



Study of Spatial Pattern Distribution of Traditional Markets to Modern Markets in Surakarta City

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Abstract. Population growth will encourage the development of economic development in a region. The trade sector, which continues to develop with the growth of trading facilities in traditional and modern markets, will create a pattern of distribution of trading points. Surakarta has 44 traditional markets and 88 modern markets as trading facilities. The market locations are spread across five districts. This study examines the spatial distribution pattern of traditional markets to modern markets in Surakarta City, using the Average Nearest Neighbor (ANN) analysis method with the help of ArcMap 10.8 software as a data processing tool. The results obtained in this study are that the pattern of distribution of traditional markets throughout Surakarta was included in the random pattern category, with a value of Nearest Neighbor Ratio = 1.020146. Meanwhile, the distribution pattern of the modern market was included in the clustered pattern category, with the Nearest Neighbor Ratio = 0.789121. Banjarsari sub-district was the area with the most trading facilities. The highest population and total area among other sub-districts in Surakarta City drove this.

Keywords: Population · Traditional and Modern Markets · ANN · Spatial patterns

1 Introduction

The population is the most important aspect of the subject of development. However, a growing population will encourage the movement of economic development in a region. The need for ever-increasing demand will accelerate the pace of trade. This condition will trigger new trading facilities, such as traditional and modern markets (Kusuma & Arifien, 2015). A city is a center of development or civilization regarding socio-economic and physical dynamics. The city's development is a sectoral field that the government carries out by involving the community in planning and implementing sustainable development policies (Amin, 2001). The city will experience development due to population growth, which drives massive changes in urban physical development to support community activities and needs. Hairudi (2008) stated that development is inseparable from growth, meaning that regional development can impact physical and non-physical changes (Saleh et al., 2019).

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Table 1. BPS-statistics of Surakarta municipality 2022

No	Districts	2020 (population)	2021 (population)
1	Laweyan	88,524	88,578
2	Serengan	47,778	47,853
3	Pasar Kliwon	78,517	78,565
4	Jebres	138,775	138,859
5	Banjarsari	168,770	168,873
	Total	522,364	522,728

Table 1 shows that the population of Surakarta City in 2020 was 522,364 people. Then in 2021, it increased to 522,728 people. It is one aspect driving the region's growth and development rate. Surakarta is one of the cities in Central Java Province which plays a role as a support center for economic activity in the Greater Solo area, which includes various regencies, including Boyolali, Klaten, Sukoharjo, Wonogiri, Karanganyar, and Sragen. Surakarta is also located in Central Java Province's golden triangle, which is connected and integrated or often nicknamed Joglosemar (Jogjakarta, Solo, and Semarang).

Apart from supporting the economy, Surakarta is also a city that has an important role in the Greater Solo area in the development of the surrounding area, namely as a center for trade, services, business, education, industry, culture, and tourism. Gross Regional Domestic Income (GRDP) is the total gross added value generated by all business units in a certain area or is the total value of goods and services obtained from the total value of goods and services (Novitasari, 2015). Table 2 shows the data (PDRB) of Surakarta City for the last three years.

Data from the Gross Regional Domestic Product (GDP) for the City of Surakarta over three years showed fluctuations in various fields. Several sectors became the backbone of the highest GRDP contributor, namely the construction sector, with a magnitude of 27.04%, followed by the trade sector as the second largest contributor, with 21.63% in 2020. However, the trend of the economic structure experienced various fluctuations in various sectors caused by various factors. These two sectors are still the backbone of the largest GRDP contributors in Surakarta City. Then one of the sectors with the lowest income level is the agricultural/forestry/fishery sector contributing 0.51%. Other sectors, such as the transportation sector, are only 1.03% in 2020. The manufacturing industry sector is 8.45%, electricity and gas is 0.20%, accommodation and food providers are 4.58%, communication and information is 14.54%, real estate is 3.97%, and government administration is 5.39%. Other services contributed to the PDRB of Surakarta City by 12.66%, including environmental, financial, education, and health services in 2020. Even though the trade sector is the second contributor to GRDP after construction, growth values fluctuate yearly. Surakarta City is the epicenter supporting economic growth in the Greater Solo area.

Supporting trading activities as an engine of economic growth can be done by increasing and building supporting facilities and infrastructure. Integrated markets and shopping

Table 2. BPS-statistics of Surakarta municipality year 2018–2020

No.	Sector Name	2018	2019	2020
1	Agriculture, Forestry, and Fisheries	0.49	0.49	0.51
2	Processing Industry	8.45	8.46	8.45
3	Procurement of Electricity and Gas	0.20	0.20	0.20
4	Construction	27.14	27.11	27.04
5	Wholesale and Retail Trade	22.15	22.16	21.63
6	Transportation	2.55	2.59	1.03
7	Accommodation and food providers	5.49	5.41	4.58
8	Information and Communication	11.67	12.01	14.54
9	Real Estat	3.96	3.85	3.97
10	Government Administration	5.54	5.40	5.39
11	Environmental Services, Finance, Corporate, Education, Health, and Other Services	12.36	12.34	12.66
Total		100	100	100

centers can encourage faster economic growth and turnover in the trade sector (Trihuwana & Farhan, 2020). It is in line with the massive growth of traditional and modern markets. At this time, the number of traditional markets and modern markets (supermarkets) in Surakarta has increased. Of course, it is a breath of fresh air that can move the wheels of the economy in Surakarta, of course, taking into account the growth rate and location of the new shopping center without suppressing the development of existing modern markets following regional spatial plans (Field & Jeffcott, 1989).

According to the Regulation of the Minister of Trade Number 23 of 2021 concerning Guidelines for the Development, Arrangement, and Development of Shopping Centers and Modern and Supermarket Stores, traditional markets are markets whose development and management systems are held by the government, regional governments, the private sector, State-Owned Enterprises (BUMN), and Regional Owned Enterprises (BUMD), including working with the private sector in the form of booth shops, kiosks, and tents managed by cooperatives or communities with small businesses where bargaining occurs when buying and selling goods. Modern market shopping centers include minimarkets, supermarkets, hypermarkets, department stores, and wholesale centers with self-service systems (self-service) that sell goods on a retail or wholesale basis (Indrasari Wisnu Wardhana, 2022). The market is an inseparable element as a means of supporting the needs of the Indonesian people. The market has an important role in supporting the development and pace of the economy in a region. Developing markets are dynamic following the level of development of the times through trade facilities to the facilities provided, so today's modern markets are born (Eka Indriya Setyawan, Bhimo Rizky Samudro, 2015).

Traditional and modern markets in Surakarta City are found in various areas, which are the locations of trade centers. Several aspects can distinguish between traditional

Table 3. BPS-statistics of surakarta municipality year 2021

No.	Facility Type	2018	2019	2020
1	Traditional Market	44	44	44
2	Modern Market	84	84	88
Total		128	128	132

and modern markets, among others, regarding the goods being traded and the target buyers or consumers (Safiullin et al., 2012). Modern markets are managed with modern management, generally found in urban areas, as providers of goods and services with good service quality to consumers, generally the upper middle class (Sarwoko, n.d.). Traditional markets have broad and varied target consumers from the upper to lower levels of the economy. In contrast, the modern market is more aimed at consumers with middle to upper economic strata. However, both types of markets have their respective roles and complement each other according to consumer needs (Setyawardman, 2009). Table 3 is data on the number of trading facilities in Surakarta.

Data on trading facilities in Surakarta City including traditional markets and modern markets above shows that traditional markets tends to remain the same for a period of three years with a total of 44 traditional markets, while modern markets have increased to 88 markets in Surakarta City in 2020 Referring to the Regulation of the Minister of Trade of the Republic of Indonesia Number 53/M-DAG/PER/12/2008 concerning the Establishment of Traditional Markets, Shopping Centers and Modern Shops states that the selection of locations for the establishment of traditional markets, shopping centers and modern shops must refer to the Detailed Plan Regency/city spatial planning and the establishment of traditional markets and modern shopping centers must comply with the requirements of laws and regulations and conduct an analysis of the socio-economic conditions of the community, traditional markets, and micro, small and medium enterprises (MSMEs) located in the area concerned.

Public facilities and infrastructure is a place that functions for community activities related to social, economic, and cultural aspects (Purnomo & Wulandari, 2017). Traditional markets and modern markets in Surakarta City in its development have been regulated following the Regency/City Detailed Spatial Plan of the total 44 traditional markets and 88 modern markets spread throughout the Surakarta area, which consists of five sub-districts, including Laweyan, Banjarsari, Serengan, Pasar Kliwon, and Jebres sub-districts. The basis for research on the pattern of distribution of traditional and modern markets is to find out about patterns and distribution of markets. The location of traditional markets and modern markets will be able to influence each other if their development and development are not controlled. Paying less attention to a location will affect the stability of the economic conditions of the surrounding traditional markets. In addition, it can disrupt the Surakarta City spatial plan if it does not follow the location of the area's functions, so analysis is needed regarding the distribution of the locations of traditional shopping centers and modern markets in Surakarta City (Saputra & Jumadi, 2022).

The application of information and communication technology in conducting a study or scientific research must be made to facilitate and support efforts to present accurate information (Putridinanti, 2021). A spatial pattern is related to the placement of objects or the arrangement of appearance objects on the surface of the earth. Each change in the spatial pattern will illustrate the spatial process shown by environmental or cultural factors. In other words, spatial patterns result from the physical or social forms of an area on the earth's surface (Sekitar & Sungai, 2022).

Along with advances in information technology, systems have developed that are capable of performing spatial analysis in the field of geography. Geographic Information System (GIS) can connect many data using certain points, analyze, and can display map visualization where the data used is spatial data that has a coordinate system so that it can find out related locations, trends, pattern shapes, and spatial modeling. Therefore, GIS is a part of a Decision Support System (DSS) or Decision-Making System, a computer-based information system that functions as a decision-support system. This system is based on interactive software that collects or compiles much information to solve a problem (Perbawati et al., 2021).

GIS is a computer-based information system used digitally to describe and analyze geographic features depicted on the earth's surface (Kusta & Wilayah, 2017). In addition, GIS is called a computer system with the ability to protect the information in the field to access data, and process data, including data storage, management, and analysis, with the final result that can be used as spatial data information. Image interpretation techniques can help determine the location of an object that does not require researchers to be present in the field (Giarno et al., 2018).

GIS software can be used to carry out distribution analysis and spatial visualization of the distribution of traditional markets and modern markets in Surakarta City, one of which is related to distribution. The association of location points in an area will form the distribution pattern of traditional markets and modern markets in Surakarta City so that the distribution pattern can be determined according to the type of pattern consisting of uniform, random, or cluster patterns. From the background above, this study aims to examine the distribution of spatial patterns of traditional markets to modern markets in Surakarta City.

2 Method

The research location for the Surakarta City area is geographically between $110^{\circ}45'15''$ – $110^{\circ}45'35''$ E and $7^{\circ}36'00''$ – $7^{\circ}56'00''$ South Latitude covering five districts consisting of Banjarsari District, Pasar Kliwon Sub-district, Jebres Sub-district, Laweyan Sub-district, and Serengan Sub-district which has a total area of 44.04 km^2 (Supangat, 2012). Figure 1 is a map of the research location for Surakarta, located in Central Java Province, Indonesia.

In this research, the method used to obtain secondary data was by utilizing image interpretation techniques, tracking the location of modern markets and traditional markets through the appearance of Google Earth satellite imagery to obtain coordinates for locations and take the location of the point according to the object so that it has a high degree of accuracy. Image interpretation is an activity of studying aerial photographs

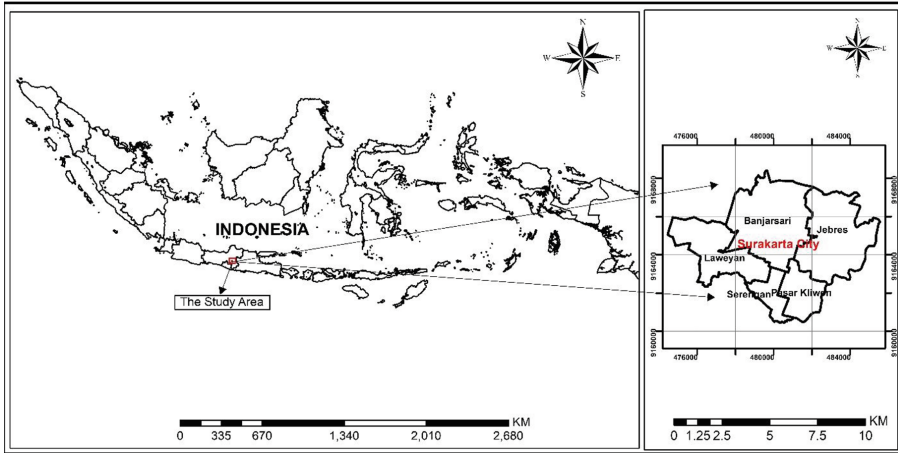


Fig. 1. Map of research locations in Surakarta City

or satellite imagery to identify the appearance of objects and assess their importance of these objects (Handayani & Setiyadi, 2003). Figures 2 and 3 shows visualization of taking coordinates and validation techniques using Google Earth.

Other supporting data is from agency publications by the Surakarta City Trade Office and the Surakarta City Statistics Center, which provide data on the number of traditional and modern markets. Studies obtain information and SHP (shapefile) data on administrative boundaries as material for spatial visualization maps through literature. The data analysis technique used in this study was a GIS spatial analysis technique with ArcMap 10.8 software through the Average Nearest Neighbor (ANN) tool, which is a geoprocessing tool in ArcGIS software, used to calculate the average index of nearest



Fig. 2. Visualization of retrieval of coordinate points

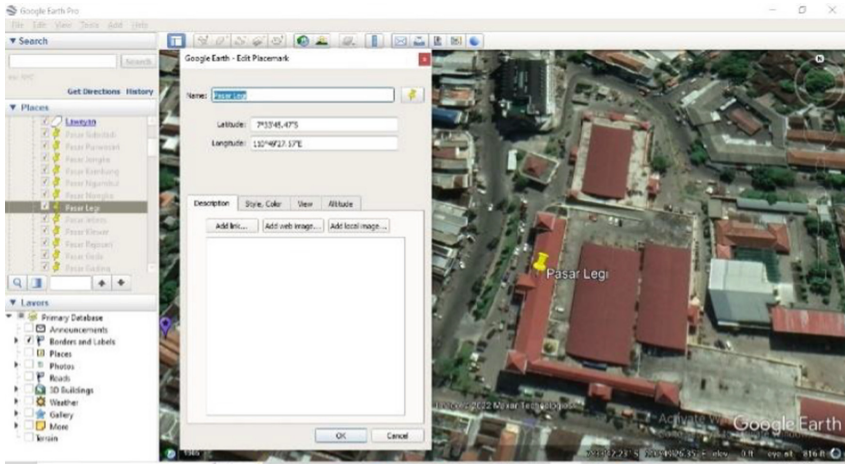


Fig. 3. Visualization of validation techniques

neighbors. ANN is used to determine the pattern of distribution of traditional and modern markets in Surakarta City according to the results of the spatial pattern classification shown (Perspektif et al., n.d.).

There are three distribution pattern classifications, including clustered, random, and dispersed, which will be indicated by the magnitude of the ANN index value. The ANN index value is the result of calculating the closest neighbor distribution index or the results of the Average Nearest Neighbor (ANN) analysis. The information on ArcGis includes the observed average distance, expected average distance, nearest neighbor index, z-score, and the P-value. If the ANN index value (nearest neighbor) < 0.7, then the pattern is clustered, whereas if the ANN index value is > 0.7 and T < 1.4, then the pattern is random, and if the ANN index value is > 1.4, then the pattern is uniform (Nugraha, 2013). Figure 4 shows in continuum.

Calculation of the nearest neighbor or ANN spatial pattern analysis value to obtain the ANN index value using a cartographic automation system using ArcMap 10.8 software, so this method is possible to find out and determine the pattern of distribution of

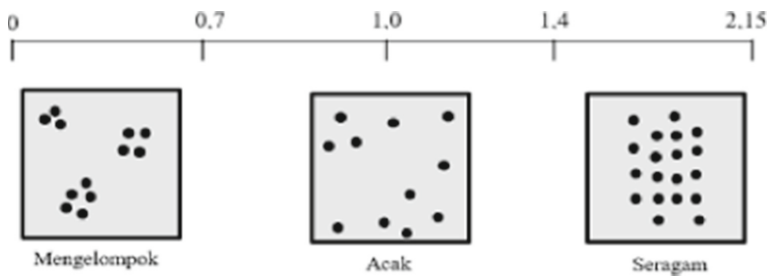


Fig. 4. Continuum nilai nearest neighbour statistic t

traditional markets and modern markets with the results displayed on ANN classification charts (Sutarga, 2022).

3 Results and Discussion

3.1 Data on Point Locations and Distribution Patterns of Traditional Markets in Surakarta City

From the data collected through the Surakarta City Trade Office, the number of traditional markets is 44, according to the number of coordinate location points obtained. Table 4 is the coordinate point data for distributing traditional markets in five sub-districts in Surakarta City.

A market is a place of interaction between sellers and buyers to meet people's needs. Traditional markets are also called centers of economic and trade circulation. Figure 5 shows the distribution of traditional markets in Surakarta. Based on the location indicated by the location of the coordinates, the number of traditional markets spread is 44. Several traditional market categories are based on their classification, including IA, IB, IIA, IIB, IIIA, and IIIB.

Based on the market classification in Surakarta City, the list of traditional markets includes IA consisting of Legi Market, Nusukan Market, and Klewer Market, which are markets with the highest classification of trading activity from morning to night. Klewer Market is a trading center that sells only one type of goods, such as cloth and batik, the largest in Surakarta City. Traditional market classification IIIB or the lowest category includes Penggungharjo Market, Ngarsopuro Market, Jurug Market, Ngumbul Market, Joglo Market, and Old Iron Market, whose trading activities only start in the morning until noon, while the Old Iron Market trades until the afternoon. Based on the classification, there are 3 markets in the class IA category, 2 IB markets, 4 IIA markets, 24 IIB markets, 5 IIIA markets, and 6 category IIIB markets, with 44 traditional markets. The distribution of locations for traditional markets in Surakarta City covers five sub-districts: Jebres, Serengan, Kliwon Market, Laweyan, and Banjarsari. The largest number of traditional markets is in Banjarsari Sub-district. Since Banjarsari is the largest sub-district in Surakarta City, the location adjustments and the existence of traditional market trading places can easily be accessed by the community to meet their needs. Figure 6 shows the distribution pattern of traditional markets in Surakarta City.

The visualization of the pattern of distribution of traditional markets in Surakarta City used the nearest neighbor analysis technique or Average Nearest Neighbor (ANN). These results showed that the value obtained from the Nearest Neighbor Ratio = 1.020146, meaning that the value is > 0.7 and < 1.4 , so the classification goes into a random pattern. By obtaining the z-Score standard deviation value = 0.255 and the P-Value probability value = 0.798, the results of the observed mean distance or the observed average value are 510.10 m. The exposed mean distance is the expected average distance of 500.03 m. Hence, the hypothesis shows that the pattern of distribution of traditional markets in Surakarta City is included in the random category (random).

These results are similar to previous researchers (Arisca & Agustini, 2020) that the distribution pattern of high school and vocational schools in Ogan Komerin Ulu, Ogan Ilir, Penukal Abad Lematang Ilir, and Prabumulih districts uses the ANN method. Based

Table 4. Data point location coordinates of traditional markets and their classification

Traditional market	Longitude	Latitude	Type
Pasar Legi	110°49'27.57"E	7°33'45.47"S	IA
Pasar Nusukan	110°49'15.63"E	7°32'48.82"S	IA
Pasar Notoharjo	110°50'1.47"E	7°35'22.66"S	IIIA
Pasar Mojosongo	110°50'19.95"E	7°33'11.95"S	IIB
Pasar Kembang	110°48'59.25"E	7°34'20.93"S	IIB
Pasar Sidodadi	110°46'46.69"E	7°33'26.32"S	IIB
Pasar Gading	110°49'34.70"E	7°35'1.16"S	IIIA
Pasar Ngarsopuro	110°49'19.22"E	7°34'5.17"S	IIIB
Pasar Pangungrejo	110°51'18.77"E	7°33'16.56"S	IIIB
Pasar Triwindu	110°49'20.94"E	7°34'9.02"S	IIB
Pasar Pucangawit	110°51'6.67"E	7°34'4.64"S	IIB
Pasar Ayu Balapan	110°49'21.39"E	7°33'26.15"S	IIB
Pasar Depok	110°48'38.88"E	7°33'9.59"S	IIB
Pasar Nongko	110°48'52.99"E	7°33'30.20"S	IIB
Pasar Kliwon	110°50'10.89"E	7°35'15.15"S	IIB
Pasar Elpabes	110°49'29.63"E	7°33'31.75"S	IIB
Pasar Gilingan	110°49'21.33"E	7°33'10.16"S	IIA
Pasar Ngemplak	110°49'46.55"E	7°33'15.58"S	IIIA
Pasar Hardjodaksino	110°49'13.19"E	7°35'2.30"S	IB
Pasar Ayam	110°50'6.15"E	7°35'18.30"S	IIB
Pasar Bangunharjo	110°48'9.44"E	7°33'30.58"S	IIIA
Pasar Rakyat Tanggul	110°50'27.55"E	7°34'17.06"S	IIB
Pasar Klewer	110°49'35.59"E	7°34'31.16"S	IA
Pasar Sibela	110°50'43.59"E	7°32'9.76"S	IIB
Pasar Rejosari	110°50'17.59"E	7°33'47.93"S	IIA
Pasar Sangkrah	110°50'22.75"E	7°34'36.66"S	IIIA
Pasar Kadipolo	110°48'55.43"E	7°34'21.51"S	IIA
Pasar Jebres	110°50'21.23"E	7°33'45.47"S	IIB
Pasar Purwosari	110°47'49.59"E	7°33'46.44"S	IIB
Pasar Singosaren	110°49'14.13"E	7°34'23.23"S	IIB
Pasar Gede	110°49'53.90"E	7°34'9.73"S	IB
Pasar Kabangan	110°48'59.25"E	7°34'20.93"S	IIB

(continued)

Table 4. (continued)

Traditional market	Longitude	Latitude	Type
Pasar Penumping	110°48'24.74"E	7°34'11.16"S	IIB
Pasar Cinderamata	110°49'47.56"E	7°34'31.31"S	IIB
Pasar Buah Jurug	110°51'30.24"E	7°33'46.70"S	IIIB
Pasar Jongke	110°47'21.52"E	7°34'3.35"S	IIB
Pasar Ledoksari	110°50'11.83"E	7°33'41.92"S	IIA
Pasar Mebel	110°49'58.43"E	7°33'24.14"S	IIB
Pasar Tunggulsari	110°50'19.90"E	7°34'47.21"S	IIB
Pasar Sidomulyo	110°49'25.10"E	7°33'18.62"S	IIB
Pasar Ngumbul	110°48'37.66"E	7°33'17.63"S	IIIB
Pasar Joglo	110°49'14.58"E	7°32'22.52"S	IIIB
Pasar Bambu	110°49'33.10"E	7°34'38.22"S	IIB
Pasar Besi Tua	110°50'7.75"E	7°35'20.19"S	IIIB

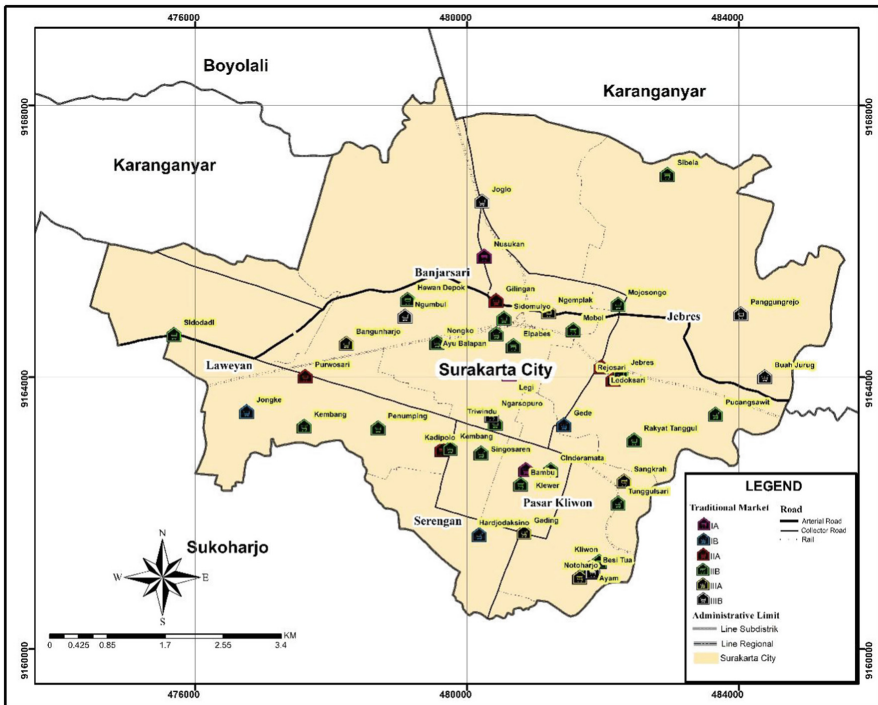


Fig. 5. Map of distribution of traditional markets in Surakarta City

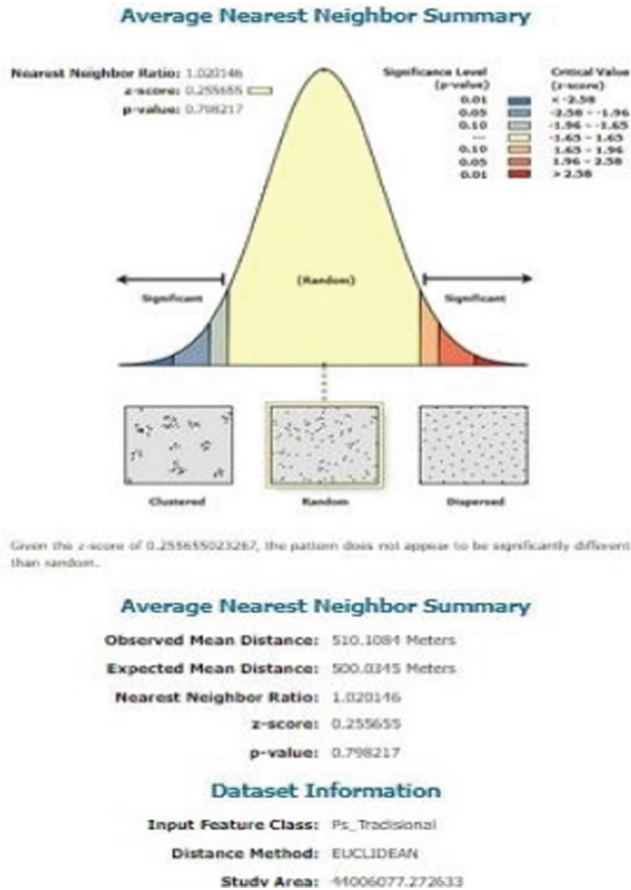


Fig. 6. Results of traditional market distribution patterns in Surakarta

on the Average Nearest Neighbor (ANN) analysis using the ArcGis 10.3.1 application, the distribution of high school schools in Prabumulih obtained the Nearest Neighbor Ratio of 0.957172 with an average distance (Expected Mean Distance) of 2650.7860 m and a Z-score of -0.317324. The distribution of high school-level schools in Prabumulih is random. The results of these calculations refer to Bintarto and Surastopo Hadisumarno (1978) if the distribution pattern is random (random), if the distance between one location and another is irregular, with an index value of 1 (one). The distribution pattern is random or random if the Nearest Neighbor ratio (T) = 1 or the T value is close to 1.

3.2 Data on Point Locations and Distribution Patterns of Modern Markets in Surakarta City

Table 5 shows the Data of modern market coordinate location points and their classification.

Table 5. Data of modern market coordinate location points and their classification

Modern market	Longitude	Latitude	Type
Indomaret	110°46'10.99"E	7°32'59.15"S	Minimarket
Indomaret	110°49'11.54"E	7°33'44.15"S	Minimarket
Indomaret	110°49'16.24"E	7°33'25.50"S	Minimarket
Indomaret	110°50'13.93"E	7°32'11.98"S	Minimarket
Indomaret	110°50'26.54"E	7°32'13.11"S	Minimarket
Indomaret	110°51'47.52"E	7°33'7.26"S	Minimarket
Indomaret	110°50'38.94"E	7°33'32.23"S	Minimarket
Indomaret	110°50'35.11"E	7°33'55.92"S	Minimarket
Indomaret	110°50'21.25"E	7°34'6.02"S	Minimarket
Indomaret	110°47'5.80"E	7°33'31.11"S	Minimarket
Indomaret	110°47'31.03"E	7°33'45.73"S	Minimarket
Indomaret	110°47'40.33"E	7°33'53.42"S	Minimarket
Indomaret	110°48'7.57"E	7°33'50.05"S	Minimarket
Indomaret	110°48'14.67"E	7°32'52.85"S	Minimarket
Indomaret	110°48'45.93"E	7°33'11.52"S	Minimarket
Indomaret	110°49'7.62"E	7°34'53.39"S	Minimarket
Indomaret	110°47'32.91"E	7°33'6.53"S	Minimarket
Indomaret	110°47'11.84"E	7°33'21.94"S	Minimarket
Indomaret	110°47'8.49"E	7°34'4.12"S	Minimarket
Indomaret	110°48'35.93"E	7°32'40.79"S	Minimarket
Indomaret	110°48'54.58"E	7°32'32.00"S	Minimarket
Indomaret	110°49'13.18"E	7°32'38.85"S	Minimarket
Indomaret	110°49'47.50"E	7°33'1.19"S	Minimarket
Indomaret	110°49'4.42"E	7°33'53.06"S	Minimarket
Indomaret	110°49'2.03"E	7°33'58.41"S	Minimarket
Indomaret	110°49'50.75"E	7°34'48.58"S	Minimarket
Indomaret	110°50'2.44"E	7°35'11.41"S	Minimarket
Indomaret	110°49'28.83"E	7°35'13.71"S	Minimarket
Indomaret	110°46'10.99"E	7°32'59.15"S	Minimarket
Alfamart	110°47'45.87"E	7°33'43.86"S	Minimarket
Alfamart	110°46'11.44"E	7°32'57.85"S	Minimarket
Alfamart	110°47'49.46"E	7°33'36.27"S	Minimarket

(continued)

Table 5. (continued)

Modern market	Longitude	Latitude	Type
Alfamart	110°48'43.28"E	7°33'14.45"S	Minimarket
Alfamart	110°49'10.21"E	7°32'27.04"S	Minimarket
Alfamart	110°49'16.53"E	7°33'29.73"S	Minimarket
Alfamart	110°50'48.76"E	7°32'4.34"S	Minimarket
Alfamart	110°50'18.71"E	7°33'23.36"S	Minimarket
Alfamart	110°50'34.39"E	7°33'56.45"S	Minimarket
Alfamart	110°48'56.49"E	7°35'10.52"S	Minimarket
Alfamart	110°48'13.68"E	7°32'55.12"S	Minimarket
Alfamart	110°48'17.77"E	7°32'19.48"S	Minimarket
Alfamart	110°48'57.55"E	7°33'1.53"S	Minimarket
Alfamart	110°50'19.92"E	7°32'9.50"S	Minimarket
Alfamart	110°48'7.86"E	7°34'15.93"S	Minimarket
Alfamart	110°50'10.94"E	7°35'15.20"S	Minimarket
Alfamart	110°49'47.88"E	7°34'56.00"S	Minimarket
Alfamart	110°49'18.19"E	7°35'38.44"S	Minimarket
Alfamart	110°48'58.54"E	7°34'50.59"S	Minimarket
Alfamart	110°50'23.11"E	7°34'14.60"S	Minimarket
Alfamart	110°50'50.08"E	7°34'14.17"S	Minimarket
Alfamart	110°49'37.75"E	7°31'50.80"S	Minimarket
Alfamart	110°49'8.66"E	7°31'55.05"S	Minimarket
Alfamart	110°48'46.24"E	7°31'55.83"S	Minimarket
Alfamart	110°50'33.52"E	7°32'26.44"S	Minimarket
Alfamart	110°50'28.43"E	7°32'46.06"S	Minimarket
Alfamidi	110°48'38.91"E	7°34'49.28"S	Minimarket
Alfamidi	110°50'13.42"E	7°34'3.12"S	Minimarket
Alfamidi	110°50'36.01"E	7°33'34.92"S	Minimarket
Alfamidi	110°48'55.64"E	7°32'41.41"S	Minimarket
Alfamidi	110°50'7.60"E	7°32'4.08"S	Minimarket
Alfamidi	110°48'34.32"E	7°34'29.23"S	Minimarket
Alfamidi	110°50'27.85"E	7°32'56.93"S	Minimarket
Alfamidi	110°49'29.05"E	7°35'12.77"S	Minimarket
Al-Muayyat	110°48'3.40"E	7°34'3.00"S	Minimarket

(continued)

Table 5. (continued)

Modern market	Longitude	Latitude	Type
Tanjungmart	110°49'22.15"E	7°33'46.46"S	Minimarket
Syari'ah	110°48'20.69"E	7°33'11.84"S	Minimarket
Linamart	110°47'37.39"E	7°33'37.76"S	Minimarket
Taniamart	110°51'21.22"E	7°33'21.59"S	Minimarket
Baru	110°49'28.11"E	7°34'16.26"S	Minimarket
An-Nur	110°49'31.19"E	7°34'30.54"S	Minimarket
Atria	110°49'14.10"E	7°34'3.31"S	Minimarket
Luwes	110°49'25.41"E	7°33'39.85"S	Supermarket
Luwes	110°49'12.99"E	7°32'30.35"S	Supermarket
Luwes	110°50'26.85"E	7°32'58.16"S	Supermarket
Luwes	110°49'1.46"E	7°34'8.64"S	Supermarket
Luwes	110°49'59.03"E	7°34'24.23"S	Supermarket
Luwes	110°50'21.45"E	7°33'12.99"S	Supermarket
Luwes	110°49'29.45"E	7°34'59.57"S	Supermarket
Superindo	110°48'56.86"E	7°33'58.10"S	Supermarket
Superindo	110°47'29.23"E	7°33'2.05"S	Supermarket
Superindo	110°48'34.13"E	7°32'33.64"S	Supermarket
Lotte Mart	110°48'30.76"E	7°34'40.45"S	Hypermarket
Solo Paragon Mall	110°48'35.80"E	7°33'45.23"S	Mall/Plaza
Solo Square	110°47'19.01"E	7°33'40.70"S	Mall/Plaza
Matahari	110°49'14.82"E	7°34'24.49"S	Mall/Plaza
Pusat Grosir Solo	110°49'47.46"E	7°34'22.23"S	Trade Center
Beteng Trade Center	110°49'29.41"E	7°34'10.99"S	Trade Center
Solo Grand Mall	110°48'26.84"E	7°33'58.22"S	Mall/Plaza
Singosaren Plaza	110°49'14.91"E	7°34'25.02"S	Mall/Plaza

Figure 7 is a map of the distribution of modern markets spread across various areas of Surakarta City based on the location of the coordinates and the classification of the types of modern markets. From these data, the number of modern markets is 88 in various locations based on their class. There are five modern market types classifications: minimarkets, supermarkets, hypermarkets, malls/plazas, and trade centers. The number of modern markets by type of classification consists of 70 markets with the minimarket class. It is the most widespread number of types because minimarkets are supermarkets or modern markets with the least capacity for goods. The area is more limited than modern markets/supermarkets of other classes. It is usually managed by the private

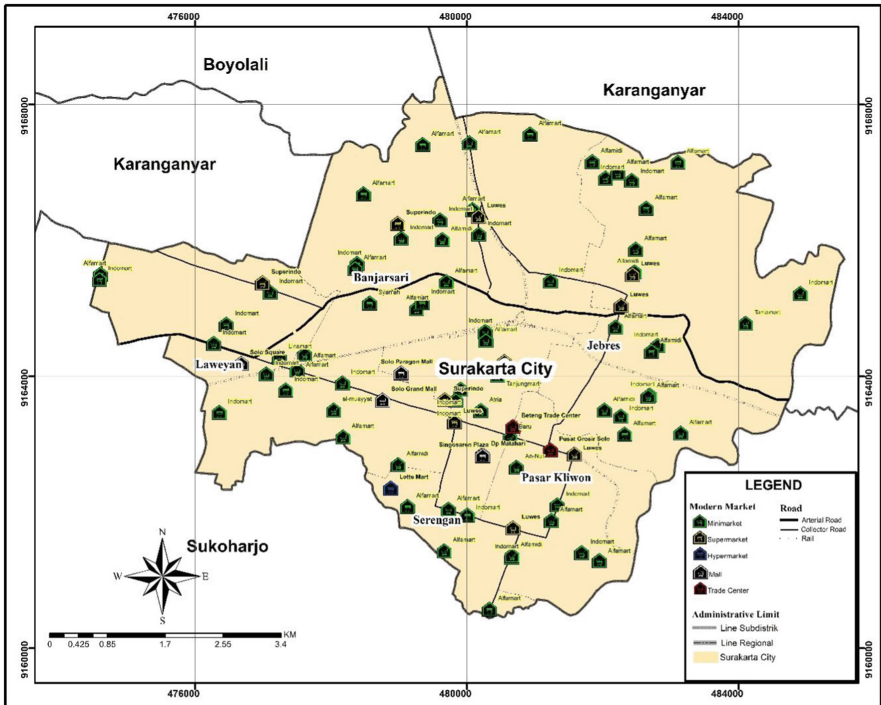


Fig. 7. Map of the distribution of modern markets in the City of Surakarta

sector or certain companies such as Indomaret, Alfamart, Alfamidi, and other private entrepreneurs.

There are 11 modern markets included in the supermarket classification with the types of supermarkets, Luwes and Superindo. There is one supermarket hypermarket with the name Lotte Mart; 4 malls/plazas consisting of Solo Square, Solo Grand Mall, Solo Paragon, and Singosaren Plaza; The 2 trade centers include the Pusat Grosir Solo and the Benteng Trade Center. The two modern markets are a type of classification that occupies the largest type based on goods traded in large quantities, from wholesalers to sub-distributors to retailers targeting intermediaries and the general public in Surakarta City and its surroundings. Figure 8 is a visualization of the distribution pattern of modern markets in Surakarta City.

The results of the analysis of the nearest neighbor spatial pattern or Average Nearest Neighbor (ANN) for the distribution of the modern market above obtained the Nearest Neighbor Ratio value = 0.789121 so that the value is < 1 , so the classification is included in the clustered pattern. By obtaining the z-Score standard deviation value = -3.784, which means it is not close to 0, it shows significant analysis results and the probability value P-Value = 0.000 with the results of the observed mean distance or the observed average value of 322.77 m. In contrast, the exposed mean distance is the expected average distance of 409.03 m, so it can be accepted that the hypothesis shows

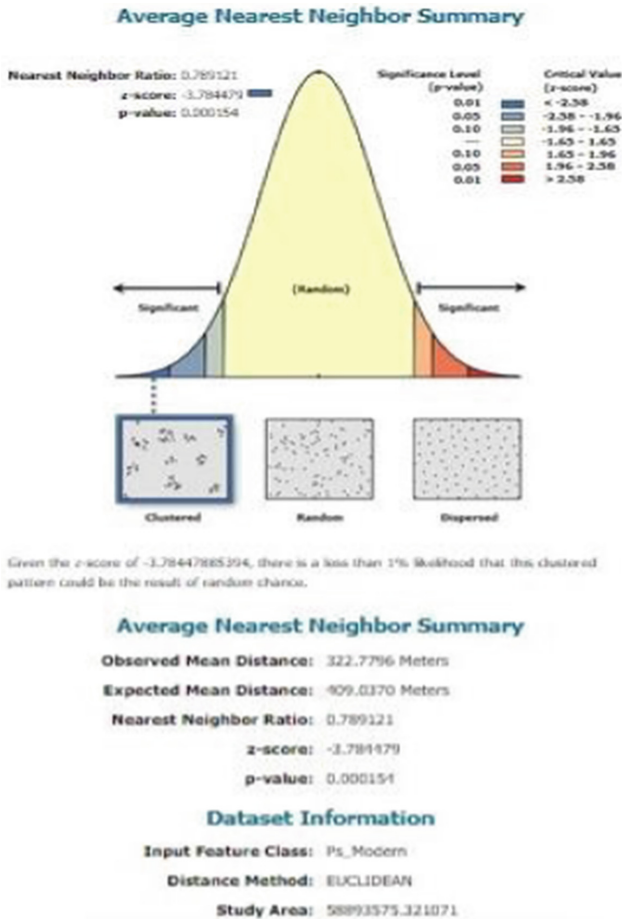


Fig. 8. Results of the distribution pattern of modern markets in Surakarta

that the distribution pattern of modern markets in Surakarta City is in the clustered category.

These findings align with the results of previous research (Hidayah & Amin, 2021) that analyzing spatial patterns and factors for selecting minimarket locations in Klaten Regency also uses the same method. The results obtained are based on the analysis of the nearest neighbor ANN obtained a critical value (Z-Score) < -2.58 with a Nearest Neighbor Ratio value of 0.677565 where the average distance between minimarkets is 302 m, thus indicating that the location distribution pattern Minimarkets in Klaten Regency are clustered. The difference in numbers between traditional and modern markets is obvious because the level of development of modern markets is higher than that of traditional markets. In the past three years, from 2018–2020, there has been an increase in the number of modern markets in Surakarta, totaling four.

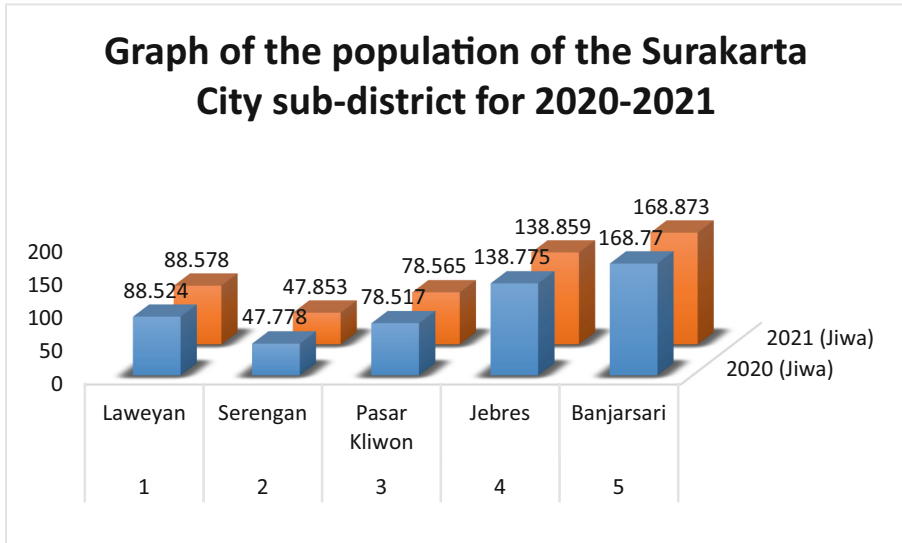


Fig. 9. Statistics Indonesia of Surakarta City for 2021

Population growth is one factor that triggers the emergence of new trading centers, both in the form of traditional markets and modern markets in Surakarta. The following is a visual graph of the number of residents per sub-district in Surakarta City.

The results of the data analysis (Fig. 9) of population growth over two years include five sub-districts spread across the city of Surakarta. The results show that the smallest population is located in Serengan District, with 47,778 people and 47,853 people in the two years between 2020 and 2021. The highest population is in Banjarsari District, with a population in 2020 reaching 168.77 people, while in 2021, it will reach 168,873 people. The percentage of the administrative area of Banjarsari District reaches 33.63%, so Banjarsari District is the largest sub-district of the entire Surakarta. These aspects encourage the growth and development of traditional and modern markets' distribution. The most dominant market location is in Banjarsari District, with 15 traditional markets with three classifications IA, IIA, IIIA, IB, IIB, and IIIB, and 30 modern markets with classification minimarkets, malls/plazas, supermarkets, and trade centers. This analysis is in line with the results of research conclusions by Aprillia & Pigawati, 2018 that the development of trade centers and infrastructure development in an area is driven by population growth, activity, and fulfillment of community survival needs.

4 Conclusions

According to the coordinate points, the location of traditional and modern markets in Surakarta City is spread throughout the city. Five sub-districts become urban areas, including Laweyan, Pasar Kliwon, Jebres, Banjarsari, and Sangkrah. The number of traditional markets spread throughout the city of Surakarta is 44 traditional markets divided into 6 classifications of market types, including type IA of 3 markets, IB 2 markets, IIA

4 markets, IIB 24 markets, IIIA 5 markets, and IIIB 6 markets. The results of the nearest neighbor spatial pattern (ANN) for traditional markets fall into the random category, while the number of modern markets is 88 markets divided into 5 types of classification. The first is the minimarket class with 70 places, 11 supermarkets, 1 hypermarket, 4 malls/plazas, and 2 trade centers. The results of the analysis of modern market spatial patterns using the Average Nearest Neighbor (ANN) or the nearest neighbor index enter into a clustered pattern. Of the five districts in Surakarta City, Banjarsari has the most locations for traditional and modern markets, driven by the highest population and area of the five districts in Surakarta.

References

- Amin, C. (2001). *'orientasi penggunaan rumah di kawasan desakota*. 15(2), 142–175.
- Arisca, W. D., & Agustini, E. P. (2020). Pola Persebaran Sekolah Sma Dan Smk Di Kabupaten Ogan Komerin Ulu, Ogan Ilir, Penukal Abab Lematang Ilir, Dan Prabumulih Menggunakan Metode Avarage Nearst Neighbour. *Jurnal Bina Komputer*, 2(2), 99–121. <https://doi.org/10.33557/binakomputer.v2i2.975>
- Eka Indriya Setyawan, Bhimo Rizky Samudro, Y. P. P. (2015). Analisis Kebijakan Pemerintah Kota Surakarta. *Jiep*, 15(1), 77–93.
- Field, J. R., & Jeffcott, L. B. (1989). Equine laminitis - Another hypothesis for pathogenesis. *Medical Hypotheses*, 30(3), 203–210. [https://doi.org/10.1016/0306-9877\(89\)90062-5](https://doi.org/10.1016/0306-9877(89)90062-5)
- Giarno, G., Hadi, M. P., Suprayogi, S., & Murti, S. H. (2018). Distribution of Accuracy of TRMM Daily Rainfall in Makassar Strait. *Forum Geografi*, 32(1), 38–52. <https://doi.org/10.23917/forgeo.v32i1.5774>
- Handayani, D., & Setiyadi, A. (2003). Remote Sensing Ipenginderaan Jauhi. *Edisi Mei*, 7(2), 113–120.
- Hidayah, B., & Amin, C. (2021). Analisis Pola Spasial dan Faktor Pemilihan Lokasi Minimarket di Kabupaten Klaten. *Media Komunikasi Geografi*, 22(2), 171. <https://doi.org/10.23887/mkg.v22i2.36806>
- Indrasari Wisnu Wardhana. (2022). *Keputusan Menteri Perdagangan Republik Indonesia*. 3, 1–4.
- Kusta, K., & Wilayah, D. I. (2017). *Higeia Journal of Public Health*. 1(4), 120–130.
- Kusuma, R. E., & Arifien, M. (2015). Geo Image (Spatial-Ecological-Regional). *Jurnal Geo Image*, 4(1), 30–37.
- Novitasari, D. A. (2015). Spatial Pattern Analysis Dan Spatial Autocorrelation Produk Domestik Regional Bruto (Pdrb) Sektor Industri Untuk Menggambarkan Perekonomian Penduduk Di Jawa Timur. *Jurnal Ekbis*, 13(1), 9. <https://doi.org/10.30736/ekbis.v13i1.113>
- Nugraha, A. S. (2013). *Analisis Pola Persebaran Pasar Tradisional dan Pasar Modern di Kota Surakarta dengan Aplikasi Sistem Informasi Geografis (SIG)*. <http://eprints.ums.ac.id/id/eprint/24511>
- Perbawati, E. K., Purwanto, T. H., Tri, H., Murti, B., & Santoso, W. Y. (2021). *Preliminary Study of WebGIS Implementation on Monitoring and Evaluation of the Regional Action Plan for Reduction and Elimination of Mercury Use*. 11, 252–267.
- Purnomo, Y., & Wulandari, A. (2017). Sebaran Fasilitas Pelayanan Publik Dan Pilihan Masyarakat Di Kecamatan Pontianak Utara, Kota Pontianak. *Langkau Betang: Jurnal Arsitektur*, 4(2), 95. <https://doi.org/10.26418/lantang.v4i2.23249>
- Safiullin, L. N., Bagautdinova, N. G., Safiullin, N. Z., & Ismagilova, G. N. (2012). *The Development of Welfare Theory in Conditions of Changes in the Quality of Goods and Services*. 18, 144–149. <https://doi.org/10.5829/idosi.wasj.2012.18.120032>

- Saleh, A., Dalimunthe, A. H., & Lubis, F. H. (2019). Development of Banking CSR Model for Community Empowerment Slum Area in Medan City. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences*, 2(3), 39–50. <https://doi.org/10.33258/birci.v2i3.392>
- Saputra, D. F., & Jumadi, S. S. (2022). *Evaluasi Kesesuaian Penggunaan Lahan Kota Surakarta Tahun 2011–2020 Terhadap Rencana Tata Ruang Wilayah Kota Surakarta 2011–2030*.
- Sekitar, D., & Sungai, A. (2022). *Aplikasi Sebagai Penentuan Pola Spasial Breeding Place Di Sekitar Aliran Sungai Progo*. 8(1), 1–10.
- Setyawardman, A. (2009). Pola Sebaran dan Faktor-Faktor yang Mempengaruhi Pemilihan Lokasi Retail Modern (Studi Kasus Kota Surakarta). *Statewide Agricultural Land Use Baseline 2015*, 1–15. http://eprints.undip.ac.id/24296/1/ADITYO_SETYAWARMAN.pdf
- Supangat, D. (2012). *Pembuatan Panduan Peta Pariwisata Kota Surakarta Berbasis Google Maps Api*. <https://dspace.uii.ac.id/handle/123456789/36617>, <https://dspace.uii.ac.id/bitstream/handle/123456789/36617/07523310DeddySupangat.pdf?sequence=1>
- Sutarga, I. K. (2022). *Analisis Pola Spasial Sebaran COVID-19 Kota Bogor Berdasarkan Indeks Moran*. 23(2), 265–276.
- Tribhuhana, A., & Farhan, O. (2020). Performance Indicators of Basic Infrastructure of Kotaku Program (The City without Slums). *Jurnal Teknik Sipil Dan Perencanaan*, 22(2), 94–102. <https://doi.org/10.15294/jtsp.v22i2.24011>

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