Typology of the Peri-Urban Area in Demak District

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Abstract. The increase in population has an impact on increasing the demand for land. In addition, the available land in the city is relatively limited. Therefore, the development leads to the peri-urban area. The development of the core city will have an impact on the physical, social, and economic transformation of the peri-urban area. Interactions that occur between rural-urban areas can affect the development of peri-urban areas. Interaction between rural-urban areas also occurs in Mranggen Sub – district as the peri – urban area of Semarang. This study aims to examine changes in the typology of peri-urban areas in Mranggen Sub – district, Demak District in 2008 - 2018. This research used a quantitative descriptive method with a spatial approach. The remote sensing data were used as the main data source and document review as secondary data. The change in the typology of Potential Urban to Semi Urban was caused by changes in people's livelihoods, increased education, percentage of permanent buildings, educational facilities, and health facilities. The change in typology from Semi Urban to Predominantly Urban is caused by various variables that cause increasingly urbanization. The results showed a change in the study area, 7 villages changed from the typology of Potential Urban to Semi Urban and 2 villages changed from the Semi Urban typology to Predominantly Urban.

Keywords: typology, peri – urban, Mranggen Sub – district

INTRODUCTION

Peri-urbanization can be defined as a development process of a city from rural areas. The rural areas which are located on the outskirts of established cities become more urban in character, physical, economic, and social-cultural terms [1], [2]. It has major factors such as population growth and land consumption per capita [3]. The peri – urban area refers to a transition or interaction zone, where urban and rural activities are juxtaposed, and landscape features are subject to rapid modifications, induced by human activities [4]. Peri – urban areas, which might include valuable protected areas, forested hills, preserved woodlands, prime agricultural lands, and important wetlands, can provide essential life support services for urban residents. The increase in population and activities has resulted in the need for more residential land and supporting facilities, while the available land in urban areas is limited [5], [6].

Limited urban land, especially in the city center, causes development to expand externally. The external development process makes changes in land use in the nearest area, namely the suburban area, which was previously more rural in character [7]. Peri-urban or suburban areas have been generally defined as transition zones located on the outskirts of the city, where rural and urban characteristics meet each other [8]. Physical development and land-use changes can cause various problems [9]. Developments that occur sometimes are not in line with existing spatial plans so that rural areas undergo a transformation that is uncontrolled [10]. The phenomenon of peri-urbanization is an important issue in third world countries. The term "peri – urbanization" is used to describe urbanization in rural areas, creating suburban areas mainly due to migration of urban residents to rural areas to get a better living environment [11]. In Australia, as in other developed countries, agricultural land in peri – urban areas has changed rapidly, historically reduced due to urban sprawl and urban development [12]–[14]. Urbanization processes in developing countries have been commonly recognized to differ from those in developed countries. In Asian cities, peri-urbanization involves a shift from rural to urban

life [15]. A specific issue for Indonesian cities, for example, has been decreasing population growth at the core followed by spreading urban population to peripheral areas, including new towns [16]. Peri – urbanization phenomenon occurred in many large cities of Indonesia, including Semarang City. The position of Semarang Metropolitan in the regional constellation is very strategic because of the advantage of location, namely as a regional node or transit point. This function is supported by the presence of Tanjung Emas Ocean Port and Ahmad Yani Airport. Semarang Metropolitan area is estimated to be 936.23 km2 covering four cities and districts, there are Semarang City, Semarang District (Ungaran, Pringapus, and Bergas Subdistrict), Kendal District (Kaliwungu and Boja Subdistrict), and Demak District (Mranggen, Sayung and Karangawen Subdistrict) [17]. Mranggen Sub – district is part of Demak District area which is a peri-urban area of Semarang. It has the largest population in 2018 which is 189,451 people and shows the fastest development in peri-urban area [18]. The number of populations implies the need for land. Changes in agricultural land use in Mranggen Sub – district in 1994 were around 5,979ha (83%) and in 2015, it was reduced to 4,995 ha (69%) [19].

This study aims to examine the changes in the typology of peri – urban areas in Mranggen Sub – district, Demak District in 2008-2018. The result of peri-urban typology can provide a better understanding of the characteristics of peri-urban in Mranggen Sub – district and can be applied to planning targets and management strategies by considering the diversity and specifications of each type of peri-urban. The research method used is descriptive quantitative with a spatial approach. Using remote sensing data as the main data source and statistical documents as secondary data. Mranggen Sub – district is part of the Demak District area which is a peri-urban area of Semarang. It has 19 villages with an area of 72.22 km^2.
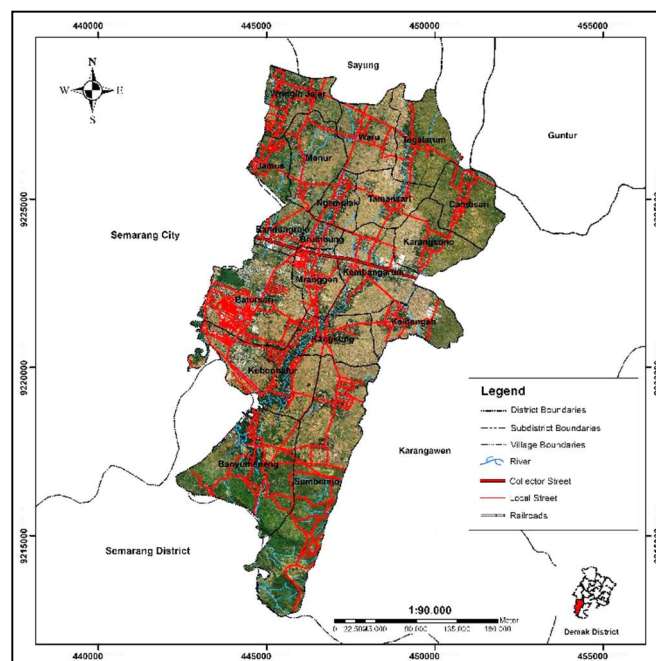

FIGURE 1. Mranggen Sub – district of Demak [20]

METHODOLOGY

This study used descriptive quantitative method with a spatial approach utilizing Geographic Information System and Remote Sensing (GIS/RS) technology in most of the analysis. The main data source was Quickbird images. Data collection techniques are carried out through field observations and statistical documents. The analysis technique in this study uses a weighted overlay The steps of the analysis were as follows: a) Analysis peri-urban typology of Mranggen Sub – district in 2008: b) Analysis peri-urban typology of Mranggen Sub – district in 2018: c) Analysis changes in the peri-urban typology of Mranggen Sub – district in 2008-2018.

The analysis used 10 variables that classify and explain the characteristic of peri-urban based on various sources in **Table 1**. The variables are settlement land use, population density, livelihood, education level, building construction, building density, the ratio of poor family, distance to the city center, availability of educational facilities and health facilities. Scoring on each variable can be seen in **Table 2.** The term urban typology used refers to the Department of Public Works which categorized into three categories or typologies [17]:

1. Predominantly Urban, an area dominated by urbanized conditions and activities.

2. Semi Urban, transition area from rural to urban areas.
3. Potential Urban, the area that at this time its main characteristic is still rural and has the characteristics of a village but has a great opportunity to become urban.

TABLE 1. Indicator of Peri-Urban Typology

No	Source	Peri-Urban Typology	Indicator
1	[21]	1. Town frame 2. Urban-rural frame 3. Rural-urban frame 4. Rural frame	• The ratio of agricultural and non-agricultural land uses
2	[17]	1. Predominantly Urban 2. Semi Urban 3. Potential Urban	• Land use • Settlement density • Access to the city • Economic activity
3	[22]	1. Primary Peri-urban 2. Secondary Peri-urban 3. Rural peri-urban	• Population density • The proportion of population livelihoods
4	[23]	1. Village Peri-urban (VPU) 2. Diffuse Peri-urban (DPU) 3. Chain Peri-urban (CPU) 4. In-place Peri-urban (IPU) 5. Absorbed Peri-urban (APU)	• Distance to the city • Population migration

TABLE 2. Scoring Measurement Indicator

No	Variable	Skor		
		1	2	3
1	Settlements Use	Settlements area <30%	Settlements area 30-60%	Settlements area > 60%
2	Population density	Density <3000 person / km^2	Density 3000-5000 person / km^2	Density> 5000 person / km^2
3	Livelihood	Agriculture sector> 60%	Agriculture sector 40-60%	Agriculture sector <40%
4	Level of education	Elementary school	Middle school	High school or more
5	Building construction	Non-permanent	Semi-permanent	Permanent
6	Building Density	Density <15 buildings/ha	Density 15-25 buildings/ha	Density > 25 buildings/ha
7	Ratio of Poor Family	Number of poor families >35%	Number of poor families 15-35%	Number of poor families <15%
8	Distance to City Center	17.5-20 km from the city center	15-17.5 km from the city center	12.5-15 km from the city center
9	Education facility	Poor, only 1 type of facility	Sufficient, there are 2 types of facilities	Adequate, there are 3 types of facilities
10	Health facility	Poor, only 1 type of facility	Sufficient, there are 2 types of facilities	Adequate, there are 3 types of facilities

The results of the score calculation are obtained from the highest number of scores and then the classification or typology of peri-urban is obtained by the formula:

$$\text{Class range} = \frac{Highest\ value - Lowest\ value}{Number\ of\ class\ (3)}$$ a)

$$\text{Class range} = \frac{30-1}{3} = 6,67 = 7$$ b)

Determination of peri-urban typology class is done by calculating the highest value of the total score is 30, the lowest value is 10, and the number of classes specified is 3 classes. The result of the class ranges is 7. The results of the total scores and class ranges are classified into 3 typologies. So the peri-urban typology is divided into:
a. Potential Urban with a total score range 10-<17
b. Semi Urban with a total score range ≥17-<24
c. Predominantly Urban with a total score range ≥24-30

RESULT AND DISCUSSION

Peri-Urban Typology of Mranggen Sub – district in 2008

Based on the analysis of 19 villages and 10 variables in 2008, peri-urban areas of Mranggen Sub – district divided into three typologies can be seen in **Table 3**. Based on the similarity of physical, social and economic characteristics in each cluster, we can define the first cluster as Predominantly Urban, the second group as Semi Urban and the third one is Potential Urban. The Predominantly Urban has a significant urban characteristic in physical, social and economic conditions. In contrast, the Potential Urban has significant rural characteristics.

Furthermore, in 2008 there are the Predominantly Urban consist of 2 villages (Batursari and Mranggen Village), the Semi Urban consists of 7 villages (Bandungrejo, Banyumeneng, Brumbung, Kebonbatur, Kembangarum, Menur, and Ngemplak Village) and the Potential Urban consists of 10 villages (Candisari, Jamus, Kalitengah, Kangkung, Karangsono, Sumberejo, Tamansari, Tegalarum, Waru, and Wringinjajar Village). **Figure 2.b** shows that the villages in Predominantly Urban are located adjacent to the core of metropolitan which is Semarang City, while the villages in Semi Urban spread to the south and north. The villages belong to Potential Urban cluster spread to the east of Mranggen Sub – district, shows the significant differences to the first and second clusters in terms of their location and distance to the core of Semarang City.

Analysis peri-urban typology of Mranggen Sub – district in 2008 was conducted by overlaying the 10 variables are as follows:

a. Settlements Use

The settlement land in Mranggen Sub – district is dominated by low settlement land use, which is less than 30%. 17 villages that have low percentage (Settlements area <30%) of settlement land use and 2 villages with medium percentage (Settlements area 30-60%) of settlements land use, consist of Brumbung Village with a percentage of 43.03% of the settlement area and 38.08% of Mranggen Village. This shows that when viewed from the variable percentage of settlement area Mranggen Sub – district still has rural characteristics. This is in accordance with the statement of [21], the higher percentage of residential area, shows more urban characteristic.

b. Population Density

Based on population density classification, it is known that there are 15 villages that have low population density with the number of population less than 3000 people/km^2. There are 4 villages that have medium population density, consists of Bandungrejo Village with 3,466.34 people/km^2, Batursari Village 4,852.82 people/km^2, Mranggen Village 4,687.31 people/km^2, and Brumbung Village 3,144.64 people/km^2. It shows that based on population density classification, Mranggen Sub – district still has rural characteristics. This condition is in accordance with that proposed by Yunus [7], the higher the level of population density, the more it shows urban characteristics.

c. Livelihood

From the economic aspect as can be seen from the change in agrarian livelihoods to non-agrarian. Based on BPS data, in 1997 the number of people working in the agricultural sector was 19,397 and in 2014 it became 15,235. On the contrary, the number of people working in the industrial sector has increased, which previously in 1997 amounted to 7,168 people to 20,591 people in 2014. Likewise, with the service trade sector, in 1997, 3,652 people increased to 14,274 people in 2014.

In the livelihoods of the people in Mranggen Sub – district in 2008, the percentage of the population living in agriculture was 28.1% of the total population employed. Based on the classification of population livelihoods, there are 11 villages with low percentage of population livelihoods in the agricultural sector, 5 villages with medium percentage of population livelihoods in the agricultural sector. And there are 3 villages with a high percentage of the population's livelihood in the agricultural sector, consists of Sumberejo Village, Tegalarum Village, and Candisari Village.

d. Educational Level

Mranggen Sub – district population has low level of education, as indicated by the highest percentage of the population with the last education level up to elementary school. The percentage of the last education up to elementary school in Mranggen Sub – district was 45.7% of the total population based on the latest education. From the education level classification, there are 17 villages with low education levels and 2 villages with high education levels, namely Batursari Village and Bandungrejo Village.

e. Building Construction

The construction of house buildings in Mranggen Sub – district is mostly permanent houses using brick material, tile roofs, and plastered/ceramic floors. The percentage of permanent buildings is 63% of the total number of buildings in Mranggen Sub – district. From the construction of buildings, there are 14 villages with high percentage of permanent building construction, 2 villages with high percentage of semi-permanent building construction and 3 villages with high percentage of non-permanent building construction.

f. Building Density

Building density in Mranggen Sub – district in 2008 averaged 5 buildings/ha. From the building density classification, all villages in Mranggen Subdistrict in 2008 had low building density with a density of <15 buildings/ha.

g. Ratio of Poor Family

The ratio of poor or pre-prosperous families in Mranggen Sub – district is classified as moderate, in 2008 amounted to 33.6%. Based on the classification of underpriviledge family ratios, there are 12 villages with high percentage of poor families, 5 villages with medium percentage of poor families. And 2 villages with low percentage of poor families, namely Batursari Village and Mranggen Village.

h. Distance to City Center

Based on the analysis of the distance to the city center, it is known there are 9 villages included in Ring 1, consist of Kebonbatur, Batursari, Mranggen, Bandungrejo, Brumbung, Ngemplak, Menur, Jamus, and Wringinjajar Village. There are 7 villages included in Ring 2, consist of Banyumeneng, Sumberejo, Kangkung, Kembangarum, Tamansari, Waru, and Tegalarum Village. And there are 3 villages included in Ring 3, consist of Kalitengah, Karangsono, and Candisari Village. Distance to the city can be seen in **Figure 2**.

i. Education Facilities

Mranggen Sub – district shas adequate education facilities. There are 13 villages that have adequate educational facilities, 3 villages that have adequate educational facilities, but there are still 3 villages with poor educational facilities, namely Karangsono Village, Tamansari Village, and Jamus Village.

j. Health Facilities

Based on the classification of facilities is still lacking, it is known there are 3 villages that have adequate health facilities, 1 village that has sufficient health facilities, and there are 8 villages with poor health facilities. However, there are still 7 villages that do not have health facilities.

Following are the score of each variable based on **Table 3** and the results of typology analysis of Mranggen Subdistrict peri-urban areas in 2008:

TABLE 3. Total Score and Typology Classification in Mranggen Subdistrict 2008

| No	Village	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	Total	Typology
1	Bandungrejo	1	2	3	3	3	1	2	3	2	3	23	Semi Urban
2	Banyumeneng	1	1	2	1	3	1	1	2	3	2	17	Semi Urban
3	Batursari	1	2	3	3	3	1	3	3	3	3	25	Predominantly Urban
4	Brumbung	2	2	3	1	3	1	1	3	3	0	19	Semi Urban
5	Candisari	1	1	1	1	1	1	1	1	3	1	12	Potential Urban
6	Jamus	1	1	3	1	2	1	1	3	1	1	15	Potential Urban
7	Kalitengah	1	1	2	1	3	1	2	1	3	0	15	Potential Urban
8	Kangkung	1	1	2	1	3	1	1	2	3	1	16	Potential Urban
9	Karangsono	1	1	3	1	3	1	2	1	1	1	15	Potential Urban
10	Kebonbatur	1	1	3	1	3	1	1	3	3	1	18	Semi Urban
11	Kembangarum	1	1	3	1	3	1	2	2	3	1	18	Semi Urban
12	Menur	1	1	2	1	3	1	2	3	3	0	17	Semi Urban
13	Mranggen	2	2	3	1	3	1	3	3	3	3	24	Predominantly Urban
14	Ngemplak	1	1	3	1	3	1	1	3	3	0	17	Semi Urban
15	Sumberejo	1	1	1	1	3	1	1	2	3	1	15	Potential Urban
16	Tamansari	1	1	2	1	1	1	1	2	1	0	11	Potential Urban
17	Tegalarum	1	1	1	1	2	1	1	2	2	0	12	Potential Urban
18	Waru	1	1	3	1	1	1	1	2	3	1	15	Potential Urban
19	Wringin Jajar	1	1	3	1	3	1	1	3	2	0	16	Potential Urban
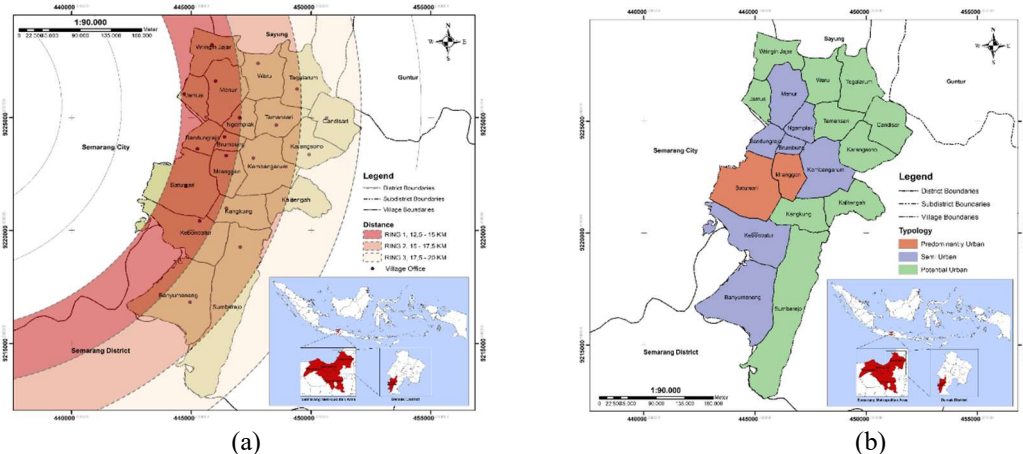
FIGURE 2. (a) Distance Mranggen Subdistrict to Center of Semarang City (b) Typology of Mranggen Subdistrict 2008

Peri-Urban Typology of Mranggen Subdistrict in 2018

Based on analysis of 19 villages and 10 variables in 2018, peri-urban areas of Mranggen Subdistrict divided into three typologies can be seen in **Table 4**. Based on the similarity of a physical, social, and economic characteristic in each cluster, we can define the first cluster as Predominantly Urban, the second group as Semi Urban and the third one is Potential Urban. The Predominantly Urban has a significant urban characteristic in physical, social, and economic conditions. In contrast, the Potential Urban has significant rural characteristics.

Furthermore, in 2018 there are the Predominantly Urban consist of 4 villages (Bandungrejo, Batursari, Kebonbatur, and Mranggen Village), the Semi Urban consists of 12 villages (Banyumeneng, Brumbung, Candisari, Jamus, Kangkung, Kembangarum, Menur, Ngemplak, Sumberejo, Tegalarum, Waru, and Wringinjajar Village) and the Potential Urban consists of 3 villages (Kalitengah, Karangsono, and Tamansari Village). **Figure 3.a** shows that the villages in Predominantly Urban are located adjacent to the core of metropolitan, which is Semarang City, while the villages in Semi Urban spread to the south and north. The villages which belong to Potential Urban cluster spread to the east of Mranggen Sub – districtshow the significant differences to the first and second clusters in term of their location and distance to the core of Semarang City.

Analysis peri-urban typology of Mranggen Sub – district in 2018 was conducted by overlaying the 10 variables are as follows:

a. Settlements Use

In 2018, it was found that there were 15 villages that had a low percentage of settlement area, which was less than 30% and 4 villages with a moderate percentage of settlement area, consist of Bandungrejo Village with 36% settlements area, Batursari Village 41.01%, Brumbung Village 43.03% and Mranggen Village with 48.64% settlements area. The higher percentage of residential area shows more urban characteristic. It shows that based on variable percentage of settlements use, Mranggen Sub – district still has rural characteristics.

b. Population Density

Population density in Mranggen Sub – district in 2018 is above 2623.25 person/km^2. Based on population density classification it is known that there are 14 villages that have low population density of less than 3000 person/km^2, 2 villages that have medium population density, and 3 villages with high density consist of Batursari Village with 7229.68 person/km^2, Mranggen Village 5870, 77 person/km^2, and Kebonbatur Village 5233.12 person/km^2. It shows that when viewed from the variable population density, Mranggen Sub – district still has rural characteristics. Urban or rural characteristics of an area can be shown by the level of density in peri-urban areas. The higher the level of population density, the more it shows urban characteristics.

c. Livelihood

The people in Mranggen District in 2018 worked in the non-agricultural sector. Based on the classification of livelihoods, 18 villages have low percentage of the population's livelihood in the agricultural sector. Only Waru Village has a high percentage of the population's livelihood in the agriculture sector. The livelihoods of residents in an area can show rural or urban characteristics [24]. From livelihood variable, it shows that Mranggen Sub – district has urban characteristics.

d. Educational Level

Overall, Mranggen Sub – district has high level of education with percentage of 49.0% of the population having the high school education level or more. There are 15 villages with high level of education and 4 villages with a low level of education.

e. Building Construction

In 2018, it was known that 19 villages or all villages in Mranggen Sub – district had high percentage of permanent construction with a percentage of 37% to 94%. The village with the highest percentage of permanent building construction is Batursari Village.

f. Building Density

Based on the classification of building density in Mranggen Sub – district, there are 16 villages that have low building density which is less than 15 buildings / ha, and 3 villages that have moderate building density namely Batursari Village, Mranggen Village and Bandungrejo Village.

g. Ratio of Poor Family

The ratio of poor or underprivileged families in Mranggen Sub – district included in the moderate classification of 29.3%. Based on the classification of underprivileged family ratios, there are 13 villages with a high percentage of underprivileged families, 4 villages with a moderate percentage of underprivileged families and 2 villages with a low percentage of underprivileged families, namely Batursari Village and Mranggen Village. The ratio of poor families in rural areas is higher than in cities [10]. The level of regional welfare can be identified through the ratio of poor families. The ratio of poor people is the result from the ratio number of poor families to the total family of each village.

h. Distance to City Center

Based on the analysis of the distance to the city center, there are 9 villages included in Ring 1, which consist of Kebonbatur, Batursari, Mranggen, Bandungrejo, Brumbung, Ngemplak, Menur, Jamus, and Wringinjajar Village. 7 villages are included in Ring 2, which consist of Banyumeneng, Sumberejo, Kangkung, Kembangarum, Tamansari, Waru, and Tegalarum Village. And there are 3 villages included in Ring 3, which consist of Kalitengah, Karangsono, and Candisari Village.

i. Education Facilities

The availability of educational facilities in Mranggen Sub – district is adequate, there are 16 villages that have adequate educational facilities, 1 village that has sufficient educational facilities, and 2 villages with poor educational facilities, namely Karangsono Village and Tamansari Village.

j. Health Facilities

Based on the analysis of the availability of health facilities in Mranggen Sub – district, 5 villages have adequate health facilities, 7 villages have sufficient health facilities, and 2 villages with poor health facilities. However, there are 5 villages that do not have health facilities, namely Brumbung Village, Ngemplak Village, Tamansari Village, Menur Village, and Tegalarum Village.

Following are the results of typology analysis of Mranggen Sub – district peri-urban areas in 2018:

Table 4. Total Score and Typology Classification in Mranggen Sub – district 2018

| No | Village | Score | | | | | | | | | | | Typology |
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	Total	
1	Bandungrejo	2	2	3	3	3	2	2	3	3	2	25	Predominantly Urban
2	Banyumeneng	1	1	3	3	3	1	1	2	3	3	21	Semi Urban
3	Batursari	2	3	3	3	3	2	3	3	3	3	28	Predominantly Urban
4	Brumbung	2	2	3	3	3	1	1	3	3	0	21	Semi Urban
5	Candisari	1	1	3	1	3	1	1	1	3	3	18	Semi Urban
6	Jamus	1	1	3	3	3	1	1	3	3	2	21	Semi Urban
7	Kalitengah	1	1	3	1	3	1	1	1	3	1	16	Potential Urban
8	Kangkung	1	1	3	3	3	1	1	2	3	2	20	Semi Urban
9	Karangsono	1	1	3	1	3	1	2	1	1	2	16	Potential Urban
10	Kebonbatur	1	3	3	3	3	1	2	3	3	2	24	Predominantly Urban
11	Kembangarum	1	1	3	3	3	1	2	2	3	2	21	Semi Urban
12	Menur	1	1	3	3	3	1	1	3	3	0	19	Semi Urban
13	Mranggen	2	3	3	3	3	2	3	3	3	3	28	Predominantly Urban
14	Ngemplak	1	1	3	3	3	1	1	3	3	0	19	Semi Urban
15	Sumberejo	1	1	3	1	3	1	1	2	3	2	18	Semi Urban
16	Tamansari	1	1	3	3	3	1	1	2	1	0	16	Potential Urban
17	Tegalarum	1	1	3	3	3	1	1	2	2	0	17	Semi Urban
18	Waru	1	1	1	3	3	1	1	2	3	3	19	Semi Urban
19	Wringin Jajar	1	1	3	3	3	1	1	3	3	1	20	Semi Urban

Changes in Peri-Urban Typology of Mranggen Sub – district in 2008-2018

Based on the results of typology changes in **Table 5,** typology changes occurred in 9 villages in the peri-urban area of Mranggen Sub – district. There are 7 villages that have changed from typology of Potential Urban to Semi Urban, consists of Candisari, Jamus, Kangkung, Sumberejo, Tegalarum, Waru, and Wringinjajar

Village. There are 2 villages that changed from Semi Urban to Predominantly Urban, consists of Bandungrejo and Kebonbatur Village. Changes in peri-urban typology of Mranggen Subdistrict can be seen in **Figure 3.b**. Changes of peri-urban typology from Potential Urban to Semi Urban with variables that have changed are population's livelihoods, educational level, building construction, availability of educational and health facilities. While the change of peri-urban typology from Semi Urban to Predominantly Urban is due to more varied variables, there are settlements use, population density, educational level, number of poor families, building density, and availability of educational and health facilities. As mentioned before, this proves that changes in peri-urban typology are caused by changes in physical, socio-economic conditions and infrastructure [2], [6], [9].

When viewed from peri-urban typology changes in Mranggen Sub – district in **Figure 3.b**, villages that experienced changes in peri-urban typology become increasingly more urban are villages that are close to Semarang City. This shows that the distance to the centre of Semarang affects the urban nature of the peri-urban area of Mranggen Sub – district. The closer the peri-urban areas to urban areas, have the higher tendency of urban characteristics. This condition is accordance with the opinion expressed by [25]. The closer such regions to the core, the more likely they will have urban characteristics. Certain causes -where the villages with dominant urban characteristics are located far from the core, it can be explained as the leapfrog process of sprawl in this region. This condition can be explained as some villages may have support factors to develop intensively due to the regulations.
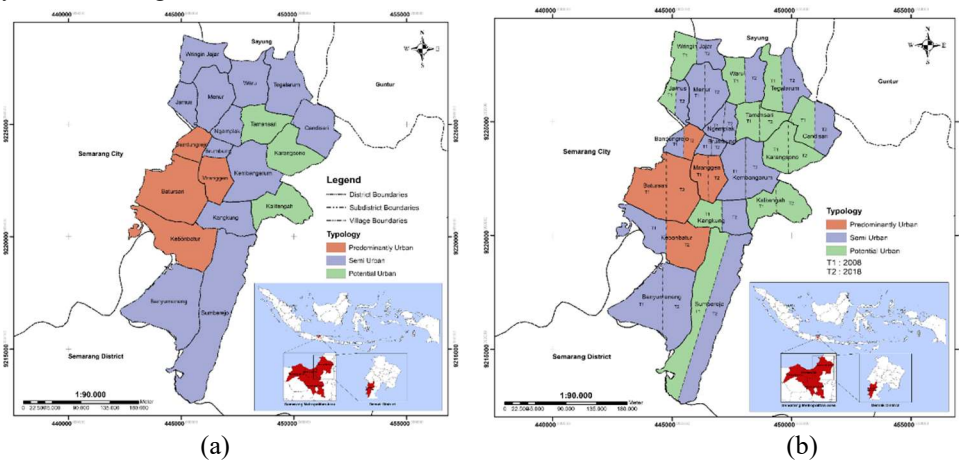

(a)　　　　　　　　　　　　　　　　　　　(b)

FIGURE 3. (a) Typology of Mranggen Subdistrict 2018 (b)Changing Typology of Mranggen Subdistrict 2008-2018

TABLE 5. Total Scores and Changes in Peri-urban Typology in Mranggen Sub – district 2008-2018

No	Village	Score		Typology	
		2008	2018	2008	2018
1	Bandungrejo	23	25	Semi Urban	Predominantly Urban
2	Banyumeneng	17	21	Semi Urban	Semi Urban
3	Batursari	25	28	Predominantly Urban	Predominantly Urban
4	Brumbung	19	21	Semi Urban	Semi Urban
5	Candisari	12	18	Potential Urban	Semi Urban
6	Jamus	15	21	Potential Urban	Semi Urban
7	Kalitengah	15	16	Potential Urban	Potential Urban
8	Kangkung	16	20	Potential Urban	Semi Urban
9	Karangsono	15	16	Potential Urban	Potential Urban
10	Kebonbatur	18	24	Semi Urban	Predominantly Urban
11	Kembangarum	18	21	Semi Urban	Semi Urban
12	Menur	17	19	Semi Urban	Semi Urban
13	Mranggen	24	28	Predominantly Urban	Predominantly Urban
14	Ngemplak	17	19	Semi Urban	Semi Urban
15	Sumberejo	15	18	Potential Urban	Semi Urban
16	Tamansari	11	16	Potential Urban	Potential Urban
17	Tegalarum	12	17	Potential Urban	Semi Urban
18	Waru	15	19	Potential Urban	Semi Urban
19	Wringin Jajar	16	20	Potential Urban	Semi Urban

Most villages which directly adjacent to Semarang City are Predominantly Urban and Semi Urban in character. Associated with accessibility, the two typologies of this region have a distance to Semarang City and are traversed by a network of collector roads and railroad lines. Villages that are near or traversed by the

transportation network to the city of Semarang will experience a transformation into a city faster. It is also possible that villages that now have Semi Urban typologies also turn into predominantly urban typologies in the future. This relates to policies for how much land to be retained and where it is located to remain a rural/agricultural area. Restrictions require strict regulations and are monitored consistently. If there is no intervention from the government, this will continue to occur and will cause urban sprawl.

CONCLUSION

The results showed a change in the study area, 7 villages changed from Urban Potential typology to Semi Urban typology, namely Candisari, Jamus, Kalitengah, Kangkung, Sumberejo, Tegalarum, Waru and Wringinjajar Village. Beside that, 2 villages changed from Semi Urban typology becomes Predominantly Urban typology, namely Bandungrejo and Kebonbatur village. The changes in peri-urban typology in the Mranggen Sub – district from Semi Urban to Predominantly Urban and Potential Urban to Semi Urban have different characteristics. The change in typology of Potential Urban to Semi Urban was caused by changes in people's livelihoods, increased education, percentage of permanent buildings, educational facilities, and health facilities. Furthermore, the change in typology from Semi Urban to Predominantly Urban is caused by various variables that cause increasingly urbanization, such as increase in settlement land use, population density, latest education, building density, educational facilities and health facilities as well as a decrease in the number of underprivileged families.

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