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Spatial Analysis of E-Warong Distribution for Basic Food Social Assistance Program in Surakarta City

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Abstract

The social assistance for the basic food program launched by the Indonesian Ministry of Social Affairs in 2020 seeks social protection for Family Beneficiaries (KPM/Keluarga Peneri-ma Manfaat). One of the distribution constraints is the absence of a database and spatial analysis for the distribution process of social assistance for basic food programs. This study aimed to inventory data on the location of e-warong, visualize, and analyze distance coverage. The method included a survey of the coordinates of the e-Warong location and an analysis of secondary data from the Surakarta City Social Service (Dinas Sosial Kota Surakarta) for March 2022. The data was processed using proximity analysis on Geographic Information System (GIS)-based software to map the affordability of e-Warong services. The results obtained are the creation of a database of e-Warong locations, mapping of accessibility, and the range of e-Warong services to KPM. The accessibility map of the e-warong location is 100 m for the near zone (most covered), 300 m for the medium zone (covered), and 500 m for the far zone (poorly covered). In conclusion, the e-warong service area is partially centered between Pasar Kliwon and Banjarsari. Meanwhile, several locations in Jebres, Serengan, and Laweyan are still unreachable.

Keywords: Social Assistance, E-Warong, Proximity Analysis, GIS

1. Introduction

Through the Ministry of Social Affairs of the Republic of Indonesia, the government distributes assistance to the poor through *Elektronik Warung Gotong Royong*, commonly called e-Warong. It is contained in the Minister of Social Affairs' Regulation Number 25 of 2016 concerning assistance in the development of business facilities through *elektronik warung gotong royong* (e-Warong) and the Joint Business Groups (KUBE) Family Hope Program (PKH). The existence of e-Warong is strengthened through the Minister of Social Affairs' Regulation Number 8 of 2017 concerning assistance in developing business facilities through *elektronik warung gotong royong* of joint business groups with the family hope program. The Conditional Cash Transfer Program (BTB), also called the Family Hope Program (PKH), provides conditional social assistance to families and/or poor and vulnerable people registered in the integrated data of the poor handling program. It is processed by the Data Center and Social Welfare Information and designated as PKH beneficiary families (The Minister of Social Affairs' Regulation of the Republic of Indonesia Number 1 of 2018 concerning the Family Hope Program, 2018). According to the Minister of Social Affairs' Regulation of the Republic of Indonesia Number 5 of 2021 concerning the Implementation of the Staple Food Program and the Minister of Social Affairs' Regulation of the Republic of Indonesia Number 11 of 2018 concerning the Distribution of Non-Cash Food Assistance, e-Warong serves the sale and purchase of basic food necessities for staple food subsidies, the disbursement of non-cash social assistance, bill payments such as electricity, telephone, water, as in collaboration with banks in the process of social assistance distribution by the Ministry of Social Affairs RI, as well as marketing KUBE products. E-Warong is expected to run

optimally following President Joko Widodo's goal to succeed in the Nawacita Program.

The Nawacita Program began in 2015 and will continue until 2024 when one of the priorities of Nawacita's nine main agendas is eradicating all forms of poverty (Mahardi, 2017). Referring to the Ministry of Social Affairs' Strategic Plan 2020-2024 related to the policy, the Ministry of Social Affairs distributed staple food assistance to 15.6 million family heads in 2020. However, the many problems that occur in the field and aspects of the findings of the Financial Audit Agency (BPK) until 2021 add to the complex distribution of staple food programs from the Ministry of Social Affairs to the Beneficiary Families (KPM). On July 15, 2021, BPS released a report on the poor people status in Indonesia until March 2021 of 10.14% or, if calculated, as many as 27.54 million people. This poverty level began to fall in September 2020, recorded by the poor population of 10.19% or, if calculated, as many as 27.55 million people. However, this data is still 9.22% higher than before the pandemic, or 24.29 million people in September 2019. It means that the government has sought to eradicate poverty, which needs improved policy implementation.

Surakarta is one of the cities in Central Java. The area is 44.04 km² divided by five districts and 54 villages (Central Statistics Agency, 2020). Surakarta became one of the pilot cities for distributing staple food packages program social assistance with e-Warong as a distributor in 2017 (Asiska, 2017). The development of e-Warong is quite good, and the commitment of the Surakarta City government to poverty alleviation can be used as a pilot project (example project) for other regions in Indonesia. The improvement of e-Warong services supported by database inventory and spatial analysis can be used to determine the affordability of e-Warong service level as a distributor of staple food. The operational procedures of the distribution of staple food programs currently involve several data, analysis, monitoring, and evaluation. It is still difficult to track data developments and manage demand and supply from beneficiaries.

The development of increasingly advanced technology encourages the monitoring of the spatial dynamics of social assistance to have the opportunity to be applied consistently by the Ministry of Social Affairs RI and related parties in each region. Utilization of technology based on geographic information systems can be an alternative decision making to improve the performance of the distribution of Staple Food Program social assistance, one of which is by way of quick response handling distribution problems in the field. The Geographic Information System (GIS) for mapping social problems is more developed at the national level with a broader scope than at the regional level with a smaller area coverage. Socio-economic information is essential, but this aspect is still very minimal in Indonesia (Atie et al., 2003). Based on the identification and formulation of the above problems, the objectives of this study include (1) inventory of e-Warong location data in Surakarta City, (2) visualizing the range (distribution) of e-Warong services (Coverage-Area) in Surakarta City, and (3) socio-economic analysis of social assistance distribution in Surakarta City.

2. Implementation Methods

2.1 Locations of Research

This research was conducted for 12 months (November 2021-September 2022) in Surakarta City and spread across five districts, namely Jebres, Banjarsari, Pasar Kliwon, Laweyan, and Serengan. The reason for choosing the location is that in 2017 Surakarta City became one of the Pilot Projects by the Ministry of Social Affairs RI for the initial distribution of the Non-Cash Food Assistance (BPNT) program (Asiska, 2017). After running for approximately two years, the distribution of e-Warong in Surakarta City has changed a lot, so it is necessary to conduct a recent spatial analysis of the location distribution and the relationship to services to KPM. The research flow can be seen in Figure 1. below.

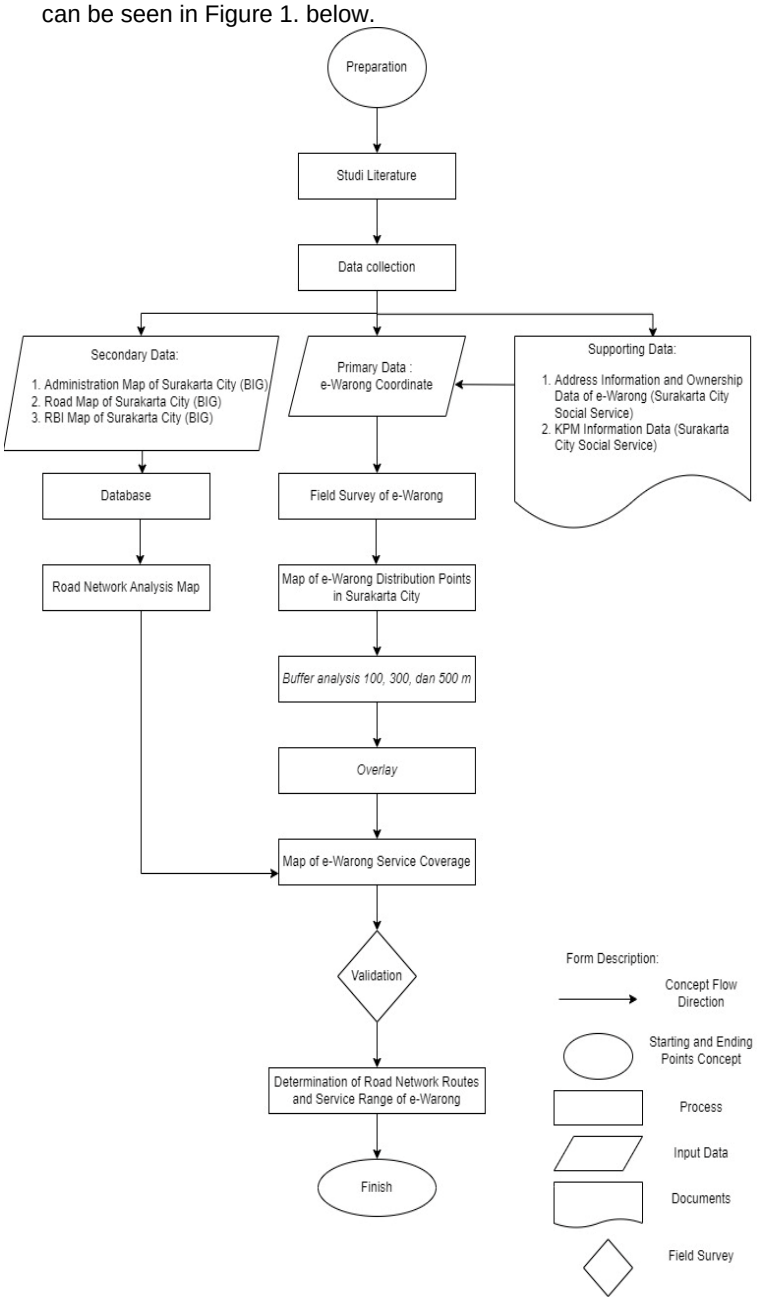

Figure 1. Research flow chart. (Source: Researchers, 2022).

2.2 Data Used

In general, the data used in this study consist of primary and secondary data. The following is a list of research data sources used in this study.

Table 1. Data used in research

Type of Data	Data Name	Procurement Resources	Year	Resolution / Scale
Primary	Coordinates of e-Warong	Field Survey	2022	1: 25,000
	e-Warong Identity	Questionnaire	2022	-
	e-Warong ID	Questionnaire	2022	-
	Address	Questionnaire	2022	-
	Number of KPM	Questionnaire	2022	-
Secondary	Administrative Shp Boundary of Central Java	Geospatial Information Agency (BIG)	2018	1: 25,000
	Shp Road Network of Surakarta City	Geospatial Information Agency (BIG)	2018	1: 25,000
	RBI Map of Surakarta City	Geospatial Information Agency (BIG)	2018	1: 25,000
	KPM Address	The Surakarta City Social Service	2022	-
	e-Warong Information	The Surakarta City Social Service	2022	-
	Number of KPM served and underserved	The Surakarta City Social Service	2022	-

Source: Researchers, 2022

2.3 Data Collection Methods

Data collection in this study is in the form of field data collection (primary) and agency data (secondary). Primary data is collected directly or originally from the source (Kuncoro, 2009). Primary data in this study is in the form of field survey data and e-warong questionnaires. According to Hanke and Reitsch (1998), the definition of secondary data is data that has been collected by an agency or institution and then published to the general public (Hamid et al., 2015). Secondary data is obtained from the Surakarta City government agencies, namely the Regional Research and Development Agency, Bappeda, and the Surakarta City Social Service.

Agency data collection is part of secondary data collection to complete the necessary data, including e-Warong tabular data per district in Surakarta City. The agency data was obtained from the Social Service of Surakarta City. Later, the data will be a table attribute content of the e-Warong point vector. Agency data collection was carried out with the permission of the Regional Research and Development Agency and Bappeda of Surakarta City.

Secondary data and supporting documents obtained are then collected using field survey methods. The survey is part of the field data collection to facilitate researchers' observations (Sari et al., 2021) on e-Warong conditions in the field. Information on field survey results in the form of coordinates for each e-Warong point, documentation, and questionnaire results. The questionnaire collects field data by making a written statement to get information from field samples. The procedure consists of creating a series of questions in the form of questionnaires that are asked and filled out by pre-determined respondents. In this study, questionnaires were distributed to e-Warong owners in Surakarta City. The questionnaire contents include: e-warong name, e-Warong ID, e-warong chairman name, number of KPM, number of KPM served in March 2022, number of KPM unserved in March 2022, address, Villages, and District funds. The number of e-Warong successfully surveyed and interviewed was 19 points using purposive sampling. This sampling method was chosen because researchers emphasized the purpose of e-Warong sampling per district unit.

2.4 Data Processing and Analysis

2.4.1 Inventory of e-Warong Location Data in Surakarta City

Databases are useful for similar grouping data to make it easier to understand and visualize. A spatial database is a set of entities with fixed or non-fixed locations. Spatial entity types have basic topographic properties, including location, dimensions, and shape (Prahasta, 2009; Aini, 2007). Spatial-based databases contain detailed information about each e-Warong point in the field.

Geographic information systems (GIS) are hardware, software, geographic data, and human resources that enter, store, manage, manipulate, integrate, analyze, and display information from geographically-based data (Barkey et al., 2009). Another opinion states that GIS (Geographic Information System) is a science that studies how computers are used to create maps at the stages of data input, data processing or management, and data output (Nuraini, 2020). Processing using GIS can be done using the concept of SMDB (Database Management System), which allows other users (multi-user) to edit and update data. SMDB is generally defined as a computer program used to enter, modify, delete, manipulate, and retrieve data or information quickly and efficiently (Susanto, 2012). The statement conveys that it can be used as a computer program to enter, modify, delete, manipulate, and retrieve data or information practically and efficiently. Based on Figure 2, the type

of database used is geodatabase (.gdb) in ArcCatalog. The e-Warong ID number is used as a primary key or enterprise that is considered unchanged and unique. The role of the road network used is arterial, collector, and local, as well as the railway network addition on a scale of 1:25,000. The source of the road network was obtained from the Shapefile of the Geospatial Information Agency (BIG). The geodatabase design is determined by examining the existing data inputted into the geodatabase sourced from BIG. Existing data can be classified into several feature sets based on essential features, as in the following table.

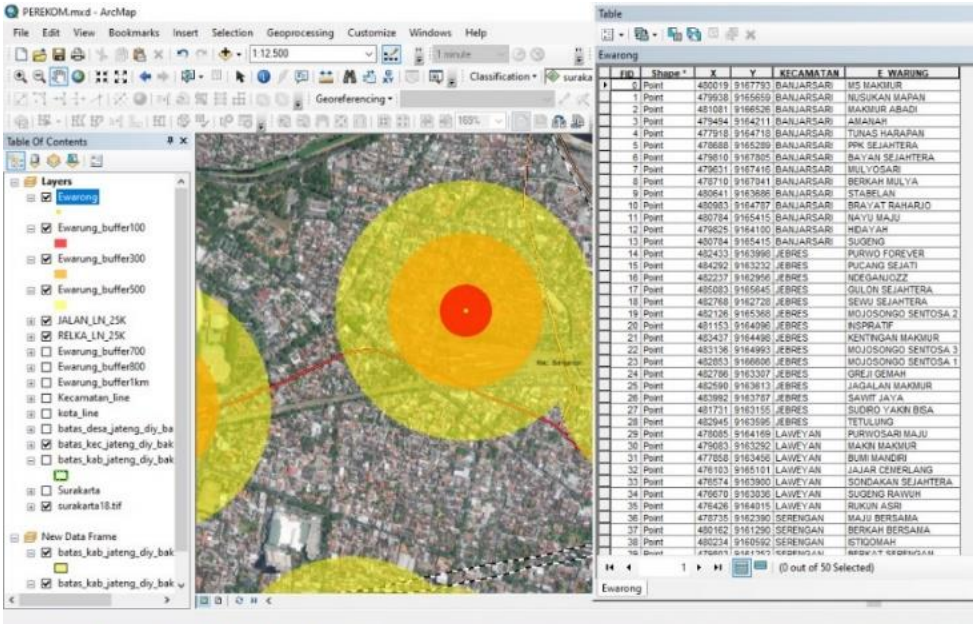

Figure 2. The spatial database of e-warong location and road network. (Source: Researchers, 2022).

Table 2. e-Warong Database Structure Design

Dataset	Feature Class	Type	Fields	Feature Type	Definition
Administration	Batas_Desa_Jateng_DIY	Polygon	IDDESA	Long Int	NOPROV+ NOKABKOT+ NOKEC+ NODESA (FIELD "ID2013")
			NOPROV	Long Int	Province Code
			NOKABKOT	Long Int	Regency Code
			NOKEC	Long Int	District Code
			NODESA	Long Int	Village Code
			PROVINCE	Text	Province Name
			KABKOT	Text	Name of Regencies/Cities
			KECAMATAN	Text	District Name
			DESA	Text	Village Name
Roads	Jalan_LN_25K and RelKA_LN_25K	Line	NORUAS	Text	FIELD NUMBER "FIRT_RUAS")
			NMRUAS	Text	Field Name
			PANJANG	Double	Field Length
			STATUS	Text	Street Status
			FUNGSI	Text	Road Functions
			PROVINSI	Text	Province Name
			KABUPATEN	Text	Name of Regencies/Cities
			KECAMATAN	Text	District Name
			DESA	Text	Village Name
e-Warong	e-Warong	Point	ID (e-warong)	Long Int	e-Warong ID of Kemensos RI
			X	Long Int	X coordinate
			Y	Long Int	Y coordinate
			e-Warong	Text	e-Warong Name
			PROVINSI	Text	Province Name
			KABUPATEN	Text	Name of Regencies/Cities
			KECAMATAN	Text	District Name
			DESA	Text	Village Name
			STATUS	Text	e-Warong Active/Not
			PKH	Long Int	Number of PKH
			NON PKH	Long Int	Number of NON PKH
			COVID	Long Int	Number of Covid

Source: Data processing, 2022

2.4.2 Proximity Analysis

Proximity analysis is a geographic analysis based on distances between layers. According to Aqli (2010), Proximity analysis is a functional form of spatial analysis in GIS that can identify the proximity between features or calculate the distance between features. Proximity is one of the analytical tools used to determine the location/country in marketing and business/commercial strategies between suppliers, e-warong, and KPM. Proximity analysis is a functional form of spatial analysis in GIS that can identify proximity between features or calculate distances between features (Rivandi, Y., & Santosa, P., 2018). The most commonly used operation in proximity analysis in ArcGIS is the buffer. In this study, the buffer method uses point distance to calculate the distance from each point in one feature class to all points within a particular search radius in other feature classes.

2.4.3 Average Nearest Neighbor (ANN)

The Average Nearest Neighbor is a method for calculating random distances to nearby neighbors using random point patterns. The calculation of the distance is based on a comparison of the average distance of its closest neighbors, and the results of the calculation can be evaluated using the expected value of the average distance of the nearest neighbor derived from the assumption of a random and independent binding point pattern (Aidi, M. N. 2009). ArcGis software can calculate ANN to determine whether e-Warong points in Surakarta City are in a random, uniform, or clustering pattern. The distance method used is Euclidean. Referring to the ESRI page, the form of data distribution in the spatial pattern of the Average Nearest Neighbor includes (1) clustered (i.e., several areas are clustered, and close to each other that represent certain entities; (2) uniformly dispersed (i.e., some areas are spread evenly and far apart); (3) random (i.e., some areas are located randomly, where between one area and another area does not affect each other.

$$\bar{ANN} = \frac{DO}{DE} \quad (1)$$

DO is the distance observed between each feature and its nearest neighbor.

$$DO = \frac{\sum_{i=1}^{n} di}{n} \quad (2)$$

n corresponds to the number of features, and A is the minimum rectangular area around all features or the value of the user-defined area.

$$DE = \frac{0{,}5}{\sqrt{n/A}} \quad (3)$$

DE is a random pattern's average distance for a given feature.

$$\bar{Z} = \frac{DO-DE}{SE} \quad (4)$$

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

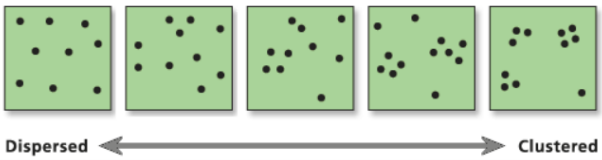

Figure 3. Illustration of spatial pattern calculation using Average Nearest Neighbor on ArcGis. (Source: ArcGIS Desktop Help, 2022).

2.4.4 Data Visualization

Data visualization facilitates readers in translating data from research results (Jumadi et al., 2020). This study visualizes spatial data as maps, graphs, and tables. Spatial data is processed with ArcGIS 10.8 software, producing e-Warong distribution maps and e-Warong service coverage maps of 100, 300, and 500 m.

4. Results and Discussion

4.1 Analysis of e-Warong Service Reach

Referring to the point of e-Warong surveyed in the field, overall e-warong in Surakarta City has a random pattern (random) which can be seen in Figure 3 below. Justify the analysis results using the analysis of Average Nearest Neighbors (ANN) or the analysis of nearby neighbors. The result of Z-score 1,439, which is close to number 1 based on the classification of standard critical value in ArcGis, means that the e-Warong pattern in Surakarta City is significantly categorized as random.

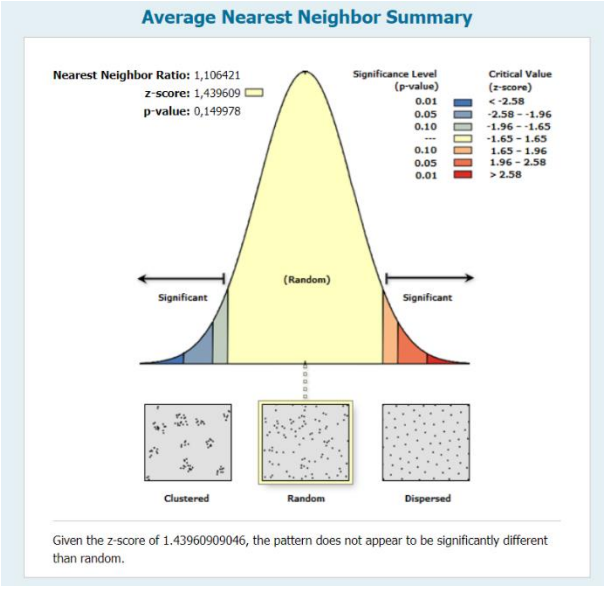

Figure 4. Distribution test of e-Warong spatial patterns in Surakarta City. (Source: Researchers, 2022).

The buffer method of each iteration performs a search for a certain closest distance from the area of the point, line, or polygon owned. The range of e-warong at a distance of 100 m was chosen as the closest distance that can be reached by the Beneficiary Families (KPM). The comprehensive data source of e-warong and KPM recorded by the Surakarta City Social Service until March 2022 is 50 e-warong. Types of e-warong services include Family Hope Program (PKH), Not Family Hope Program (Non-PKH), and affected by Covid. Figure 4 shows the buffer results at several different distances.

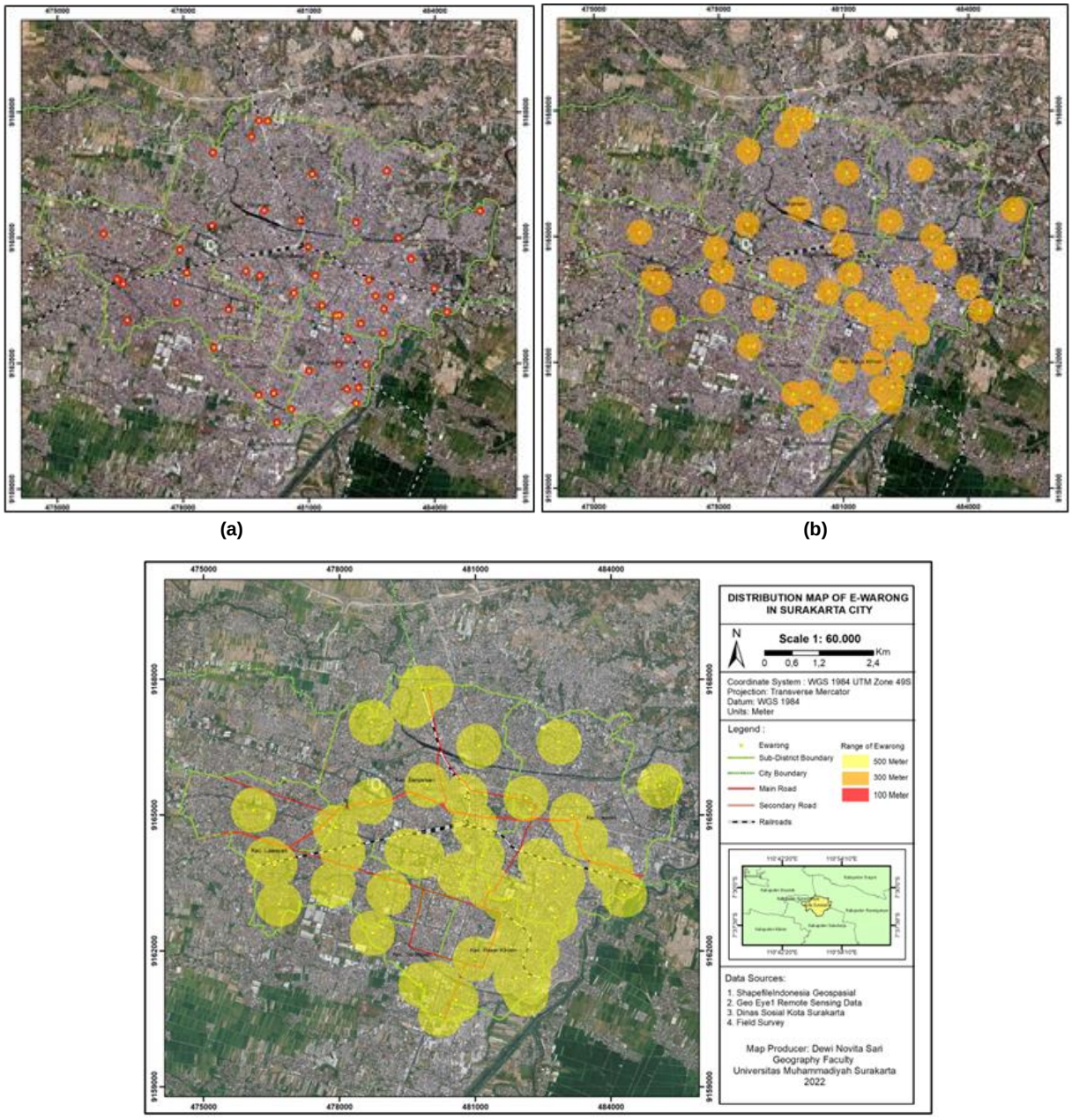

Figure 5. (a) Map of e-warong range using 100 m buffer method, (b) Map of e-warong range using 300 m buffer method, (c) Map of e-warong range using 500 m buffer method. (Source: Researchers, 2022).

Based on the survey results and primary data in Figure 5. above, it shows that the distribution of e-warong in Surakarta City has not been evenly distributed. It is based on the results of several points in 3 districts that are not intersecting with each other. The greater the buffer distance used, the wider the coverage area of 1 e-warong point. It can be seen from the area compared with the area served in each district which can be seen in Table 2. The closest distance of 100 meters was chosen because it was assumed that it could be reached by the main KPM of the elderly and disabled, so this distance was categorized as the most affordable. The distance of 300 meters was chosen as the distance between 100 and 500 meters, categorized as the medium range (affordable) for KPM by walking for residential areas around e-warong. The distance of 500 meters was chosen as the furthest distance, assuming KPM did not have a vehicle and was on foot and/or using public transportation to be able to reach e-Warong. When viewed at a distance of 500 meters, the e-warong service area is primarily centralized between Pasar Kliwon, Surakarta City, and Banjarsari. The assumption of these three areas can be reached by

KPM using public transportation modes such as Batik Solo Trans (BST) route integration along the Pasar Kliwon and Banjarsari. The results of the e-warong distribution also indicate that the distribution of e-warong in Jebres District, Serengan District, and Laweyan District at some points is not yet reached (intersected) within 500 meters.

4.1 e-Warong Distribution Analysis of Beneficiary Families (KPM)

Acceleration of poverty prevention and alleviation in Indonesia by the government is one of the mandates of the 1945 Constitution articles 33, 34, and 27, paragraph (2). One crucial step that can be taken is to improve the quality of life of Indonesian people. Operationally, Social Service is one of the milestones in accelerating poverty reduction at the City/Regency level following Presidential Regulation Number 166 of 2014. Poverty prevention and alleviation programs have evolved from previous administrations. Some government assistance programs include Direct Social Empowerment Assistance (BLPS) in the form of Joint Business Groups (KUBE) or Productive Economic Business (UEP), Uninhabitable Home Social Rehabilitation Program (RS-RTLH), Environmental Facilities Assistance for the Poor, Rastra (Raskin), Expansion of Family Hope Program (PKH), and the like (Mahardi, A. 2017).

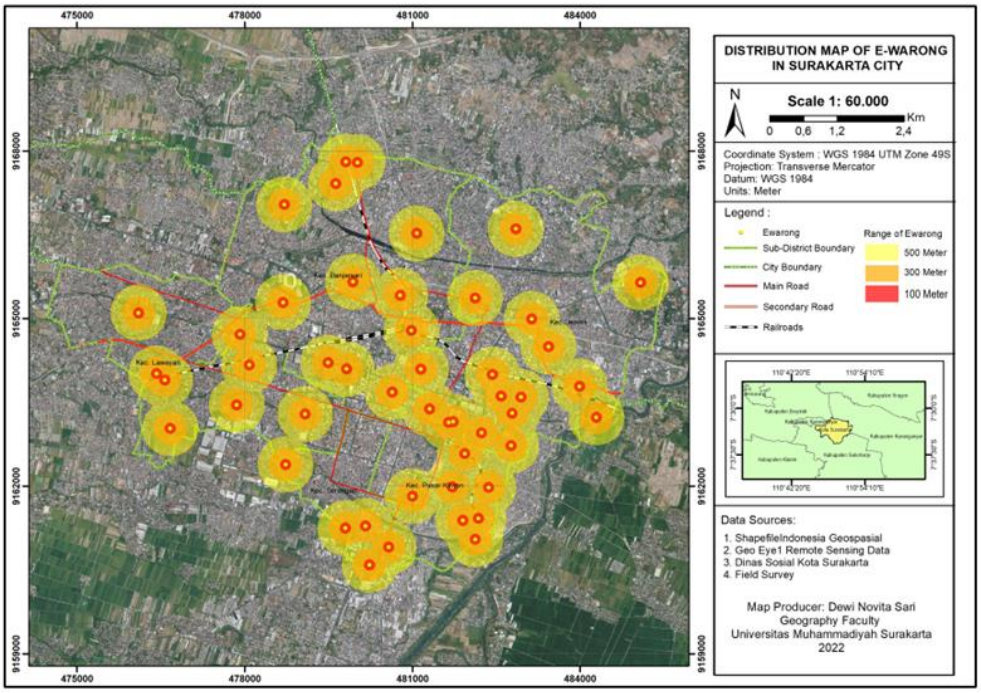

Figure 6. Map of the range of e-warong distances of 100, 300, and 500 m along the road network in Surakarta City. (Source: Researchers, 2022).

Based on Figure 6. above, it can be seen that some locations do not yet have coverage of e-warong coverage area from a radius of 100-500 m. That is, KPMs not in the range zoning must find an alternative location that mostly follows the capabilities of the KPM. The following is data on the number of KPM and e-Warong per district for March 2022.

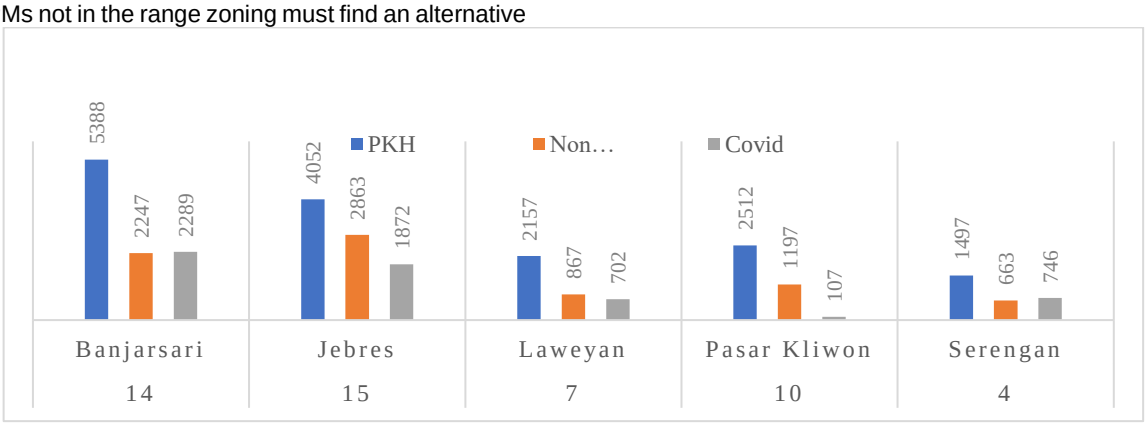

Figure 7. Data of e-warong in 5 districts in Surakarta City based on the type of assistance (Source: Surakarta City Social Service, March 2022).

Based on Figure 7. above, there is an accumulation of the number of KPM and e-Warong per district. From a total of 50 e-Warong in Surakarta City, starting from March 2022, the most are in Jebres

District as many as 15, followed by Banjarsari District 14, Pasar Kliwon District 10, Laweyan District 7, and the least is Serengan District only four e-Warong. The average number of KPM for PKH is 3,121 members. The highest is Banjarsari District, with 5,388 members, and the lowest is Serengan District, with 1,497 members. The average number of KPM for Non-PKH is 1,567 members. The highest is in Jebres District, with 2,863 members, and the lowest is in Serengan District, with 663 members. The average number of KPM assistance covid is 1,143 members. The highest was Banjarsari District, with 2,289 members, and the lowest was Pasar Kliwon District 107.

Based on the criteria for the establishment of e-Warong according to Permensos Number 25 of 2017, one of the requirements is that e-Warong can serve 500 (five hundred) to 1,000 (one thousand) KPM members from all types of social assistance. The following is a table of the results of the realization of e-Warong to KPM in Surakarta City.

Table 3. Social assistance realization in Surakarta for March 2022

District	Realization of Distribution				Not yet Served	Area (km^2)
	PKH	NON PKH	Covid	Total		
Banjarsari	4569	1865	1774	14117	1719	14.81
Jebres	3918	2712	1520	8350	437	12.58
Laweyan	2081	831	683	3595	131	19.62
Pasar Kliwon	2512	1197	107	3816	0	4.82
Serengan	1328	574	520	1912	484	3.19

(Source: Primary data of the Social Service of Surakarta City, March 2022).

Based on the calculation of the distribution realization in March 2022 in Table 3 above, the highest underserved KPM is in Banjarsari District, with 1,719 members. Furthermore, Serengan District has 484 members, Jebres District has 437 members, and Laweyan District has 131 members. Meanwhile, in Pasar Kliwon District, KPM has been fully served well. The average number of e-Warong capable of serving KPM per District, Banjarsari ranges from 709 KPM, Jebres 586 KPM, Laweyan 532 KPM, Pasar Kliwon 382 KPM, and Serengan 726 KPM. When viewed from the average, e-Warong is following Permensos Number 25 of 2017. However, the uneven distribution of e-Warong can be seen from the district area that has not been supported with adequate service. For example, in Banjarsari District, in March 2022, 1,719 KPMs had not received benefits or were fully served.

KPM, in this case, the recipient of staple food assistance, certainly has limitations in taking basic necessities from partners of the Logistics Affairs Agency (Bulog) and distributing staple food in e-Warong. Some things that affect the problematic conditions of business development and optimization of e-Warong distribution in Surakarta City include the location and distance of e-warong located far from poor people's settlements in Surakarta City. Especially in Serengan and Laweyan areas, some e-Warong are far from the accessibility of the Solo City public transportation mode, and some e-Warong have not reported the number of real-time services each month to the escort officers.

According to the findings of interviews and observations using questionnaires, there were problems in the field from the e-warong manager. Among others, there were limitations of e-Warong services to KPM, which amounted to >500 KPM. The quantity and quality of food that is still difficult to provide by e-Warong every month. The increasing distance of e-Warong services decreases the quantity and quality of basic necessities.

6. Conclusion and Discussion

6.1 Conclusion

From the research carried out, an inventory of the location database and e-Warong road network in Surakarta City was obtained using field survey methods and secondary data from the Social Service for the distribution of e-Warong of 5 districts in Surakarta City. The contribution of spatial analysis in the distribution of social assistance can be used to know the distribution of e-Warong and locations that are still unreachable within a radius of 100-500 m. Visualization of e-Warong service range (coverage area) in Surakarta City using buffer point distance obtained results of 100 m for the near zone (most affordable), 300 m for the medium zone (affordable), and 500 m for the far zone (quite affordable). The spatial pattern of e-Warong distribution using the Average Nearest Neighbor obtained a random (random) z=1.439. In socio-economic analysis, the farther away from the place of distribution of social assistance, the more money must be spent to go to the nearest e-Warong. The social assistance given in full must be exchanged for necessities. Pasar Kliwon District and Banjarsari District have affordability slices in the 500 m zone. Meanwhile, in some locations, Jebres District, Laweyan District, and Serengan District are still not reached by e-Warong or not sliced <500 m. The role of spatial analysis in e-Warong distribution can be a recommendation of related parties to open a new e-Warong at several potential location points in Surakarta City.

6.2 Discussion

Based on the study's results, there are weaknesses in the buffer point distance method that is not yet able to analyze in detail the distance between the KPM house and the nearest e-Warong point. There needs to be an advanced field survey to determine the precise location of the KPM house, the service area's location, and additional analysis of the road network. In addition, according to Permensos Number 25 of 2017, several things can be the criteria for the formation of a new e-Warong KUBE PKH in the region, including the location is connected to the internet and electricity network, able to serve KPM 500-1,000 people, can use the place of KUBE management or according to the agreement, and can carry out non-cash transactions (cashless). If the policy is associated with the number of KPMs still underserved in some districts, it is necessary to add

e-Warong at several strategic location points that can be seen using spatial analysis.

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