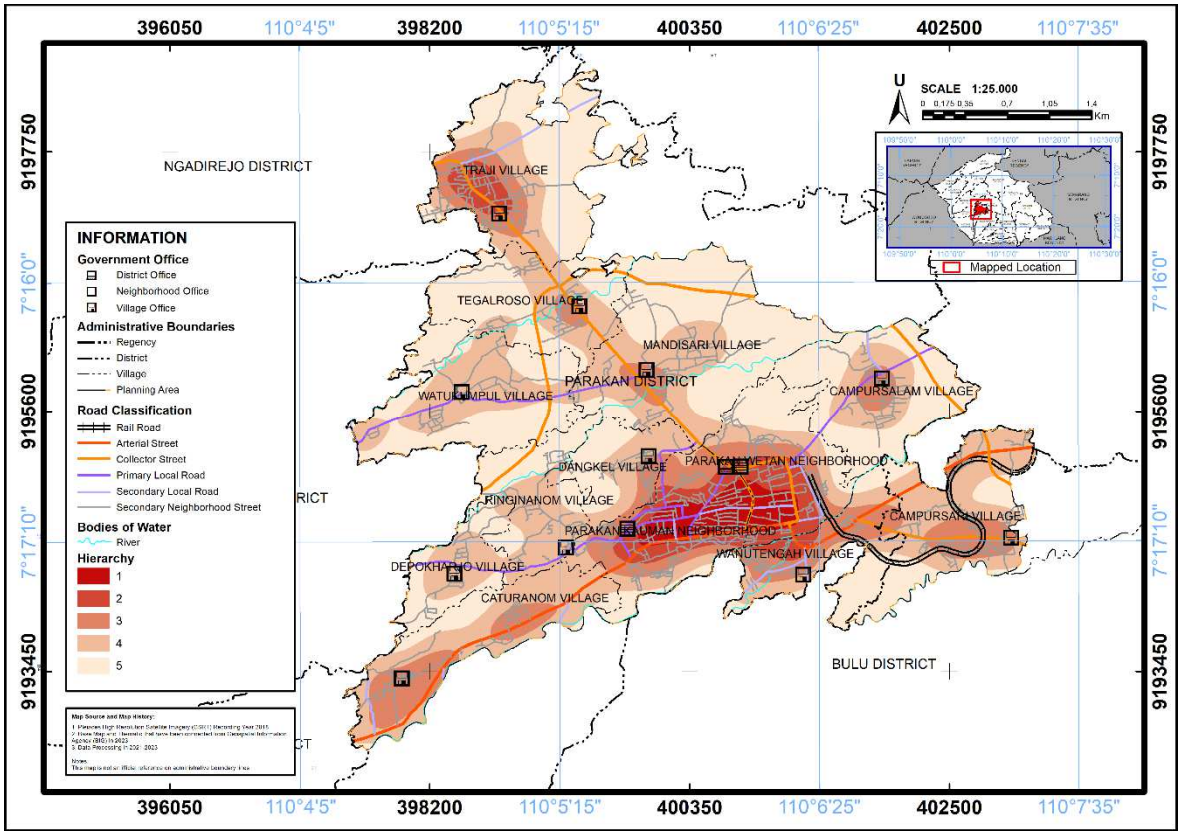

Figure 5. Density Map of Trade and Services in Parakan Urban Area
Source : 2024 Compiler

The density of trade and services can be a measure of the location or area as a point or center of the crowd. The trade and service center is a location that can serve the various needs of the community which is located in a central location (Kapiarsa et al., 2022). In the Parakan Urban Area, the location of the trade and service center is at Pasar Legi Parakan or other shopping centers that can serve community activities. The map above shows the Hierarchy value which has different meanings, Hierarchy value 1 illustrates the high density of trade and services. Based on the results of the analysis, the intervals of each Hierarchy are as follows.

Table 3. Hierarchy based on Density of Trade and Services of Parakan Urban Area

Hierarchy	Score	Neighborhood/ Village
I	5	Parakan Kauman
II	4	Parakan Wetan

Hierarchy	Score	Neighborhood/ Village
III	3	Wanutengah, Traji, Caturanom, Mandisari, Ringinanom
IV	2	Dangkel, Campursalam, Watukumpul
V	1	Campursari, Tegalroso, Depokharjo

Source : 2024 Compiler

D. Building Density

The building density analysis was carried out to obtain an overview of the level of service of a villaged seen from the presence of a building facility or built-up area in the Urban Area. This building density is obtained from the results of building locations represented as points in the Parakan Urban Area. Building density is the number of buildings in an area based on the type of building, if the concentration of buildings is denser, it will indicate greater activity and service needs in the area (Setyono et al., 2019). Then, this analysis is carried out by the kernel density method on the building point data in order to produce building density contours with several classifications. The map presents different values to describe the level of building density, ranging from density values 1 to 5. The following is a map of the building density of the Parakan Urban Area.

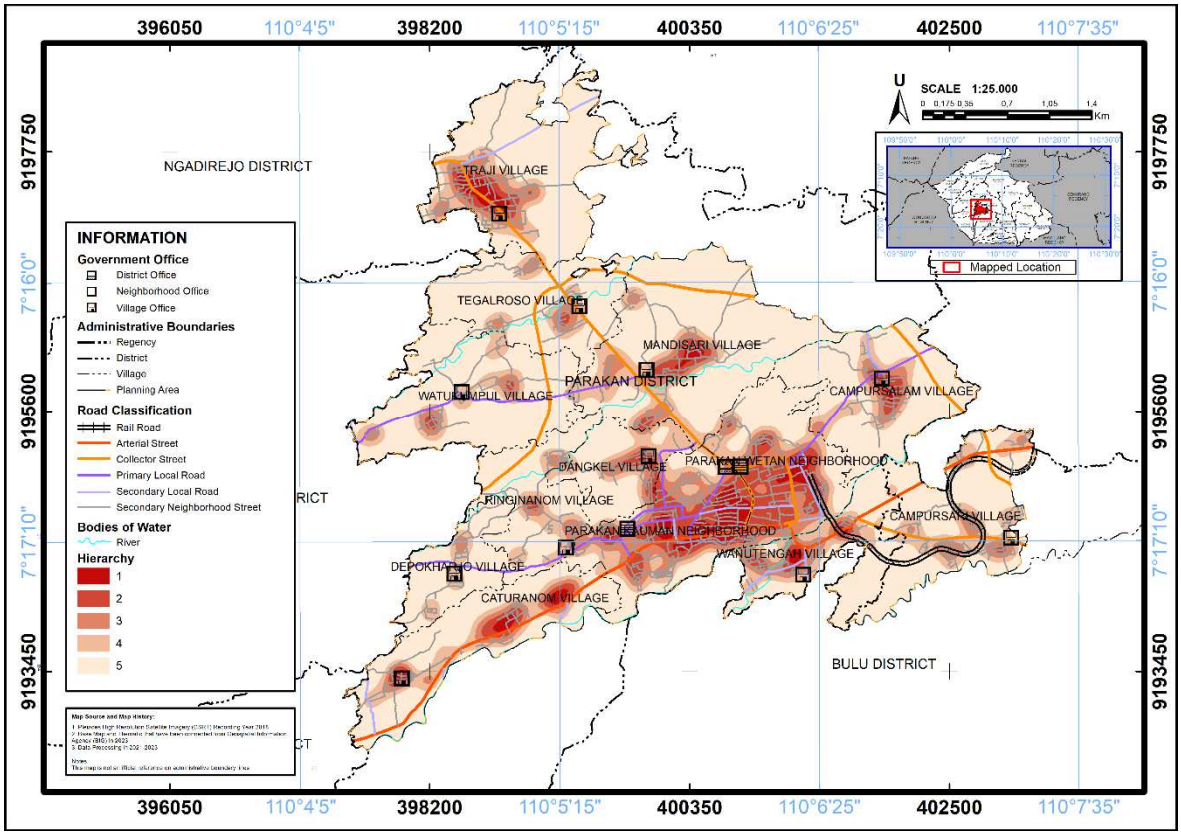

Figure 6. Building Density Map of Parakan Urban Area
Source : 2024 Compiler

On the map above shows several colors, the red color illustrates that the area has a density value of 1 which means the highest density. While the density that has a value of 5 describes an area with low density. Based on the results of the analysis, the intervals of each Hierarchy are as follows.

Table 4. Hierarchy based on Building Density of Parakan Urban Area

Hierarchy	Score	Neighborhood/ Village
I	5	Parakan Kauman, Parakan Wetan
II	4	Wanutengah, Traji, Caturanom
III	3	Mandisari, Campursalam,
IV	2	Campursari, Tegalrejo, Dangkel, Ringinanom, Watukumpul
V	1	Depokharjo

Source : 2024 Compiler

E. Parakan Urban Area Service Center Plan

Based on the calculation of the analysis of facility density, road density, building density, and trade and service density using the kernel density method to obtain the density level of each variable, calculations can be made to determine the service center in the Parakan Urban Area. The following is the calculation of the results of the analysis of service centers based on the Score in the previous analysis.

Table 5. Determination of Service Center of Parakan Urban Area

Neighborhood/ Village	Facility Score	Road Score	Trade and Services Score	Building Score	Amount
Parakan Kauman	5	5	5	5	20
Parakan Wetan	4	5	4	5	18
Traji	3	4	3	4	14
Wanutengah	3	4	3	4	14
Caturanom	3	3	3	4	13
Mandisari	2	3	3	3	11
Campursari	2	3	1	2	8
Tegalroso	2	3	1	2	8
Depokharjo	2	2	1	1	6
Dangkel	2	2	2	2	8
Campursalam	2	3	2	3	10
Ringinanom	2	2	3	2	9
Watukumpul	2	2	2	2	8

Source : 2024 Compiler

The total scoring obtained from each variable, then the determination of service centers is carried out using weighted overlay. The following is a weighted overlay map of the Parakan Urban Area.

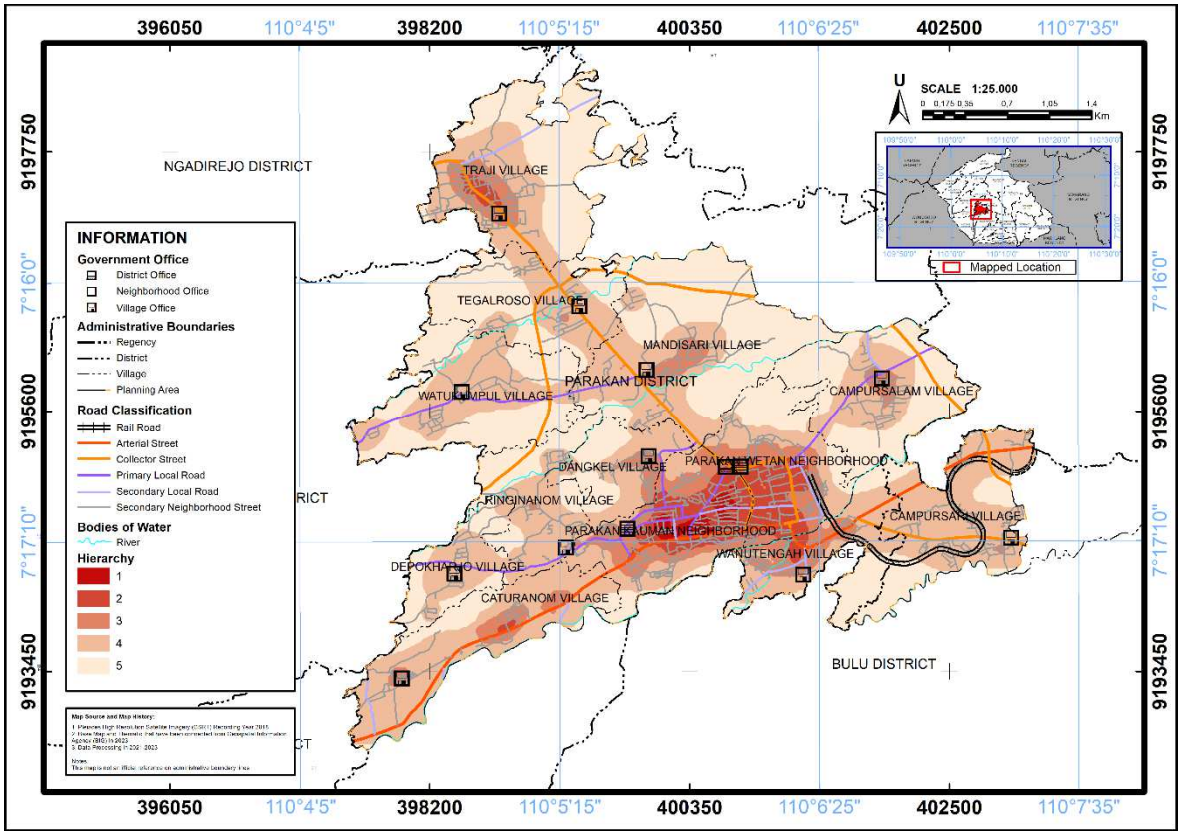

Figure 7. Density Map of Service Center of Parakan Urban Area
Source : 2024 Compiler

Based on the results of the weighted overlay map above, the resulting Hierarchy of service centers can be seen in table 6.

Table 6. Hierarchy of Service Centers of Parakan Urban Area

Hierarchy	Neighborhood/ Village
I	Parakan Kauman
II	Parakan Wetan, Wanutengah, Traji, Caturanom
III	Mandisari, Campursalam
IV	Campursari, Ringinanom, Watukumpul
V	Dangkel, Tegalroso, Depokharjo

Source : 2024 Compiler

The following is a map of the service center of the Parakan Urban Area in accordance with the Hierarchy table of service centers above.

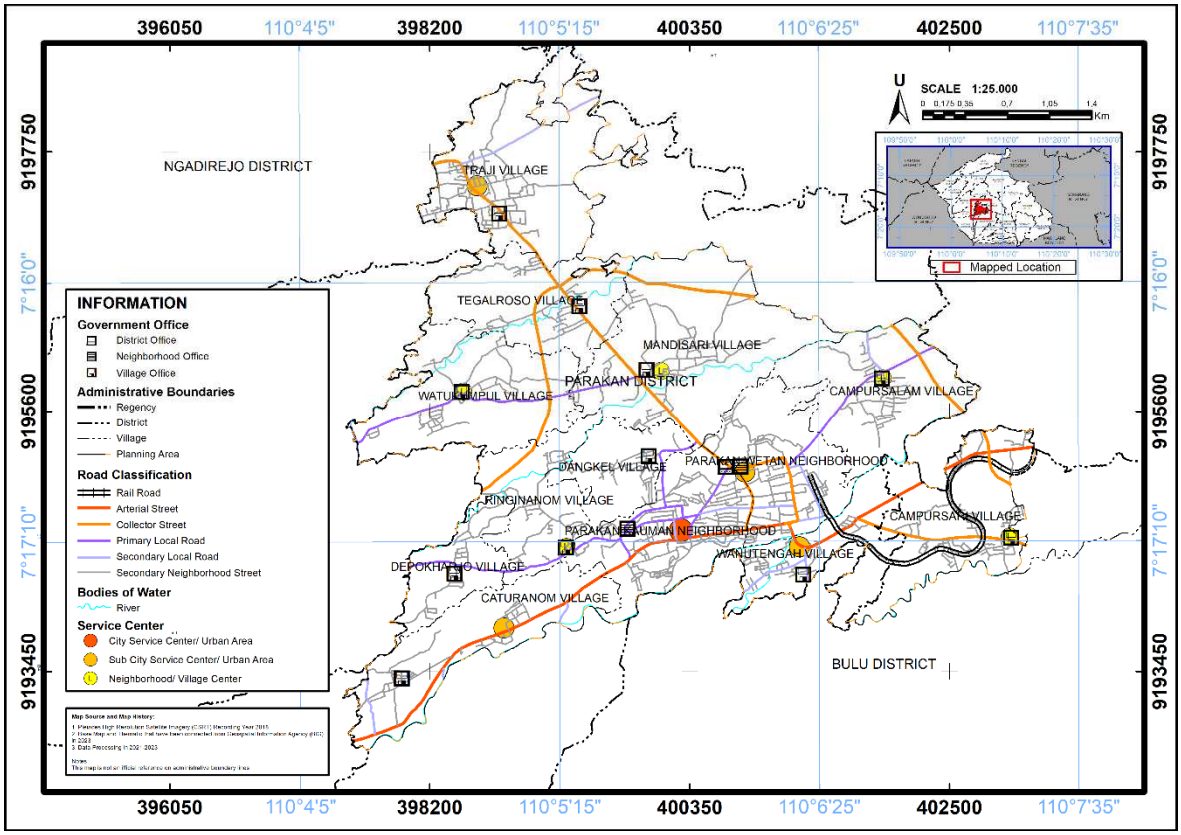

Figure 8. Peta Pusat Pelayanan Kawasan Perkotaan Parakan
Source : 2024 Compiler

The final result shows the direction of the service center of Parakan Urban Area based on community activities or land use as such as a new service center in Traji Village which has the embryo of becoming a trade and service center and a market that can serve the community in the western Parakan Urban Area.

Table 7. Service Center in Parakan Urban Area

Neighborhood/ Village	Service Center	Existing and Forecast Considerations of Regional Development	Service Center Location
Parakan Kauman	City Service Center/Urban Area	The existence of a trade and service center at Pasar Legi Parakan and the government center of Parakan District	Legi Market
Parakan Wetan	City/Urban Area Service Sub Centers	Completeness of facilities and trade and services and high building density	Parakan Wetan Village Office

Neighborhood/ Village	Service Center	Existing and Forecast Considerations of Regional Development	Service Center Location
Traji	City/Urban Area Service Sub Centers	Provincial road access to Ngadirejo sub-district and facilities for the North WP of Parakan Urban Area	Traji Village Office
Wanutengah	City/Urban Area Service Sub Centers	The confluence of National and Provincial Roads and Hospitals with trade and service activities.	Ngesti Waluyo Hospital
Caturanom	City/Urban Area Service Sub Centers	The existence of industrial facilities and national roads towards Wonosobo Regency which can be planned as trade and service activities	Jami' Al-Hidayah Mosque
Mandisari	Sub-district/Village Neighborhood Center	The density of facilities and buildings is quite high and there is a Provincial Road to Ngadirejo Sub-district	Mandisari Village Intersection (Primary Collector Road)
Campursari	Sub-district/Village Neighborhood Center	The density of facilities is rather high and the location is quite far from the City Service Center	Muhammadiyah Hospital Development of people's welfare
Tegalroso	Sub-district/Village Neighborhood Center	There is a provincial road to Bulu sub-district and a hospital	Senior High School 1 Parakan
Depokharjo	Sub-district/Village Neighborhood Center	Existence of Local Roads to Bansari Sub-district and sufficient density of facilities.	Depokharjo Village Office
Dangkel	Sub-district/Village Neighborhood Center	Sufficient density of facilities for a location that is quite far from the City Service Center	Dangkel T-junction (Primary Local Road)
Campursalam	Sub-district/Village Neighborhood Center	The existence of a trade and service center at Pasar Legi Parakan and the government center of Parakan Sub-district	Campursalam Village Office
Ringinanom	Sub-district/Village Neighborhood Center	Completeness of facilities and trade and services and high building density	MIN Ringinanom
Watukumpul	Sub-district/Village Neighborhood Center	Provincial road access to Ngadirejo sub-district and facilities for the North WP of Parakan Urban Area	Watukumpul Village Office

Source : 2024 Compiler

Determination of service centers with the kernel density method has also been carried out in the Pattallassang Urban Area, Gowa Regency, South Sulawesi Province (Hidayat et al., 2022). One of the variables used in the study is the same as this study, namely the point of the facility building, which was processed with Arcgis 10.8 software. Next, weighting and summation between variables were carried out with a low to high value classification. The highest value of building density is the center of the urban area.

However, there are different variables in this study. The Parakan Urban Area uses the addition of road variables, while the Patalassang Urban Area only uses the point of building facilities. This does not reflect how well the building can be accessed by the community (Yu et al., 2015). Road variables are added to support accessibility in the building function area. If the road function is at a high level, it tends to encourage a lot of community activity and mobility, so the addition of road variables is very important to support the formation of activity centers in the area (Fasa & Revayanti, 2021).

4. CONCLUSIONS

The results of the analysis to determine the service center have been carried out by analyzing the density of facilities, road density, trade and service density, and building density to become a density hierarchy. Then perform density analysis using kernel density. Then, density scoring and weighted overlay are carried out to determine the service center of the Parakan Urban Area which becomes three service centers. At the service center of the city/urban area has the potential for trade and service centers and government centers in Parakan Kauman Neighborhood. Then, in the sub service center of the city/urban area has the potential to be developed, namely the completeness of facilities and trade and services, access to provincial roads or the meeting of national and provincial roads, high building density and industrial facilities located in Parakan Wetan Neighborhood, Trajil Village, Wanutengah Village, and Caturanom Village. Meanwhile, the sub-district/village environmental center has the potential for residential areas by looking at the density of facilities and buildings found in Mandisari Village, Campursalam Village, Ringinanom Village, and Watukumpul Village. This study shows the importance of existing variables and analysis that support the determination of service centers in the planning area, taking into

account the dynamics of urban growth. By using the kernel density method, it is possible to identify locations with high activity due to the large number of facilities that support the basic needs of the community and good accessibility. In addition, this method provides a clear visualization of the distribution pattern of facilities and makes it easier to determine areas that are underserved and require attention in the development of service centres. The findings of this research underscore the kernel density method in optimizing data collection through surveying existing facilities with the Avenza Maps tool.

5. REFERENCES

Apriana, M., & Rudiarto, I. (2020). Penentuan Pusat Pelayanan Perkotaan Di Kota Tanjungpinang. *Tunas Geografi*, *9*(1), 1. https://doi.org/10.24114/tgeo.v9i1.17217

Fasa, A. S., & Revayanti, I. (2021). Kajian Penentuan Sistem Pusat Pelayanan Kawasan Perkotaan di Kecamatan Jatinangor. *Geoplanart*, *3*(2), 85. https://doi.org/10.35138/gp.v3i2.347

Fithra, H. (2017). *Konektivitas Jaringan Jalan Dalam Pengembangan Wilayah Di Zona Utara Aceh*. http://repository.unimal.ac.id/3412/1/Buku Konektivitas Jaringan Jalan.pdf

Fitriansyah, H., & Zulkia, D. R. (2023). Penentuan Sistem Pusat Pelayanan Perkotaan Berdasarkan Data Point of Interest di Kota Pangkalpinang. *Journal of Education, Humaniora and Social Sciences (JEHSS)*, *6*(2), 853–862. https://doi.org/10.34007/jehss.v6i2.1951

Gao, S., Janowicz, K., & Couclelis, H. (2017). Extracting urban functional regions from points of interest and human activities on location-based social networks. *Transactions in GIS*, *21*(3), 446–467. https://doi.org/10.1111/tgis.12289

Government. (2007). *The Law of Spatial Planning No 26 of 2007*.

Hidayat, A., Hijriah;, & Setiowati, N. O. (2022). Penentuan Pusat Pelayanan Perkotaan Patalassang, Kabupaten Takalar. *Compact : Spatial Development Journal*, *1*(2), 42–52. https://doi.org/10.35718/compact.v1i2.793

Ikhwan, H. (2010). Struktur Ruang dan Isu Keberlanjutan Perkotaan di Jabodetabek. *Perencanaan Pembangunan*, 14–21.

Kapiarsa, A. B., Silitonga, T., Afrianita, Y., Yasin Ramadhan, M. T., & Kurnia Novianty, S. (2022). Kajian Teori Lokasi Christaller Terhadap Jaringan Pelayanan Sarana Perdagangan Di Pulau Karimun Besar. *Jurnal Pelita Kota*, *3*(1), 150–160. https://doi.org/10.51742/pelita.v3i1.469

Lathifah, D., & Aulia, F. (2024). *Identifikasi Perkembangan Struktur Polisentris Perkotaan Medan Identification of Polycentric Structure Development in Medan Urban Area*. *8*, 122–132.

Nanda, C. A., Nugraha, A. L., & Firdaus, H. S. (2019). Analisis Tingkat Daerah Rawan Kriminalitas Menggunakan Metode Kernel Density Di WiSilverman, B. W. (2018). Density estimation for statistics and data analysis. Routledge.layah Hukum Polrestabes

Kota Semarang. *Jurnal Geodesi Undip*, *8*(4), 50–58.

Patrik, L. R., Rotinsulu, W. C., & Jocom, S. G. (2021). Analisis Hirarki Pusat Pelayanan Perkotaan Di Kota Bitung. *Jurnal Agri-SosioEkonomi*, *Volume 17*(Nomor 1), Pages 541-548. https://ejournal.unsrat.ac.id/index.php/jisep/article/view/35413/33127

Rumengan, C. R. M., Kindangen, I. J., & Takumansang, D. E. (2019). Analisis Ketersediaan dan Kebutuhan Fasilitas Sosial Di Kota Kotamobagu. *Jurnal Spasial*, *6*(2), 375–387.

Setyono, D., Hariyani, S., & Haryani, B. (2019). Identifikasi Bentuk Struktur Ruang Kota Batuidentifikasi Bentuk Struktur Ruang Kota Batu. *Tata Kota Dan Daerah*, *11*(2), 85–92. https://doi.org/10.21776/ub.takoda.2019.011.02.5

Surya, B. (2015). The dynamics of spatial structure and spatial pattern changes at the fringe area of Makassar city. *Indonesian Journal of Geography*, *47*(1), 11–19. https://doi.org/10.22146/ijg.6926

Wang, J., Gao, C., Wang, M., & Zhang, Y. (2023). Identification of Urban Functional Areas and Urban Spatial Structure Analysis by Fusing Multi-Source Data Features: A Case Study of Zhengzhou, China. *Sustainability (Switzerland)*, *15*(8). https://doi.org/10.3390/su15086505

Yesiana, R., Septiarani, B., Astuti, K. D., Anggraini, P., Pardcipta, J. S., Pradana, G. A., & Pandie, A. R. (2023). Strengthening City Branding Through Investment in Ambarawa Urban Area, Semarang Regency. *IOP Conference Series: Earth and Environmental Science*, *1264*(1). https://doi.org/10.1088/1755-1315/1264/1/012006

Yu, W., Ai, T., & Shao, S. (2015). The analysis and delimitation of Central Business District using network kernel density estimation. *Journal of Transport Geography*, *45*(May 2015), 32–47. https://doi.org/10.1016/j.jtrangeo.2015.04.008