

CONFIGURING EDUCATIONAL FACILITIES SERVICES PATTERN IN TRADITIONAL CITIES (A CASE STUDY OF YOGYAKARTA AND SURAKARTA CITY)

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DOI: 10.21163/GT_2019.141.29

ABSTRACT:

In accordance with the regulatory mandate, the policy of providing educational facilities will be carried out by considering aspects of population size and distribution of schools. The development of new facilities is used service scales and capacity factors. The aims of this study are measuring the school service rates and patterns in the traditional or historical cities which are define as Yogyakarta and Surakarta City. The results of this study are needed to validate the results of previous studies and this is done in several cities with different characteristics. Measurements were made by cell/grid catchment analysis (CGC) with the aim of identifying service levels from each region. CGC analysis is used as a modification method which is considered to produce comprehensive results rather than basic methods. The results showed that the average level of primary school services in the city of Yogyakarta was 351% and different from Surakarta City, which had a high level of 1.036%. In addition, school services in Yogyakarta configure a relatively similar pattern among sub-areas while unique patterns are found in Surakarta City. These patterns can be explained that students in Surakarta have diverse and broad access to primary schools while students in Yogyakarta have a limited range.

Key-words: Educational Facilities, Traditional Cities, Service Pattern, Catchment Method.

1. INTRODUCTION

The educational sector was considered as the main part of national and international development agenda and it basically aims to increase the quality of social welfare and human resource condition. Mizunoya and Zaw (2017) described that qualified and adequate educational access needed as a benchmark of the socioeconomic development and national development agenda. In general topics, the universal primary education development becomes as main part of Millennium Development Goals (MDGs) 2015 and yet still being an important part of Sustainable Development Goals (SDGs) 2030 (UNESCO, 2015). The goals are ensuring inclusive and equitable quality education and promote lifelong learning opportunities for all peoples. Indonesia as one of the developing countries has the same development agenda which the constitution mandate was a provision of access to better education services for all citizens in each area of Indonesia. Hence, it was hampered the constraints by the existed condition of educational sectors such as the school facilities and infrastructure conditions are contrasted with progress to improve the quality and efficiency of education systems.

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Till now, educational development is the main part of the national plan program as it mandated on 5 y national development plan (RPJMN 2015–2019) and also it became the core of Presidents vision NAWACITA. The related point from the Presidential Vision is improving national quality of life based on educational quality improvement. Therefore, several programs are needed to support and enhance the education sector policy and one of them was Compulsory Education “*Wajib Belajar*” program. These are a national program that derived from New Order regime and yet still implemented up to now contained about qualified and competent teachers recruitment, education curriculum improvement and education facilities or school provision in all areas (Regulation of the Minister of National Education Number 2 on 2007). Related with those programs, theses research focused on the provision of educational facilities. Main public facilities that have important functions to endorse and describe the development progress are education facilities.

As the national policy and regional regulation, that school facilities provision was done with the basis of demographical and social characteristic aspect so far. And yet the determination of new facility considered just normative procedure as part of regional and local development plan. In some areas, the development of facility consider from the political motives of local leaders. Therefore, it is need more comprehensive and adaptive approaches to configure and describe the provision of facilities with the consideration of school service scales or rates. And also the facility services attributes development become important step that will result on the quality of services improvement. It also intended to eliminate the effects of school competition as it discovered in several previous research. Later, this study conducted in aims to configure and describe the rate and pattern of school services with the result more precision using the modified method called as cell or grid based catchment (CGC) method. As previous study had been conducted, areas with not optimal coverage or maximal service had identified or discovered using this method and it was figured in near precise rate (Setyono et al., 2016). Hence, from these research it also could be described the spatial connectivity between sub areas based on the educational facility services.

This research focused to measure and describes the educational facilities service rates and patterns especially for the elementary school as previous studies. And then this research conducted in the traditional or historical areas which are Surakarta and Yogyakarta. Again, the primary or elementary school was chosen as the focus of study. Basically, these aim to identify the competition or conflict of school services. In addition, the study will be done to discover if there is an imbalance or disparity of elementary or primary school services in the study area. These two traditional cities (Surakarta and Yogyakarta) has pretty similar conditions as a city that had been developed several hundred years ago and now become a growth center in the central part of Java. These conditions made those cities have unique characteristics. As the previous study areas, these cities were picked as a focus in an aim to configure main problems which are imbalanced of school service in the several parts of an area. It also expected that this research conducted to find of disparity of services in these two traditional cities.

2. SCHOOL SERVICES

Several studies were conducted to find the problem of school services as part of the school market study. Misra et al. (2012) suggest that geographical restrictions are subject to aggregation bias given that sometimes actual school competition is not captured. To

determine the size of the different school markets, the author drew a circle of about 1 km around each school. And that is similar to the assumption of research that uses national standards that school coverage is limited by illustrative boundaries. The problem is the method used to capture or identify coverage in each region especially to determine the level of service.

In another study, Hoxby (2000) measured competition in the school market by using the Herfindahl-Hirschman (HHI) market concentration index as a proxy for the level of competition faced by each school market. The index uses the application of the Geographic Information System (GIS) tool to enter the level of competition faced by each school from peer schools that are spatially located within a 1 km radius in their local market area. These fingers are considered and used in this study to identify coverage of primary school services. These considerations also exist in the National Standards (SNI) specifically to find out the coverage of public facilities. Regarding the scope of this service, some authors (Barrow & Rouse, 2005; Millimet & Collier, 2008) limit the school market or school service coverage based on geographical zones and district sizes, while others use the boundaries of school districts in the metropolitan area (Hoxby, 2000; Greene & Kang, 2004).

In contrast, Garcia-Diaz et al. (2016) conducted a study to identify the relationship between the concentration of city school markets (lack of competition) and technical efficiency of schools. Both efficiency and competition cannot be directly observed and are similar to our research. To measure school efficiency, researchers used the Stochastic Frontier Analysis (SFA) method to get a calculation of technical efficiency.

3. RESEARCH METHODOLOGY

As the previous studies, this research also done with aims to identify and configure the rate and spatial pattern of educational services, especially elementary school as the case of this study. There are several steps that need to be done in aims to discover the school service rates and also configure the school service spatial patterns. Setyono et al. (2016) conducted the modified method to identify school service rates in each area or sub-area at an initial stage which referred to as Cell or Grid Based Catchment (CGC) method. In specific, the CGC method was the derivation model of Floating Catchment Method (FCM) that introduced by Luo (2004).

FCM basically was used to identify urban facility services based on the interaction between distribution facilities and settlement coverage. Later this method was perceived had better pictures in order to configure the total number of coverage areas of school service and it will be caught as basic data of service rate calculation. This research process has similar characteristics with previous studies that had been done (Setyono et al., 2016), catchment method based on the cell or grid system was applied with the help of GIS tools especially related with buffer analysis tools. Technically, the first step was the study area (Surakarta and Yogyakarta) which divided into the cell or grid system and then it adjusted to the land use that existed in these areas. So that each cell will be had one type of land use which is kind of inbuilt and built-up types.

Furthermore, GIS tools were used to discover the service layer or coverage area of each school and then it would be caught by the cell or grid units. The radius of service or coverage layer for the elementary/primary school in Indonesia round about 1 kilometer and in another term, those school service or coverage can accommodate needs about 1 600

inhabitants (Setyono & Cahyono, 2017). Specifically, the service or coverage area must be surrounding the school units as it assumed that school only facilitated students in their neighboring areas. Later, it could be known the number of service layer or coverage that was caught in each cell or grid. For this method, service rates will be calculated in each administrative unit (village or sub-sub-district) with the formula as follow:

A further stage of this research is spatial connectivity analysis. This step will be done with the results of previous calculation/ analysis in the aim to find the elementary school service spatial relationships or patterns. To identify that aspect especially related to school service between parts inside the traditional cities area, the Moran Index 'I' was used (Setyono et al., 2016). This method could discover the connectivity between areas on the basis of elementary school service access which are indicated from index values. Areas with a high value indicated had good connectivity of school access while on the other condition, areas with low values indicated had no or low connectivity on school access.

This research focused on elementary or primary school as part of the educational development systems which are elementary school must be provided in each administrative areas. Furthermore, the provision of facilities has important aims which are a fundamental step to provide qualified, adequate and equitable educational services for all students as the regulation mandates. Surakarta City and Yogyakarta City were focused as a case study in this research. Those cities are known as the traditional city which means it has unique characteristics than other cities in Indonesia, especially for its cultural and historical aspects. It is expected that analysis results from those cities can describe the uniqueness of service patterns than other general cities.

4. STUDY AREA AND DATA

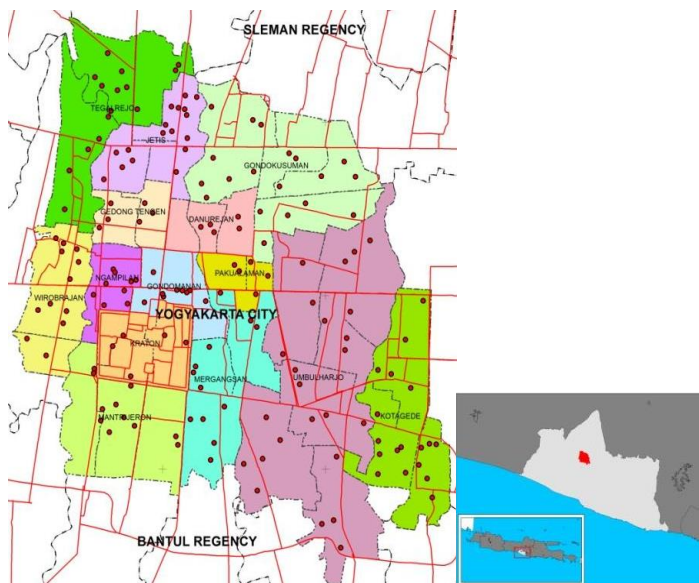
Up to 2015, Surakarta City has 261 primary or elementary school units which are consists of 254 unit general schools and seven unit Islamic schools. Those schools distributed in various parts of the city area (Mizunoya & Zaw, 2017). Furthermore, there are 169 elementary school units in the Yogyakarta City which are 167 general school units and 2 Islamic school units. There are significant differences between Surakarta and Yogyakarta City based on the elementary school availability. Till now, educational facilities development and improvement has been done in those cities with aim to provide better access of educational services for the students.

However, the existing distribution of schools in the Surakarta and Yogyakarta City area has differences significantly. In the Surakarta City area, each district has 40 to 50 school units on averages except two districts whereas the Serengan District has lowest number around 26 units and the Banjarsari District has the most number of facilities reach 82 units. Meanwhile, elementary school availability among the Yogyakarta City districts rather similar ranging around 5 – 19 units, except Umbulharjo District. In the 2015, that district has 25 school units and it became sub area with the most number of schools.

As for the conclusion, school in each Yogyakarta City districts has fewer number comparing with the Surakarta City districts. Later, calculation and determination process of elementary school service rates and patterns both in the traditional cities (Yogyakarta and Surakarta) was done based on the number and distribution of schools. The calculation not considered city area as analysis unit but specifically the sub district areas as analysis unit of this research. The elementary school availability condition both in Surakarta and Yogyakarta City can be seen as **Table 1** and **Fig. 1 & 2**.

Table 1. Distribution of elementary school in Yogyakarta & Surakarta City.

District	Population Number	School Number		
		General	Islamic	Total
Surakarta City				
Laweyan	88.278	53	1	54
Serengan	44.781	24	2	26
Pasar Kliwon	76.184	43	1	44
Jebres	141.614	54	1	55
Banjarsari	161.369	80	2	82
Total	512.226	254	7	261
Yogyakarta City				
Mantrijeron	32.691	11	-	11
Kraton	17.547	5	-	5
Mergangsan	30.275	12	-	12
Umbulharjo	86.580	24	1	25
Kotagede	35.285	18	1	19
Gondokusuman	46.840	18	-	18
Danurejan	18.905	6	-	6
Pakualaman	9.336	4	-	4
Gondomanan	13.507	9	-	9
Ngampilan	16.829	9	-	9
Wirobrajan	25.662	12	-	12
Gedongtengen	17.942	6	-	6
Jetis	23.834	18	-	18
Tegalrejo	37.271	15	-	15
Total	412.504	167	2	169

**Fig. 1. Elementary School Availability in Yogyakarta City.**

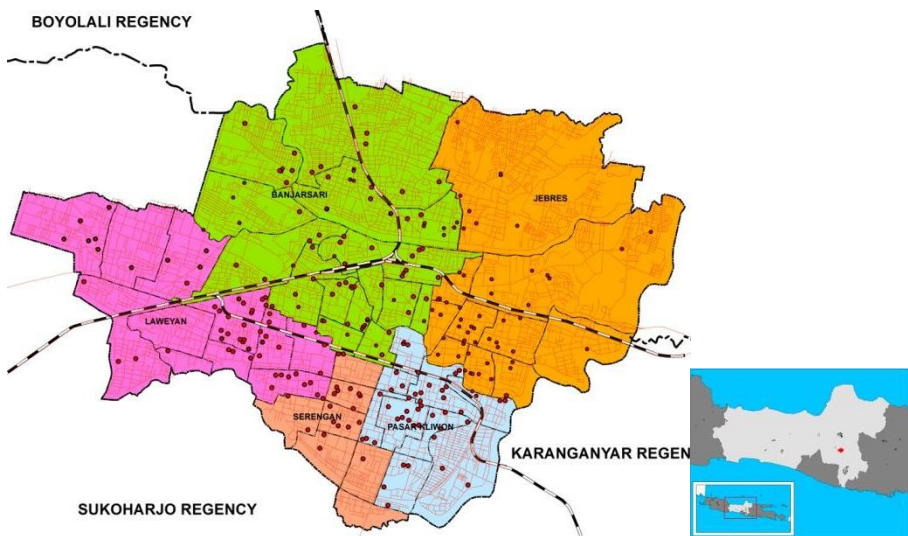


Fig. 2. Elementary school availability in Surakarta City.

5. DATA ANALYSIS

In the first stage, identification and calculation about school services rate was done by the school number that located on each sub-district either in the Surakarta and Yogyakarta City. Furthermore, a sub-district unit was used as the analysis units for this research. Basic assumption for the first method calculation was the communities or students were able to access the elementary schools only surrounding their residential areas or near their house/home. For the result, it was showed that rate of school services in the Surakarta were higher than the Yogyakarta average rates which are 84.5% compared to 70.4% respectively. In general, it can be described that the results both of Yogyakarta and Surakarta City could not meet community needs as normative quota for the new facility development.

School service rates for most districts and sub-districts in the Yogyakarta City indicate the similar or small range around 60% to 70%, except Gondomanan District which has 114%. Meanwhile, the school service rates on each districts and sub-districts in the Surakarta City relatively higher than the other cities which are range around 90% to 100%, except Jebres District with only 60%. From the analysis result, it showed that the students or peoples in Yogyakarta and Surakarta City has limitation which were only can choose educational facilities located inside the local administrative boundary only. The services of elementary school in these two traditional cities are on the quite low rate.

Cell or Grid Based Catchment (CGC) method was used for another step in this research. This method can be considered as a modified or advanced method when compared to the basic method. The method used the cell or grid system in aim to catch the service layer or coverage and then it can be define the service rates. The cell or grid that can affect for the service rate calculation is cell or grids that contain the built-up type.

Using the second method, it show that student in the Surakarta City can access various schools as it described that the number of layers which can be accessed on each sub districts around six layers to 65 layers. Those numbers are higher compared with original

number of elementary school that are available or exist in each sub-districts. For example based on data, the Surodiprajan sub-district only has two school units but the students in this area can access more than 65 school units from the calculation. The similar condition also occurs on another sub-district especially in the center-southern parts of the city whereas student in those areas can access more than 40 school units around their residential areas. Sub-district in the peripheral areas has small or limit number of layers which is around six units to 15 units. Detail results for the Surakarta City based on the CGC method shows in the **Fig. 3**. In aims to define the school service layer number on each sub-district in Yogyakarta City, the second method (CBC method) was used.

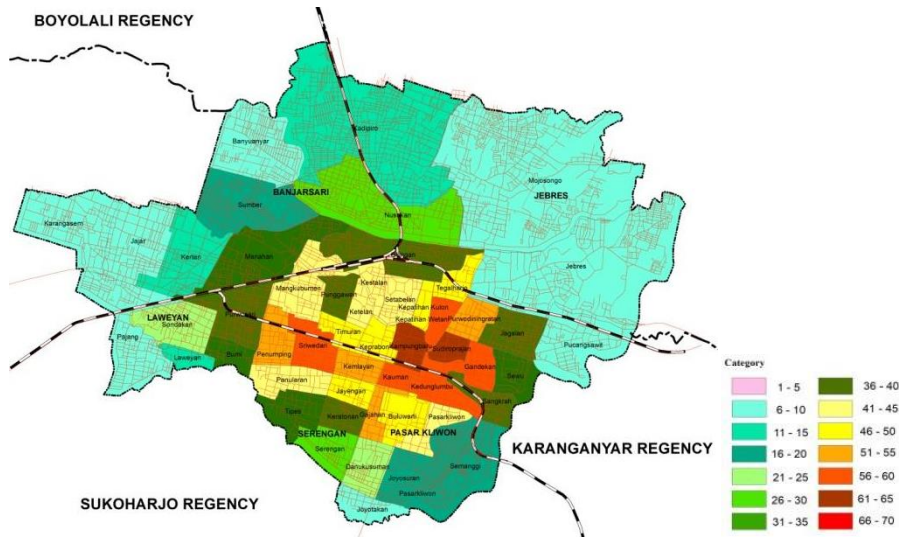


Fig.3. Elementary School Service Layer Rates based CGC Method in Surakarta City.

The process was done in the Yogyakarta City is relatively similar as identifying the school service layers in the Surakarta City. Furthermore, the analysis result show that number of service layers rather similar on each sub-district which is around 6 school to 25 school service layers. In detail, it shows that differences or gap between western and eastern part of the city especially related with number of school service layers. Sub districts that located in the west part of the city has high number of school layers ranged around 16 school to 25 school layers while sub-districts in the east part has lower number about six school to 15 school layers on average. Sub district that has highest number of school layers is Ngampilan sub-district with 26 school layer. It means that students or a community in the western part has better opportunities to access the elementary school than the eastern part of the city. As the result, sub-districts in the Yogyakarta City can catch low number of school service layer comparing with the sub-districts of Surakarta City which is can catch a high number on average. Detail result of the second catchment method in Yogyakarta City area can be figure as in **Fig. 4**.

These Cell/Grid Based Catchment method result was used for the further step of analysis which is calculating the rate of elementary school service among the sub-districts both in the Yogyakarta and Surakarta City. In general, the service rate was higher than using the previous basic method and it described that the students and communities from

both cities has better access to various school units around their residential area. At first, it was found that in Surakarta City the school services rate in average are much higher which more than 1 000 %. Those rate also higher comparing with the Yogyakarta City rate which was around 350 %. Moreover, the Surakarta City analysis result show that the districts has high rate which more than 1 000 % especially in the Pasar Kliwon, Jebres and Banjarsari District (**Fig. 4**). Those means elementary schools on these districts can accommodate the need of communities 10 times higher. In the sub-district level, several areas has the high rates of school service i.e Kepabron, Timuran, Kepatihan Kulon, Sriwedari, Kampung Baru and Kauman which more than 2.500 %. Elementary school service rates for most sub-districts are high but some areas have low rates which are Kadapiro, Mojosongo and Jebres (**Fig. 4**). All of those sub districts located in outer and northern part of Surakarta. In contrast, the high rate areas concentrated in the city center that was located in southern part of the city.

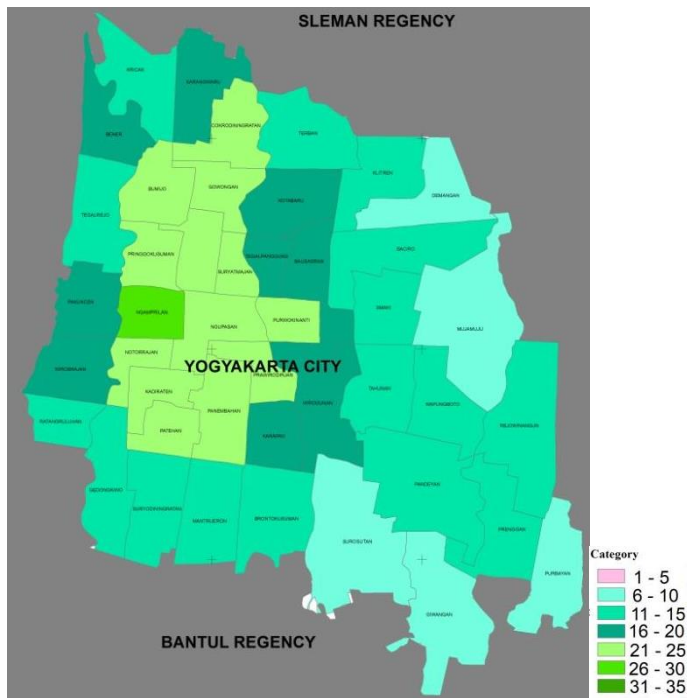


Fig. 4. Elementary School Service Layer Rates based CGC Method in Yogyakarta City.

Meanwhile, school service rates in Yogyakarta City show different pattern. In general, service rates among districts in Yogyakarta rather similar around 200 – 300%. District with highest rate of services was Pakualaman with 628% while the lowest rate district was Kotagede and Mantrijeron with 175% and 180% respectively. On the sub-districts level, all of sub districts have service rates above 100% and those means all students or communities in this city can access or choose elementary school not only on their residential boundaries but also facilities outside the boundaries. There were no significant differences among the sub districts related with elementary school service rates.

As it was said before, the result from this second method higher than the previous method and these could be predicted as better result. The analysis has more advanced screening comparing with the basic results. It also described that there was wide gap of school service between sub districts in the Surakarta and Yogyakarta City.

School service patterns in the Surakarta City figured that the city centre has the high – high rate of connectivity compared with the peripheral areas which has neighborless rate of connectivity. It can be described that there is strong concentration of elementary school service in the centre of Surakarta City. However, there is no area with neighborless rate of connectivity in the Yogyakarta City and it show that the connectivity among the city sub districts similar. Configuration map can be seen in the **Fig. 5 & 6**. Based on the pattern, it can be concluded that the elementary school services in the Yogyakarta City more balanced than in the Surakarta City.

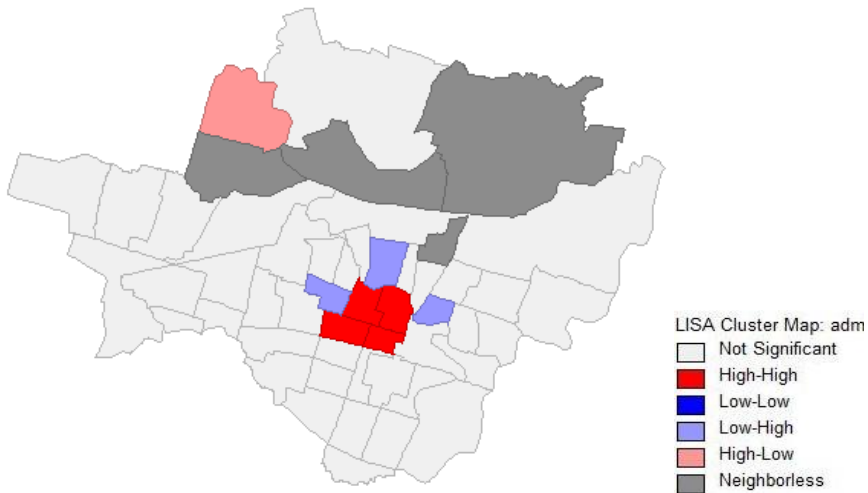


Fig. 5. School Service Connectivity Patterns in the Surakarta City based on LISA Cluster.

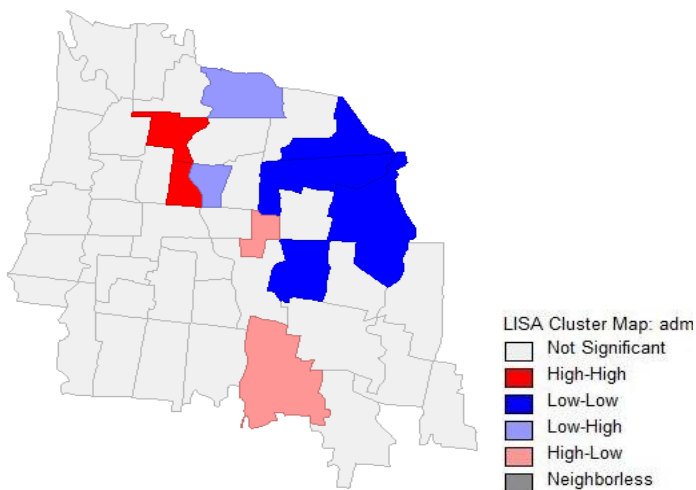


Fig. 6. School Service Connectivity Patterns in the Surakarta City based on LISA Cluster.

6. CONCLUSIONS

In general, these research result shows that there was significant differences related with the rate and pattern of elementary school services between these traditional cities. Elementary schools in the Surakarta City has higher service rates than in the Yogyakarta City based on the Cell/Grid Based Catchment (CGC) method, However, there was significant gap about school service among the Surakarta City sub districts especially between the city centre areas and peripheral areas. Several sub-districts have lower school service rates (below 100 %). Meanwhile, the school service rates among the sub-districts in the Yogyakarta City rather similar and there is no sub district has lower rates (below 100 %). It means that service pattern between these two traditional cities was different.

This research was part of our teamwork about educational facility service pattern researches. In the past, we already analyze the rate and pattern about elementary school service in the medium-size city. In the future, we continue to research about school service pattern in the rural areas and metropolitan areas.

REFERENCES

- Barrow, L. and Rouse, C. E. (2005) Using market valuation to assess public school spending. *Journal of Public Economics*, 88(9-10), 1747 – 1769.
- Garcia-Diaz, R., del Castillo, E. and Cabral, R. (2016) School Competition and Efficiency in Elementary Schools in Mexico. *International Journal of Education Development*, 46, 23–34.
- Greene, K. V. and Kang, B. G. (2004) The effect of public and private competition on high school outputs in New York State. *Economics od Education Review* 23(5), 497 – 506.
- Hoxby, C. M. (2000) Does Competition Among Public Schools Benefit Students and Taxpayers?. *American Economic Review*, 90(5), 1209–1238
- Millimet D. L. and Collier, T. (2008) Efficiency in Public Schools: Does Competition Matter?. *Journal of Econometrics*, 145(1–2), 134–157
- Minister of National Education RI (2007). Minister of National Education RI Policy No. 24 – 2007 about Facilities and Infrastructure of Elementary, Junior High Schools and Senior High School Standards. The Republic of Indonesia
- Misra K., Grimes, P. W. & Rogers, K. E. (2012) Does Competition Improve Public School Efficiency? A Spatial Analysis. *Economic Education Review*, 31(6), 1177–1190
- Mizunoya, S. & Zaw, H. T. (2017), Measuring The Holes of The Ship: Global Cost Estimations of Internal Inefficiency in Primary Education. *Int. Journal of Education Development*, 54: 8–17
- National Standardization Agency of Indonesia (2004), National Indonesian Standard (SNI) 03-1733-2004: The Procedures for Planning a Residential Neighborhood in Urban Areas, National Standardization Agency of Indonesia, Indonesia. http://sisni.bsn.go.id/index.php/sni_main/sni/detail_sni/6861 [Accessed Mach 2019]
- Setyono, D. & Cahyono, D. D. (2017) School services pattern in urban and rural areas: a comparatives study (Case study: Elementary school in Malang City and Malang Regency). *IOP Conference Series: Earth and Environmental Science*, 70: 012051.
- Setyono, D., Cahyono, D. D. & Helmy, M. (2016) Measuring Service Capacity of Public Facilities Based on Supply Aspect (Case study: Elementary school in Malang City). *Procedia-Social and Behavioral Sciences*, 227: 45–51.
- UNESCO (2017) Education for sustainable development goals, UNESCO Publishing, Paris, Retrieved from: <http://unesdoc.unesco.org/images/0024/002474/247444e.pdf> [Accessed Mach 2019]