Impact of Infrastructure Availability to the Level of Slum Area in Banyumanik District

Khristiana Dwi Astuti[1, a)], Pangi[1, b)], Bayu Ika Mahendra[2, c)]

[1]*Vocational School, Diponegoro University*
[2]*Master or Urban and Regional Planning, Diponegoro University*.

[a)] Correspondence author: khristiana.dwiastuti@live.undip.ac.id
[b)] pangi@pwk.undip.ac.id
[c)] bayu.im@gmail.com

Abstract. Slum especially in big cities such as Semarang City occurred not only in the inner city but also spread to the suburbs of Semarang City, one of them in Banyumanik District. Based on the Decree of Mayor of Semarang no. 050/801/2014 about Determination of Slum Location at Semarang City, there are 6 (six) urban villages in Banyumanik District which have slum areas. Determination of the slum area is based on the Semarang City Slum Inventory Study from 2010 to 2014. As a consequence, it is known that the main problem causing the development of slum settlement is related to the availability of environmental infrastructures : road network, sanitation, clean water, and drainage. This research was conducted to determine the slum level in the slum areas located in Banyumanik district based on the availability of environmental infrastructure. The analysis included descriptive analysis to explain the characteristics of slum settlements and the availability of existing environmental infrastructure, and scoring analysis to determine the impact of the availability of this infrastructure on the slum level. Based on the results of the analysis, shows that the slum settlements in RT 01 / RW IV of Jabungan have the highest slum level in Banyumanik district.

Keywords : infrastructure, availability, slum area

INTRODUCTION

Development that occurs in a region or city can be identified from various conditions, both physically and non-physically related to the social condition of the community. One form of development which can be seen physically is settlements expansion as an implication of urban population growth, changes in socioeconomic conditions, and interactions contained in it [1].

The population growth phenomenon is not balanced with the provision of the infrastructure of the city. Therefore, the development that occurs actually results in a decrease in environmental quality, potentially create slum settlements. Most of the time, slums grow naturally and cannot be avoided. Slum with various conditions not only revolve around the inner city but also to the periphery.

The slum develops due to the demand of occupancy for people who are coming from other areas [2]. The migrant initially aims to find better jobs and livelihoods in the city. However, high competition and no skills required by the jobs causes them work in the informal sector. The main work of the informal sector affects the purchasing power to have a comfortable house for both location and condition of the building. As a result, there emerged slums with a variety of poor conditions, including limited physical structures, quality of buildings that did not have health requirements, limited environmental infrastructure, and so on [3].

Semarang City as the capital of Central Java Province is one of the big cities in Indonesia which is in the process of growth and development. Currently, Semarang City has developed into a large city that has a variety of functions, as a regional administrative center, and is devoted to trade and services. This is in line with the vision of RPJMD (medium-term development plan) Semarang 2016-2021 "Semarang City of Great Trade and Services Toward Increasingly Prosperous People" [4]. This is certainly a positive implication for Semarang City

itself. On the other hand, it presents a challenge because the development will bring more diverse activities that encourage the fulfillment of supporting infrastructure, one of which is the need for housing.

The housing needs are met through the planned and unplanned housing, under various conditions. When a house that is occupied is no longer following the prerequisite of a healthy house, it will become a slum neighborhood. Slum areas have a limited level of infrastructure and basic facilities environment services, especially the limitations to obtain services clean water facilities, drainage and sanitation [5] [6].

Under the Decree of Mayor of Semarang No. 050/801/2014 about Determination of Slum Location at Semarang City, it is determined that Semarang has 415,83 Ha slum that is spread in 62 (sixty-two) sub-district. Among these slum locations, 6 (six) sub-district are located in Banyumanik district, i.e.: Ngesrep, Padangsari, Jabungan, Tinjomoyo, Srondol Kulon, and Gedawang .

That determination is influenced by the environmental infrastructure availability in settlement area, which includes: road network, clean water, sanitation, drainage, and garbage [7].

INFRASTRUCTURE AVAILABILITY AT SLUM AREA

Referring to the Slum Settlement Management Program of Semarang City, the main problem causing slum is related to the availability of road network, drainage, clean water and sanitation [8]. According to Law No.1/2011 about Housing and Residential Areas, the infrastructure is the basic physical completeness of a residential environment with specific standards to stay: healthy, safe and comfortable. The regulation, Guidelines of the Slum Identification at the Metropolitan Buffer Area [7] explained that a slum settlement area must have road network, drainage network, clean water network, wastewater network and solid waste network.

The existence of environmental infrastructure has a vital role in supporting the activities of a settlement. In addition, infrastructure as a physical facility becomes a potential factor in determining the success of a region's development [9].

METHODS

The method used to describe the characteristics of the slum in Banyumanik District is descriptive statistic, which is related to the number and physical condition of the house, and the socio-economic condition of the community. In addition, descriptive analysis is also conducted to determine the characteristics of the availability of environmental infrastructure in the slum area. That condition identified by observing the phenomenon of slums growth that found in large cities, including Semarang. Based on the tendency of slum settlements, there is a decrease in the quality of settlement environment, which is influenced by the limited availability of environmental infrastructure [10] .

TABLE 1. Research Variables

Variable		Measured Parameter
Slums area	General characteristics	- The dimension of the house - Number of houses - Number of household members
	Physical condition	- Building conditions (floor, wall, roof, and distance between buildings)
	Socio-economics condition	- Income level - Education level
Settlement infrastructure	Road network	- Road condition - Road material
	drainage	- Network availability - drain dimensions - drain condition
	Clean water	- water sources - fresh water quality
	sanitation	- private latrine - commmunal latrines - management of communal latrines
	Solid waste	- number of the private trash bin - the household waste disposal system - number and location of the garbage dump

Meanwhile, scoring analysis is used to provide an assessment of the availability and service of infrastructure in each sub district that has slum areas in Banyumanik. Through these assessments then the analysis was used to determine the slum level in the study area.

TABLE 2. The Criteria That Used for The Analysis

No	Variable	Object	Score	Criteria
1.	Road condition	Neighborhood road	50	Bad condition > 70%
			30	Medium condition 50% - 70%.
			20	Good condition < 50%.
2.	Drainage condition	Drainage network	50	Bad condition >50%
			30	Medium condition 25% - 50%.
			20	Bad condition < 25%.
3	Clean water condition	The number of houses in residential areas that have obtained water flow from the water supply system.	50	The area with the level of piped water system service <30%
			30	The area with the level of piped water system service 30%-60%
			20	The area with the level of piped water system service >60%
4	Sanitary condition	Sanitation in the residential area	50	Areas with sanitation services < 30%.
			30	Areas with sanitation services 30%-60%.
			20	Areas with sanitation services >60%.
5	Garbage condition	Solid waste in the residential area	50	The area with the level of garbage service <50%.
			30	The area with the level of garbage service 50%-70%
			20	The area with the level of garbage service >70%.

SLUM CHARACTERISTIC

Determination of Slum Location at Semarang is based on the results of previous studies, *Inventory and Identification of Slums in Semarang City 2010-2014*, and its existence is administratively legal and does not conflict with the spatial regulation of Semarang City. Referring to the results of the inventory, in Banyumanik District there is 27.5 ha of slum area and consists of 321 housing units [11].

TABLE 3. Number of Slum Houses at Banyumanik District

No	Subdistrict	Location	Wide (ha)	Number of houses
1.	Ngesrep	RT 05/RW II	0,59 Ha	22 units
2.	Padangsari	RT 03/RW III	0,49 Ha	30 units
3.	Jabungan	RT 01/RW V	11,68 Ha	41 units
		RT 01/RW IV		40 units
		RT 4/RW II		92 units
4.	Tinjomoyo	RT 01/RW I	5,53 Ha	35 units
5.	Srondol Kulon	RT 06/RW I	3,67 Ha	35 units
6.	Gedawang	RT 05/RW II	5,54 Ha	26 units

Source: Decree of Mayor of Semarang No. 050/801/2014, observation, 2016

Physical condition

Land area and Building Area

The average of slum land area in Banyumanik district varies from 50 m^2 to 150 m^2. Whereas, the comparison of the building's floor area to the land area was quite varied, ranging from 50% to 80%, even though some reaches 100%.

Distance between buildings

The average of distance between buildings is 2-3 m (RT 01/V of Jabungan, RT 05/II of Ngesrep, and RT 03/III of Padangsari). In addition, most of them do not have distance at all (RT 01/IV of Jabungan, RT 04/II of Jabungan, RT 05/I of Tinjomoyo, RT 06/I of Srondol Kulon, and RT 05/II of Gedawang).

TABLE 4. Land Area and Building Area of Slum in Banyumanik District

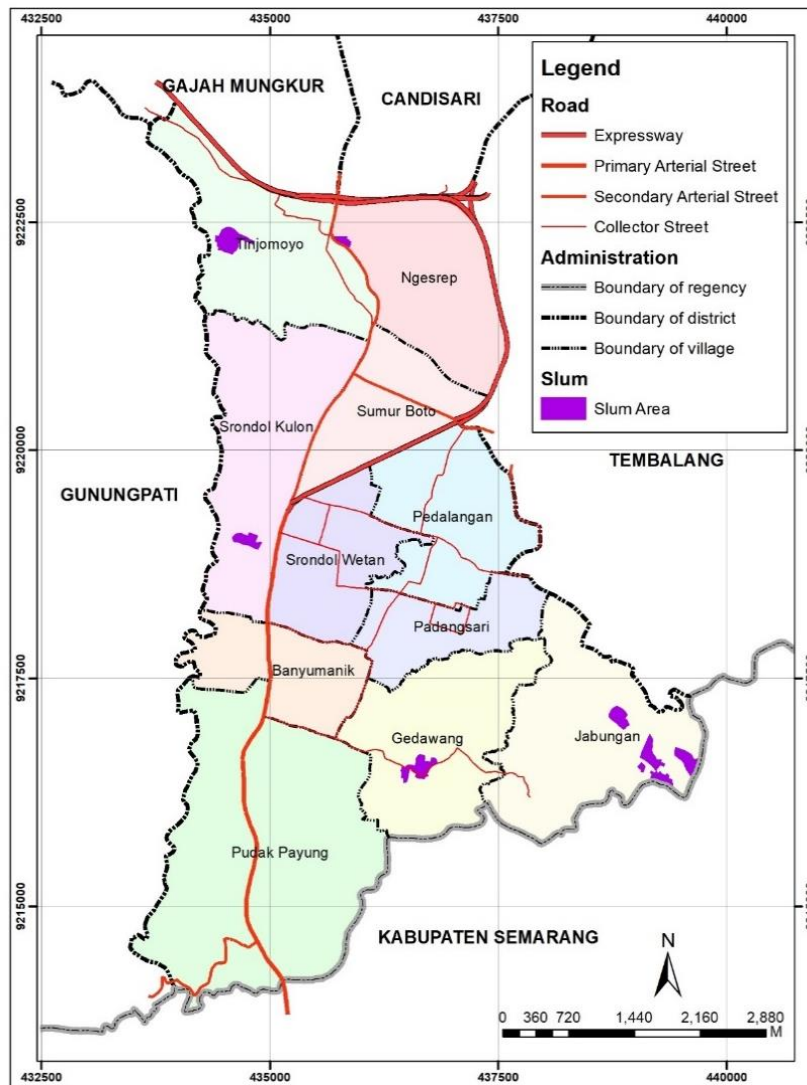| Location	Average of land area (m^2)	Average of building area (m^2)
RT 05/II of Ngesrep	100	60
RT 03/III of Padangsari	50	50
RT 01/V of Jabungan	150	70
RT 01/IV of Jabungan	120	50-100
RT 04/II of Jabungan	120	80
RT 05/I of Tinjomoyo	120	60
RT 06/I of Srondol Kulon	60	60
RT 05/II of Gedawang	60	100

FIGURE 1 Map of Slum Location in Banyumanik District [12]

Condition of The Floor

Overview of condition of the floor is based on the identification on each room in the house. In general, most of the houses are cemented/stucco, some are tiled and ceramic.

- Floors from cement/stucco are located in RT 5/RW II of Ngesrep, RT 3/RW V and RT 4/RW II of Jabungan, and RT 5/RW I of Tinjomoyo. The proportion of houses with cement/stucco floors is about 50% of slum dwellings located in Banyumanik District.
- Floors from tiles (around 31.25%) are located in RT 3/RW III of Padangsari, RT 6/RW I of Srondol Kulon and RT 5/RW II of Gedawang.
- Floors from ceramics (around 18.75%) are located in RT 1/ RW IV of Jabungan and RT 5/RW of II Gedawang.

The condition of The Wall

Based on the results of slum buildings identification, the walls of house building are made from the plastered bricks, unplastered brick walls, bricks-wood/bamboo, and wood/bamboo.

- Walls with plaster brick (12.5%) are located in RT 5/RW II of Gedawang.
- Unplastered brick walls (12.5%) are located in RT 3/RW III of Padangsari.
- Walls with Brick-wood/bamboo (50%) are dominate in Banyumanik's slum area. Houses with these conditions are in RT 5/RW II of Ngesrep, RT 3/RW V and RT 4/RW II of Jabungan, and RT 5/RW I of Tinjomoyo.
- Walls which made from wood/bamboo (25%) located in RT 1/RW IV of Jabungan and RT 6/RW I of Srondol Kulon.

Socio-economic condition

Income and education level

Following the findings of the study, it is known that there is a tendency of the income level of the population in slum location is low (earnings per households less than the minimum wage of Semarang city /less than Rp 1.500.000,00). The number of households with income less than Rp 1.500.000, 00 is about 60% of all existing households. The lack of income is caused by the low level of education. Therefore, the people cannot work in the formal sector because most of them are farmers, traders, factory workers and rough workers. Based on the level of education, about 66% population only graduated from junior high school, 22% graduated from high school, 6% graduated from elementary school, and the rest are graduated from diploma program/university.

Nutritional status of children under five and morbidity rate

The nutritional status determined by the percentage of children under five year old with malnutrition is less than 10%, except in RT 01/IV of Jabungan (31-50%). This is caused by the economic conditions and an understanding of the importance fulfillment of the nutrition for children under five years old.

The morbidity rate is the percentage of people affected by certain diseases per year [13]. The average of morbidity rate is less than 5%, except RT 02/V of Ngesrep with dengue fever and diarrhea (6-10%), and RT 01/V of Tinjomoyo with diarrhea rate ranges from 6 to 10% [14].

Infrastructure Condition

Clean Water Service

In general, all households are served by clean water infrastructure either from PDAM or shallow well water, with decent condition. However, some water source is not suitable to be consumed, i.e. in the slum that is located in RT 1/RW V of Jabungan. In general, the number of households which are not served by clean water is on average 10% -30%. The number of households which have not received clean water service is <10% and they are located in RT 5/RW II of Ngesrep, RT 3/RW III Padangsari, RT 1/RW V of Jabungan, and RT 5/RW II of Gedawang. While, 50% of the area located in RT 1/ RW IV of Jabungan does not have the clean water service.

Sanitation

Almost all households already have private restrooms. There are still some public toilets in some areas. Four units at RT 3/RW V of Jabungan are built from the community's funding. Two units at RT 1/RW IV of

Jabungan are built by the private company. Two units at RT 4/RW II of Jabungan are built from a governmental grant from and four units at RT 5/RW I of Tinjomoyo are also built from the governmental aid. While the public toilets at RT 3/RW V of Jabungan, and RT 5/RW I of Tinjomoyo are managed by community groups.

The number of households who do not use restrooms at the community at RT 01/RW V of Jabungan, RT 05/RW II of Ngesrep, RT 03/RW III of Padangsari, RT 05/RW I of Tinjomoyo, RT 06/RW I of Srondol Kulon, and RT 05/RW II of Gedawang is less than 10% of the population. While, RT 4/RW II of Jabungan is about 31-50%, and the highest is at RT 1/RW 4 Jabungan about 61-70% of the population.

Solid Waste

There is one garbage dump in RT 5/RW II Ngesrep by government aid. For other areas, the garbage disposal is still using a vacant land. Concerning the number of households who do not have the solid waste service, RT 5/RW II of Ngesrep is <10%, RT 1/RW IV and RT 4/RW II of Jabungan are about 11-30%, and the other areas are over 70%.

Drainage Channel

In some slums area in Banyumanik District do not have proper drainage systems because there are not even drainage networks, such as in RT 3/RW III of Padangsari, RT 1/RW V of Jabungan, RT 6/RW I of Srondol Kulon, and RT 5/RW II of Gedawang.The existing drainage channel has 15-50 cm of wide. The condition of drainage in some areas is not clogged, but because of small dimensions and bad condition, when it rains some channels cannot accommodate rainwater. This causes a flood/puddle moment when rain falls.

The existence of the drainage network is found in the Ngesrep region with dimensions: width of 50 cm, 20 cm depth, by bricks. In Padangsari, the existing drainage channel has a diameter of 20 cm, a depth of 10 cm, with concrete pavement, and the drainage length that is clogged with <10%. In RT 4/RW II of Jabungan, the dimension of drainage channel is about 30 cm width, 20 cm depth, with soil material. In this location, the drainage length is not smooth between 11-25%.

Road Network

The road network in Banyumanik District is dominated by asphalt and paving block, with the average width of the road is 1-4 meters. RT 04/I of Jabungan has the worst road condition with the percentage of road that damaged more than 70%, and it also happened in RT 05/I of Jabungan which has the percentage of road that damaged 51-70%.

TABLE 5. The condition of The Road in Banyumanik District

No	Location	Wide of the road (m)	Material	Length of the damaged road (%)
1.	RT 05/II of Ngesrep	2	asphalt	<10%
2.	RT 03/III of Padangsari	1,5	paving block	11-30%
3.	RT 01/V of Jabungan	1	paving block	51-70%
4.	RT 01/IV of Jabungan	2	paving block	>70%
5.	RT 04/II of Jabungan	4	asphalt	31-50%
6.	RT 05/I of Tinjomoyo	1	paving block	11-30%
7.	RT 06/I of Srondol Kulon	1	concrete	31-50%
8.	RT 05/II of Gedawang	1	paving block	31-50%

IMPACT OF INFRASTRUCTURE AVAILABILITY TO THE LEVEL OF SLUM AREA IN BANYUMANIK DISTRICT

Referring to the Guidelines for Identification of Slum on Urban Buffer Areas [7], assessment of the availability of infrastructure that affects the level of slum area are:

Clean water conditions

The scoring of clean water conditions is based on the number of households in residential areas that have obtained water flow from the water supply system, either from PDAM or shallow well water.

Based on the characteristics of the slum in Banyumanik District, only a slum area located in RT 01/IV of Jabungan is served by 30-60% clean water service (score: 20), and other regions have more than 60% (Score: 30). It is still far from the target to be achieved by the government, which seeks to realize 100% access to drinking water for all communities in 2019 through the "Program Kotaku (Kota Tanpa Kumuh)" [15], which would be achieved through the provision of available clean water.

Sanitation Condition

The scoring of sanitation conditions in slum areas takes into consideration the availability of private latrines and communal latrines that can be utilized by the local communities. Sanitation access is appropriate for the community as one of the targets to achieve at 2019, as contained in the National Medium Term Development Plan (RPJMN) 2015-2019 [16]. In Banyumanik District, the highest scoring (50) indicating that the area with <30% private latrine availability is at RT 01/IV of Jabungan. This condition is still under the average of decent sanitation access in urban areas throughout Indonesia which is around 61% in 2014 [17]. While in other regions the average >60% of households use and have private latrines (score 20).

Solid Waste Condition

Solid waste service in each sub-district that has slum areas in Banyumanik is identified through the garbage disposal system by every household and the availability of garbage disposal facilities, both private and communal. Referring to the Regulation of the Minister of Public Works and People's Housing No. 02/PRT/M/2016 on Quality Improvement of Slum [18], waste management system affects the slum level in a region seen from the availability of infrastructure and facilities which meets the technical requirements, such as garbage bins with garbage sorting on every household, and the availability of garbage dump on environment scale. Based on the research criteria, the score of solid waste service has an average of 50, with the number of households served by the garbage <50%. However, in 3 slum areas found in RT 01/IV of Jabungan, RT 04/II of Jabungan, RT 05/II of Ngesrep, the service has reached 70%, because at RT 05/II of Ngesrep supported by the availability of 1 unit of the garbage dump.

Drainage System conditions

In slum areas located in Banyumanik district, some of them do not have drainage network. The absence of drainage influences of slum level area. Because scoring is based on the results of drainage network conditions seen from the availability, dimensions, pavement, and clogged channel conditions. There are four areas which have clogged drainage more than 50%, i.e., at RT 01/V of Jabungan, RT 01/IV of Jabungan, RT 06/I of Srondol Kulon, RT 05/II of Gedawang (score 50). Whereas at RT 05/II of Ngesrep, RT 03/III of Padangsari, RT 05/I of Tinjomoyo have good drainage condition, just about <25% in bad condition.

Road conditions

The scoring of road conditions is based on the characteristics of roads in slum areas located in each sub-district, observed from the pavement type and the extent of the damage. The highest level of damage road is found in RT 01/IV of Jabungan, which is about 70% of the existing road network in the area (score 50). While in other areas road network that suffered damage <50% are in RT 05 / II of Ngesrep, RT 03/III of Padangsari, RT 04/II of Jabungan, RT 05/I of Tinjomoyo, RT 06/I of Srondol Kulon, and RT 05/II of Gedawang.

Referring to these criteria, the determination of slum level based on data processing of field study can be seen on table 6.

Based on the assessment, from the eight slum settlements scattered in Banyumanik District, the highest slum level is in RT 01/IV of Jabungan, with total score 200. This condition indicates that the availability of infrastructure in RT 01/IV of Jabungan is still limited when compared to the other slum locations. In addition, referring to the socio-economic conditions, the community has low-income levels, and the fulfillment of nutritional needs for children under five years old is also still below from the average of other slums.

TABLE 6. Criteria and Assesment of Slum Area

No	Variable	Ngesrep	Padang-sari	Jabungan			Tinjomoyo	Srondol Kulon	Gedawang
		RT05/II	RT03/III	RT01/V	RT 01/IV	RT04/II	RT05/I	RT 06/I	RT 05/II
1.	Clean water service (% of the number of households which are not served by clean water service)	20	20	20	30	20	20	20	20
2.	Sanitation Condition (% of the number of households which do not use private restrooms)	20	20	20	50	30	20	20	20
3.	Solid Waste Condition (% of the number of households are not served well)	20	50	50	20	20	50	50	50
4.	Drainage System conditions (If it has drainage, % of the drainage length that clogged)	20	20	50	50	30	20	50	50
5.	Road condition (% of the length of damaged road)	20	20	30	50	20	20	20	20
	Total score	100	130	170	200	120	130	160	160

SUMMARY

6 (six) slum areas in Banyumanik district have diverse infrastructure availability and services. PDAM's water supply service has not reached all slum areas, so some of them utilize shallow well water. However, in general, the service has been able to meet the needs of the community, except in the slum areas found in RT 1/RW IV Jabungan. In that sub-district, approximately 50% of the people has clean water service . Sanitation infrastructure, in general, has reached the entire region. Most of the people already have private restrooms, and in some areas have communal latrines from government aid and the private company. Whereas the garbage disposal system, there's supported by the presence of 1 (one) garbage dump at RT 5 / RW II of Ngesrep. The existence of drainage channels has not covered all of the existing territories. While in some areas that some areas already have drainage network, dimensions and conditions have not supported to be used optimally. The road network is a crucial issue that needs to be considered, considering that from the condition have a high level of damage that is more than 50%.

From that identification, slum areas located on RT 04/IV of Jabungan have the most limited availability of infrastructure. It makes that location have the highest level of slum compared with other slum areas in Banyumanik District.

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