Infrastructure Development in Surakarta Suburbs (A Case of Expansion of Kadipiro Urban Village, Banjarsari Sub-District, Surakarta City)

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Abstract. Acceleration of urban development will be carried out to create a safe and comfortable livable city; and city competitiveness. In order to reduce the inequality of the rapid development of the city of Surakarta, infrastructure development is directed at several suburban areas. Banjarsari Subdistrict is one part of the suburbs of Surakarta City in the northwest which has increased activity. This results in the need for facilities and infrastructure services that can meet the needs of the community. Especially in the expansion of the Kadipiro Urban Village area, infrastructure development is carried out to facilitate the potential of the periphery to be able to increase economic growth. The purpose of this study is to analyze the availability of infrastructure in the suburbs of Surakarta City, especially in the area of Kadipiro Urban Village. The research method used is a quantitative rationalistic deductive approach with needs and availability analysis techniques based on frequency distribution data processing. The result concludes that the expansion of Kadipiro Village of Surakarta City makes a suburb that has fast growth. The needs of facilities and infrastructure are estimated based on the minimum service standards that have been set and the minimum population served has met the needs. The coverage of existing facilities and infrastructure services needs to be improved.

Keywords: infrastructure, area, suburb

1. Introduction
The strategic position of Surakarta city in Central Java Province brings a rapid development in the supply of urban infrastructure. Along with the development of the population, it is necessary to meet the needs of urban infrastructure and increase living facilities. Related to the expansion of the city, the development of urban space requires a wide space. However, limited space as an unavoidable obstacle needs land consolidation and reserve to be carried out for the benefit of providing urban facilities and infrastructure. Banjarsari Subdistrict is one of the areas in the southwestern part of Surakarta city which has an area of 1481.10 Ha or 33.63\% of the total area of Surakarta City. It consists of 13 villages, one of which is Kadipiro Village, which is an expansion area into three sub-districts. In accordance with Surakarta City Regulation No. 11 of 2017 concerning the Expansion of the Semanggi and Kadipiro Villages, Kadipiro Village is divided into 3 (three) Villages namely Banjarsari, Kadipiro, and Joglo.
Villages. The enactment of this regulation was effective from January 1, 2019. Therefore, the standard services of facilities as centers of community activities are currently still an administrative area. This study aims to analyze the availability of infrastructure in the Kadipiro expansion area so that services to communities experiencing new territories can be fulfilled.

Regional inequality is one of the problems that usually arise in development. Regional inequality becomes significant when the area within an administrative boundary consists of a variety of potential natural resources and geographical location.

The development process has three objectives, namely increasing availability, expanding the distribution of various facilities and infrastructure for people's living needs, and improving overall social living standards [1]

According to Setiadi (2006) [2], infrastructure development can lead to economic growth, both directly and indirectly. Infrastructure is a prerequisite for other sectors to develop.

Referring to the physical system, infrastructure provides transportation, irrigation, drainage, buildings and facilities to meet basic human needs in social and economic life. Infrastructure systems can be interpreted as basic facilities which are built for social and economic needs. According to Stiglitz, 2000, infrastructure tends to lead to public goods provided by the government.

World Bank (1994) [3], divided infrastructure into three parts, namely: 1) economic infrastructure as the development of physical infrastructure such as utility of electricity, communication networks, water, sanitation and gas; public works infrastructure such as roads, dams, canals, drainage, irrigation; and the transportation sector such as airports, terminals, stations and ports; 2) social infrastructure as infrastructure that leads to human development and its environment, education, health, worship housing, and markets; and 3) administrative infrastructure as infrastructure in the form of law enforcement, administrative control, and coordination.

According to Mulyono Sadyohutomo (2008) [4], the role of public infrastructure and facilities is as a facility that is needed by the wider community which is carried out simultaneously by the government as the party responsible for meeting the needs of the community both primary and secondary needs. This responsibility concerns the provision and management of management. Although the implementation of the provision is not entirely by the government, it can be implemented by private sector officials.

Yunus (2008) [5], defined Peri-Urban as the area surrounding the city. The location of this region has a character between urban and rural areas. Initially, the peri-urban area (WPU) had a rural function with the activities of its people as farmers who used agricultural land. In its development, peri-urban areas have changed into urban areas. This is indicated by the conversion of agricultural land into settlements, trade and services, and industry. In the physical character of the WPU morphology, it can be identified from the outer boundaries of built-up land, a city that is compact with urban land, characterized by 100% appearance of non-agrarian land use to 100% characterized by agricultural landforms. The existence of non-agrarian land use shows urban spreading outwardly and the closer the distance to the main urban area. Thus, it indicates the more intensive development of the urban physical appearance, the further the intensity is, the urban development will diminish. In its socio-economic character, WPU is characterized by increasing population growth and economic activity. In fact, population growth and activities are always followed by increasing demands for the use of space for living and for their activities. The development of facilities and infrastructure plays an important role in meeting the needs of the community.

In general, infrastructure can be defined as a physical facility in developing or building public uses through the provision of goods and services to the public. Facilities and services infrastructure is usually provided free of charge or at affordable and controlled prices (Akatsuka and Yoshida, 1999) in Rindang Bangun Prasetyo (2010) [6].

The infrastructure system is a major supporter of the functions of social and economic systems in people's daily lives. Infrastructure systems can be defined as facilities or basic structures, equipment, installations that are built and needed for the functioning of the social and economic systems of the community.
Infrastructure is an important component of production activities and can affect economic activities. Improving infrastructure facilities can encourage technological development so that efficiency can be achieved in production activities. Through efficiency, it will create greater output and employment opportunities. On the other hand, the availability of adequate infrastructure can increase regional investment (Kodoatie [7], 2000).

Infrastructure can also be classified into basic and complementary infrastructure. Basic infrastructure covers sectors that have public characteristics and interests that are fundamental to other economies, which cannot be traded (non-tradeable) and separated either technically or spatially; for example: highways, railroads, seaports, drainage, dams, and so on. On one hand, complementary infrastructures are, such as, gas, electricity, telephone and drinking water supply. Basic infrastructure is usually organized by the government because of the nature needed by the wider community. However, in its provision, the government can work with business entities or the private sector.

The Government through Presidential Regulation No. 42 of 2005 concerning the Committee for the Acceleration of Infrastructure Provision, explained several types of infrastructure whose provision is regulated by the government, namely: transportation infrastructure, road infrastructure, irrigation infrastructure, water and sanitation infrastructure, telematics infrastructure, electricity infrastructure, and oil transportation and natural gas infrastructure. The classification of infrastructure can be categorized as basic infrastructure because it is needed by the wider community so that its provision needs to be regulated by the government.

2. Research Method
In this study, identification of the availability and quality of environmental infrastructure in the Kadipiro Region was analyzed using a quantitative descriptive method based on the results of questionnaires and observations obtained in the field to determine the availability, quality, and distribution of environmental infrastructure in urban suburbs. Descriptive method was used to examine groups of people, objects, conditions, and thoughts. The stages in this study are the formulation of problems (problem statement), determining the purpose of research, limitation of substance and spatial, formulating theoretical framework, both explicitly and implicitly, data collection, statistical analysis, interpretation of results, recommendations and reporting, John W. Creswell [8] (2009).

This descriptive method is considered in accordance with the research conducted where the writer tries to identify and analyze the availability of environmental facilities in the periphery, in the planning of the next 10 (ten) years with the limitations of observations on community needs facilities.

3. Data and Analysis
The development of Kadipiro Village covers 3 regions, namely: Kadipiro, Banjarsari, and Joglo. The map of the region can be described as follows:
With the Regional Regulation (Perda) of Surakarta City No. 11 of 2017, Kadipiro Village with a population of ± 55,532 people is divided into Banjarsari Village with a population of ± 18,866 people, Kadipiro Village with a total population of ± 23,268 people, and Joglo Village with a population of ± 13,398 people.

The area of Banjarsari Village is + 2.33 km\(^2\) with the following borders: North= Karanganyar Regency; South= Joglo Village; West= Kadipiro Village; and East= Mojosongo Village.

The total area of the Kadipiro Village as the result of the expansion is + 1.81 km\(^2\) with the following borders: North= Boyolali Regency; South= Nusukan Subdistrict; West= Banyuanyar and Boyolali Districts; East = Banjarsari Village.

The area of Joglo Village is + 0.86 km\(^2\) with the following borders: North= Banjarsari Village; South= Nusukan Subdistrict; West= Nusukan Village; East= Mojosongo Village.

3.1 Analysis of Supporting Facilities and Infrastructure Requirements Due to Changes in Administrative Borders and Development of New Activities

The need for facilities and infrastructure is estimated based on the minimum set of service standards, the minimum population served, and the range of existing facilities and infrastructure services. The division of the administrative area of Kadipiro Village into three urban villages will affect the estimated development of basic urban facilities and infrastructure based on minimum service standards especially related to government service office facilities.

3.2 Changes and Projections of Population Numbers

In addition to changes in the administrative area of Kadipiro Village into three, namely Kadipiro, Banjarsari and Joglo Villages, consideration of the analysis of the needs of basic regional facilities and infrastructure is based on the minimum number of supporting residents in order to find out the facility and infrastructure needs of the population for the next 10 years (i.e. 2029).
Table 1. Population Development in 2011-2016 before Division

| No. | Village | Population | | | | |
|-----|---------|------------|---|---|---|---|
|     |         | 2011       | 2012 | 2013 | 2014 | 2015 | 2016 |
| 1   | Gilingan| 17,827     | 21,718 | 20,255 | 19,716 | 20,091 | 20,466 |
| 2   | Nusukan | 27,841     | 29,502 | 30,998 | 30,398 | 30,811 | 31,224 |
| 3   | Kadipiro| 46,867     | 48,467 | 53,461 | 52,712 | 54,036 | 55,359 |

Source: Banjarsari Subdistrict in Number 2012-2017

Table 2. The Trend of Population Development and Projections after Division

| No. | Village | Po | r | 1+r | Population Projection |
|-----|---------|----|---|-----|-----------------------|
|     |         | 2018 | | | 2019 | 2024 | 2029 |
| 1   | Gilingan| 22,297 | 0.0232752 | 1.0232752 | 22,816 | 25,598 | 28,719 |
| 2   | Nusukan | 30,243 | 0.0192967 | 1.0192967 | 30,827 | 33,918 | 37,319 |
| 3   | Kadipiro| 22,892 | 0.028143 | 1.028143 | 23,536 | 27,040 | 31,065 |
| 4   | Banjarsari| 19,220 | 0.028143 | 1.028143 | 19,761 | 22,703 | 26,082 |
| 5   | Joglo   | 13,396 | 0.028143 | 1.028143 | 13,773 | 15,823 | 18,179 |

Source: Analysis of the Drafting Team, 2018

3.3 Analysis of Distribution of Community Activity Centers

Community activity centers in Kadipiro are scattered and have a service scale ranging from the city, sub-district to village levels. There are many activity centers, but only 4 centers of activities which become points of interest for the community. The centers of these activities include:

a. Education: elementary school, junior high school, senior high school, and college
b. Trade: markets, big trade, and shops
c. Offices: village offices
d. Health: hospitals, community health center and supporting community health center

3.4 Analysis of Distribution of Public Facilities

Basically, the existing educational facilities are quite complete in the study area, from kindergarten to higher education. The distribution is also quite evenly able to reach the entire service area. However, the construction of the airport railroad and the development of double track railways, along with a wall of restrictions/safety, has caused some educational facilities more difficult to reach. Residents must turn around to access the facility. Travel time is also increasing. Not to mention, the congestion has increased due to the loss of alternative accesses that can no longer be passed because of the closed railroad network.

Meanwhile, the expansion of one region of Kadipiro into three new urban areas namely Kadipiro, Banjarsari, and Joglo, ideally also change the minimum needs of basic facilities and infrastructure that must be provided by each village. Following are the estimates of basic facilities and infrastructure needs that must be provided to residents until the end of the planning year of 2029 with the provisions of SNI 03-1733-2004.

4. Kadipiro Village

Plans for the construction of a double railroad track consisting of airport link lines and existing rail lines will divide the eastern and western Kadipiro Village. However, the regional government has anticipated the division of Kadipiro Urban Village into three villages. In accordance with Surakarta City Regulation No. 11 of 2017 concerning the Expansion of the Semanggi and Kadipiro Villages, Kadipiro Village was divided into 3 (three) villages namely Banjarsari, Kadipiro, and Joglo Villages. The enactment of the
regulation was effective from January 1, 2019. Thus, the standard service facilities as the centers of community activities are currently still an administrative area. However, it is necessary to recalculate the service needs of community activities in 2018 if the regulation has been implemented.

The following is the calculation of the distribution of community activity centers in Kadipiro, Banjarsari and Joglo Villages:

**Table 3. Distribution of Public Facilities in Kadipiro Village in 2019**

| Village | Education | Trades | Health |
|---------|-----------|--------|--------|
|         | Elementary | Junior High | Senior High | College | Store | Posat Store and Market | Market | Village Office | Supporting Community Health | Hospital |
| Kadipiro | 8 | 5 | 5 | 0 | 4 | 1 | 0 | 1 | 0 | 0 | 0 |
| Banjarsari | 4 | 2 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| Joglo | 6 | 2 | 2 | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 0 |

*Source: Analysis of Drafting Team, 2018*

Based on the data above, several points must be considered regarding the distribution and service of community activity centers; among others are:

1. It is necessary to add the number of elementary, junior and senior high school education centers in each village so that education services are evenly distributed so as to minimize community movements, especially those crossing the Joglo Cross (because only Joglo Cross will be opened in the Kadipiro Village division);
2. For higher education service, it is the scale of the city service so that the people are directed to continue using official crossings, namely Joglo, Ngemplak, and Tanggul crossings;
3. Ideally, each village has a 1-unit shopping center + environmental market with a scale of 30,000 residents. It needs to be provided for the Kadipiro and Joglo Villages. Shopping centers and environmental markets are one of the highest generation factors besides education, so they need to be provided as needed by considering locations. Thus, prospective buyers and prospective sellers do not need to cross Joglo crossings;
4. The existing urban office will be replaced with the Banjarsari/ Sekip Urban Village office, while the Kadipiro and Joglo Urban Village offices are still in the initial development process. Village offices are the center of community activities that are essential for population services so that it is important in the selection of new locations;
5. Health services for supporting community health centers, community health centers are sufficient so that public health services are expected to be fulfilled. This means that the need for health services is on site in each of the newly created villages. Meanwhile, the hospital is the scale of city services so that if the community wants to access it then they are directed to pass through the official crossing, namely Joglo;
6. The need for a community activity center to support the village level government services (30,000 supporting residents) is in the form of a multi-purpose hall/youth center of each village.
4.1 Analysis of Community Movement Patterns and Traditional Pathways

In macro terms, the pattern of community movements in the region is influenced by the pattern of road structures that connect activity centers. The pattern of movement from north to south is served through the primary collector road of Solo-Purwodadi Boulevard until the Simpang 7 (seven intersections) Joglo which is continued through the secondary collector road of Kol. Soegiyono street that meets with Lt. Jen. Sutoyo, Street and Capt. Piere Tendean Street which meets A. Yani Street as the Solo-Ngawi arterial road. Congestion points occur on the Joglo railroad doorstop which is a meeting of Simpang 7 (intersection 7).

The pattern of movement from the north is also served by primary local roads (inspection roads) along the edge of the railroad tracks from Jetak (under Soker Highway) in the north to Tanggul crossing in the south. This inspection road has an important role in assisting community movements, especially if all railroad crossings are closed and walled to the official crossing that remains open such as Joglo and Tanggul. Meanwhile, the pattern of community movements from west to east is served by artery street, Letjen Suprapto Street, Kimangun Sarkoro Street - Joglo Cross - Sumpah Pemuda Street up to the ring road which is connected to the Solo-Ngawi arterial road. In addition, the movement pattern from the west to east is also served by A. Yani street which is also an arterial road. The congestion point occurs at Ngemplak intersection because there is a traffic light.

Before the traditional crossing (without crossing) in the Kadipiro village was closed, many of the people who moved from west to east through the traditional crossings were mainly motorbikers. The traditional crossing is the easiest and fastest route from the center of community activities on the west side (Stikes PKU Muhammadaiyah, Regional Hospital of Surakarta, housing) to reach the destination on the east side (industry and housing) because it can directly access the highway. However, if the traditional crossing is closed, then all motorized vehicles must turn around to arrive at the Joglo doorstop. This causes the density of vehicles in the Joglo intersection. As a result, the congestion gets worse.
Estimated severe congestion is also found at Tanggul crossing. Congestion is caused by the high flow of two-wheeled vehicles that cross Tanggul as a result of the closing of traditional crossings, not because of the crossing of railroad tracks. According to information from residents in the vicinity of the embankment, the crossing of the railroad tracks is not in the same level as the railway line above and on Tentara Pelajar (local road) is below. Thus, the estimated congestion point occurs at the intersection of Jl. Tentara Pelajar with Letjen Sutoyo Street.

At Ngemplak crossing, it is estimated that there is no significant impact because the road class is already arterial, and the type of crossing is not at the same level. In addition, the effect of closing traditional crossings has been transferred to Joglo and Tanggul Crossing. Congestion is estimated to occur because of the bottle neck under the railroad crossing, causing a slowdown in the vehicle's speed.

5. Conclusion
From the results of the study, it can be concluded that the expansion areas of Kadipiro Village into 3 (three) regions, namely Kadipiro, Banjarsari, and Joglo Villages makes a suburb of Surakarta City experience rapid development of the activity. In meeting the community's needs, it has been calculated based on the population and provisions of SNI 03-1733-2004.

In the region of expansion, it still needs complete and educational facilities (elementary; junior and senior high Schools), shops, markets, and government offices in Joglo and Banjarsari villages. For health facilities, they have been fulfilled.

The pattern of transportation movement in the study area which is quite dense is influenced by the pattern of road structures that connect the center of activity. The problem is there is congestion in the Joglo railroad crossing, which is a meeting of 7 road segments (intersection 7).

6. Recommendation
The coverage of existing facilities and infrastructure services needs to be improved. The solution to overcoming congestion problems in the Simpang 7 area is to immediately realize a plan to build flyovers.
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