A Rural Transformation Model: The facts of rural development in the Surakarta Metropolitan Region

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Abstract. Not only cities are entering the urban age but suburban villages are also feeling the impact of this global phenomenon. In Indonesia, the uncontrolled rural transformation has had some negative impacts because of the unpreparedness of various aspects such as land conversion, the emergence of the informal sector, and crime. This phenomenon is often referred to as developmental externalities that need to be anticipated in planning and controlling the growth of cities and villages. This inevitable rural transformation also occurs in the Surakarta Metropolitan Region. The previous rural transformation studies in the Surakarta Metropolitan Region are based on economic, spatial to socio-ecological perspectives and are still rarely studied from the perspective of urban studies. This article aims to examine the model of rural transformation in the Surakarta Metropolitan Region based on the Rural-Urban Transformation theory by Lo, Shalih & Douglass (1998), especially in the Simo, Sambi, Ngemplak, and Nogosari Sub-districts in Boyolali District. The qualitative methods consisting of interviews, 150 questionnaires, and field observations in 2017 and literature study were used for the discussion in this article. The rural to urban transformation of the Surakarta Metropolitan Region follows the Southeast Asian Model. This research opens a new discussion on how to create a sustainable city system in the Surakarta Metropolitan Region.

1. Introduction
The rapid flow of urbanization which resulted in the increasing number of people living in urban areas make the cities in the world into a new period commonly referred to as the urban age [2]. The assumption is based on the phenomenon of urban population growth rate that is not only influenced by natural population growth but the increasing rate of urbanization. United Nation (2014) noted that the number of urban residents in 2014 reached 54% and is projected to reach 66% by 2050 [27]. One consequence is the total urban area in the world will triple in the next 40 years and will convert land agriculture [25]. Specifically, for developing countries like Indonesia, it is assumed that urban population growth rate is higher than developed countries. It is of recent concern that the phenomenon is not only happening in big cities, but starting to happen in small towns.

Same condition with other developing countries, Indonesia is experiencing a rapid urbanization process; the amount of urban land increased from ± 8,900 km² to 10,000 km² between 2000 and 2010 and this urbanization continues to increase to date. The increase of urban area in Indonesia is about 1.1 percent per year and the growth rate is ranked second in East Asia after China. This has resulted in a shift to an urban economy. Cities in Indonesia have an average economic growth of 4.1 percent per year, a faster pace than other Asian cities. By 2025, an estimated 68 percent of Indonesians will be urban
Rural transformation can be defined as a process of comprehensive community change in which rural communities diversify their economies and reduce their dependence on agriculture; they become dependent on distant places to trade and to acquire goods, services, and ideas; moving from scattered villages to small and medium-sized cities; and are culturally more like large urban agglomerations [1]. There are trends and dynamics that encourage and accelerate the process of rural transformation. These factors become causes and effects that illustrate how these dynamics change the rural space and how they are interrelated. Of course, these dynamics are revealed differently in each country and are contextual [12].

Worldwide, the rural transformation process affects the lives of some 4.6 billion people who work 60 percent of the world's fertile land and produce nearly two-thirds of food and non-food products. Rural transformation is a major challenge for the people and rural areas, but also provides great opportunities for sustainable development [12]. Rural transformation can improve the performance of both urban and rural areas when strong rural-urban linkages are developed. However, it is generally understood that strong reciprocal links exist between urban and rural areas, through the flow of human resources, capital, goods, information, and technology [26].

These developments have had an impact on rural areas near metropolitan areas that are experiencing the phase of the urban age. Then, the failure of the development paradigm that initially relies on the urban-based industry in creating equitable distribution has led to new approaches and alternative regional planning strategies. Douglass suggests that there are limitations in the role of selected cities and growth centres to stimulate rural development solely through the promotion of urban growth [4]. So, an effort is made that is a selective investment in rural areas of towns. This further encouraged the rural-urban transformation. Therefore, the rural-urban linkage is a crucial part of regional development.

Lo, Salih, & Douglass [13] in their chapter Rural-Urban Transformation in Asia identified dualism within the framework of macro spatial development, namely (a) north and south dualism; (b) formal and informal sector dualism, and (c) rural-urban dualism. This dualistic structure shows an imbalance in the interaction of the three. These three dualistic relationships are interrelated and integrated into complex systems where differences for each country depend on four important factors, namely natural resources, demographic characteristics, technology and human resources, and development ideology. In the concept of economic growth and development process there are four differentiated patterns of development according to its characteristics, namely: (1) Southeast Asia Model, (2) South Asia Model, (3) China Model, and (4) East Asia Model. Each model gives rise to different rural-urban transformation patterns.

Surakarta is one of the big cities in Indonesia that continues to grow to form a metropolitan area in the central part of Central Java Province. The Surakarta Metropolitan Region is a metropolitan area consisting of Surakarta, Boyolali, Sukoharjo, Karanganyar, Wonogiri, Sragen, and Klaten commonly abbreviated ‘Subosukowonosraten’. The development of Surakarta affects the development of other (peri-urban) areas around it of both the spatial and regional characteristics of the economy. The rapid growth of settlements in Surakarta that is not supported by adequate land causes the growth of the city towards the outskirts of Surakarta. This phenomenon has influenced the development of villages around Surakarta and caused the transformation from rural to urban.

Previous research by Giyarshih [10] showed that the spatial pattern in the Yogyakarta-Surakarta corridor shows a regional transformation where a higher accessibility leads to a higher level of transformation. Rahmayana and Handayani [21] found that the rural transformation into urban areas in the Solo Baru Region, Sukoharjo District, is seen from the socio-economic changes of local communities where changes in economic aspects are faster than social ones.
This study aims to determine the model of rural-urban transformation in Metropolitan Surakarta from the perspective of urban studies based on the rural-urban transformation theory in Asia which was put forward by Lo, Salih & Douglass [13] especially in the Simo, Sambi, Ngemplak, and Nogosari Sub-districts in Boyolali Regency. This research explains the transformation occurring in the four subdistricts from the aspects of land use, socio-demography, accessibility, and development policy.

2. Material and methods

2.1. Study area
Simo, Sambi, Ngemplak, and Nogosari Sub-districts, hereinafter referred to as "Mobilano" are located in Boyolali District which is part of the Surakarta Metropolitan Region. The four sub-districts are located southwest of Surakarta City with a respective size of Sambi: 4,649,4935 Ha, Ngemplak: 3,852.70 Ha, Nogosari: 5,508.43 Ha, and Simo: 4,804,0275 Ha.

![Figure 1. Administrative map of Simo, Sambi, Ngemplak, and Nogosari Sub-districts [15]](image)

The four sub-districts were selected as the case study for the rural-urban transformation in the Surakarta Metropolitan Region because of the following aspects that spur the ‘urban age’ phenomena, i.e., (1) Ngemplak Sub-district is the administrative location of Adi Soemarmo International Airport or known as Solo Airport, 2) Simo Sub-district is the administrative area of the Hajj Central Java-Special Region of Yogyakarta Embarkation Building that every day attracts people from various regions within their service area, (3) An increased accessibility is indicated from the development of the Trans Java Freeway that intersects Ngemplak Sub-district, dividing it into a northern and southern part with one of the freeway gates located close to the airport, which is also serviced by a commuter railway project, (4) The four sub-districts are Sustainable Food Farm regions for rice crops, (5) ‘Pro-investment’ policies from the local government of Boyolali District. The high accessibility makes these four areas referred to as the gateway of Metropolitan Surakarta.

2.2. Research approach
This research uses secondary and primary data with a qualitative evaluation process which refers to the development pattern in Asia based on Lo, Salih, & Douglass (1998)[13].

2.2.1. Assessment by theory. The rural-urban transformation refers to the pattern of development in Asia of Douglass et al. [4], which distinguishes the Southeast Asia, South Asia, China, and East Asia models. Each model has different characteristics seen in its economy, natural resources, and social culture [4]. In the theory of regional development with a growth pole, the growth of a region comes from an already developed centre. The development of the regional centre will affect its surrounding areas which forms suburbs. The area has mixed village and city traits. This shows the transformation of rural to urban areas.

The Southeast Asian rural-urban model is characterized by richness in natural endowment, open domestic markets, and low technology. In their transformation, urban villages in Southeast Asia underwent a process of foreign investment in the resource and commercial sectors, exports of resource-based primary products, foreign investment in modern industries, imports of modern industrial products, rural development expenditures, economic income from remittances, and the relationship between landowners and their tenants.

In the South Asian transformation model, urban villages are characterized by low resource availability per capita, distance from urban to rural areas which are not yet supported by transportation, and low rural-urban transformation. The South Asian model exhibits a transformation process that starts from the potential of exporting limited commercial crops, foreign industries, and modern industries with limited manufacturing export capacity, import substitution industries with modern technology and limited manufacturing.

The characteristics of the East Asia model are a closed economy with food deficits and a high population density, a closed economic and political system, and indigenous technology. In the transformation of the rural-urban area, East Asia underwent two phases; the first phase was the redistribution of assets (land, capital, etc.) and the second phase consisted of minimizing external dependency, self-reliant regional development, and rural-based urbanization.

The Chinese model is like the East Asia model, consisting of a centrally planned closed economy with food deficits and high population density, a closed economic and political system, and indigenous technology. China's rural-urban transformation model also consists of two phases; the first phase is the redistribution of assets (land, capital, etc.), a controlled production and distribution system, and controlled rural-urban migration. The second phase consists of minimizing external dependency, self-reliant regional development, and rural-based urbanization.

2.2.2. Evaluation process. The model of rural-urban transformation in the Surakarta Metropolitan Region is determined by comparing facts with theory. The evaluation is based on the rural model of urban transformation model by Mike Douglass [4-8] describing the transformation model from East Asia, Southeast Asia, South Asia, and China. The analysis of the changing conditions of the Surakarta Metropolitan region from 2005 - 2015 based on the data already obtained is used to describe the characteristics of the phenomenon of transformation of the urban villages in the focus area. This is then matched with the four rural-urban transformation models from Douglass to uncover which model the transformation of urban villages in the Surakarta Metropolitan Region follows, especially Simo, Sambi, Ngemplak, and Nogosari Sub-districts. The transformation of the urban villages of East Asia, South Asia, and Southeast Asia has distinctive features and the characteristics of each region are distinguished based on economic, physical, demographic, and socio-cultural conditions.

3. Material and methods

3.1. Study area
This section describes the rural-urban transformation phenomenon in the study area.
3.1.1. Demographic characteristics. The development of the city of Surakarta does not rule out that it will attract people from outside the city. An area with unchanged administrative boundaries will experience high density if it continues to accommodate the incoming community. This affects the Boyolali district, especially the four sub-districts of Simo, Sambi, Ngemplak, and Nogosari (the Mobilano Area) which are near Surakarta City. This phenomenon can be seen from the data by the Central Statistical Agency of Boyolali District. The data from 1990 to 2015 shows the population trends in Boyolali District, in particular of the ‘Mobilano’ Region.

Table 1. Population in the ‘Mobilano’ Region Per Five Years from 1990 to 2015 [15].

| Sub-district | Population | Percentage of Boyolali District (2015) | Percentage of ‘Mobilano’ (2015) |
|--------------|------------|--------------------------------------|---------------------------------|
| Sambi        | 45.354     | 46.549                               | 47.672                          | 48.303                          | 48.657                          | 49.783                          | 5%                             | 20%                            |
| Ngemplak     | 58.880     | 62.743                               | 65.975                          | 69.235                          | 71.111                          | 84.717                          | 9%                             | 34%                            |
| Nogosari     | 58.578     | 60.326                               | 61.078                          | 61.066                          | 60.788                          | 65.580                          | 7%                             | 27%                            |
| Simo         | 41.053     | 41.400                               | 42.443                          | 43.235                          | 43.667                          | 45.649                          | 5%                             | 19%                            |
| Total        | 203.865    | 211.018                              | 217.168                         | 221.839                         | 224.223                         | 245.729                         | 25%                            |                                |
| Boyolali District | 870.326 | 896.527 | 922.852 | 941.147 | 953.839 | 963.690 |                                |                                |

Ngemplak Sub-district has the largest population while Simo Sub-district has the smallest. The large number of inhabitants influences the contributing percentage of the larger upper region, where a large population will contribute more and vice versa. Ngemplak Sub-district has the largest contribution towards the population of the ‘Mobilano’ Region and Boyolali District.

Figure 2. Growth rate per five years in the ‘Mobilano’ Region 1995 – 2015 [15].

The growth rate of the Mobilano Region exhibits a similar pattern as Boyolali District that decreases in the first four periods and rises in the last period, while Sambi Sub-district experienced a decrease in the last period. The increasing rate of population growth in 2010 - 2015 may be caused by the transformation of Surakarta. The increase in the rate of population growth in the last five years is quite a drastic change from previous years. The population in the ‘Mobilano’ Region is predicted to increase in the coming year considering the development of Trans Java Freeway that will intersect the area.
Rural-urban transformation in Surakarta City impacts on the increasing population numbers in Boyolali District. Ngemplak Sub-district has the highest density in the Mobilano region, which makes its urban development more visible than in the other three sub-districts.

The low population density has the potential to attract migration from other areas in the Greater Solo region, thus supporting urban processes in urban areas. People moving from Greater Solo on average have higher potential in terms of human resources and soft skills. It is expected that this ability can impact the development of urban areas. In addition to affecting the urban development process, it is expected to also affect the indigenous people of the urban area and improve the quality of human resources.

The population of productive age (15-60 years old) of Boyolali District is concentrated in Ngemplak Sub-district, which is a potential driving force of the regional economy. The existence of this potential has not been supported by a good human development program which can be seen from the relatively high level of poverty in the Mobilano region of almost 50 percent; the sub-districts of Sambi and Nogosari have a poverty rate of more than 60 percent. This high level of poverty affects the ability to obtain education and health services, which tends to be low. This will affect the quality of human resources to be low, causing new problems of unemployment. When the unemployment rate is high, then the dependency rate is also high, hindering development and increasing poverty levels.
The female population in Mobilano is higher than the male population. The high female population is a potential that can support activities in the industrial sector, which requires female workers, e.g., the cigarettes and garment industries.

Figure 5. Mortality and birth rate of Boyolali District. in 2011 – 2015 [15].

In population dynamics, birth rates are higher than death rates from year to year. The productive age of the population is around age 34 - 40 years; in the ‘Mobilano’ area, the productive population is 60 percent and the dependency ratio is 66 percent. Thus, the region has a high labour potential.

Figure 6. Population pyramid of the ‘Mobilano’ Region [15]

The female population is shown in red and the male population in blue.

The population pyramid of the ‘Mobilano’ Region in 2015 is of a constructive type that shows low birth rates and very high mortality rates. The population pyramid shows a large old age group but also an extensive young population. In addition, the low growth rate causes a decline in the population.

3.1.2. Human resources. The quality of human resources in the four sub-districts (Simo, Sambi, Ngemplak, Nogosari) can be seen from the level of education. Figure 7 shows the changes in of human resources over five years.
Figure 7. Population based on highest completed education level in 2011-2015 [15].

Figure 7 shows the level of education in the four sub-districts of the study area. The graph shows that the dominant level of education in the study area is elementary school. However, the graph shows that the level of senior high school graduates increased in the last five years and the population that does not complete primary school is quite stagnant although it has increased since last five years. The overall education trends show an increase in human resources in the four sub-districts. Although the population with elementary school graduates increased, the amount of senior high school and university graduates showed a stronger increase than the number of elementary school graduates.

Figure 8. Population based on highest education level obtained in 2011 [15].

The above graph shows the data of all residents in the four sub-districts including the elderly residents and non-resident students. Therefore, the number of elementary and non-primary school graduates is still quite high. However, the current school survey is dominated by senior high school graduates, which could be a result of the recent increase in the number of senior high school educators. Thus, the quality of human resources in the study area has increased during the last five years, which can be seen from the decreased level of elementary school education and the increase in senior high school graduates. This indicates a positive change over the last five years.
Figure 9. Number of population graphic according to labour in 2011-2015 [15].

Figure 9 shows that the residents of the study area have livelihoods dominated by ‘others’, comprising non-agricultural labour other than industry, trade, services, and transportation. In the study area, the labour force in the agriculture sector is still quite large, being the second highest group after other labour (non-agriculture other than industry, trade, and service) during 2011 - 2015. They are conventional farmers using simple technology. The number of workers in these six categories tends to increase. Thus, the population of the study area is dominated by non-agricultural labour with a ratio of non-agricultural to agricultural labour of 3:2.

Figure 10. Population of productive and non-productive age in 2013-2015 [15].

Figure 10 shows that the study area is dominated by population in the productive age of the 15 to 65 years old. This high availability of labour offers opportunities for the study area. The number of people in the productive age, as well as the non-productive age group increase, the annual population increase in the study area, could explain this. Looking at the population in the productive age group compared with the population in the workforce it can be concluded that the population in the productive age predominantly work in non-agricultural sectors. However, the population working in the agriculture is still widely found in the study area with 43 percent of the population.

3.1.3. **Land use.** Transformations of human activity impact on land use change [15]. The conversion of land from natural to human use is the most permanent and often irreversible effect of human interaction with the natural environment [12]. The transformation of land use in the four sub-districts, affected by the development of the Surakarta Metropolitan Region, has converted non-built-up to built-up areas. Most changes in land use that occur are due to urban activities such as industry as well as commercial
activities. This land use change is driven by factors of urban development that are intertwined due to the rural-urban relationships between the four districts with the Surakarta Metropolitan Region. In addition, airport and freeway development plans have had a huge impact on the land-use change that accelerates the process of rural transformation.
3.1.4. Development policy in creating a conducive investment climate. Since 2010, Boyolali District has a 'Pro Investment' policy to arrange a conducive investment climate to boost the local economy. The 'Pro Investment' policy is intended to simplify all services and investment licensing through the one-stop service implemented by the Board of Investment and Integrated Service Permits Boyolali District, the existence of information centres, and the improvement of supporting infrastructure [18]. This policy has been legalized in District Regulation of Boyolali District Number 3 Year 2014 concerning Investment. Another breakthrough that supports the pro-investment policy is technological innovation in the service community to facilitate licensing services.
The regional and even national development projects such as Trans Java Freeway, Commuter Line Station, and the development of International Airport Adi Soemarmo increasingly supports the investment climate in Boyolali District. The ‘Mobilano’ region can be viewed as a transitional area that comprises the development of the Inter-City passenger transport network within the province connecting the cities of Semarang, Surakarta, and Yogyakarta. The construction of a commuter station as an intermodal station will connect land transportation with air transportation in the ‘Mobilano’ region. The planned air transport network is an international-scale airport development. The transportation system is also strengthened by the Semarang-Surakarta freeway development plan of 75.8 km, Yogyakarta-Surakarta of 40.495 km and, Surakarta-Mantingan of 56.1 km in length which passes the Boyolali District and is an intersection between the freeways. Based on the Spatial Plans of Boyolali District for 2011-2031 the ‘Mobilano’ region is designated for large industries consisting of machinery, electricity, textile, transportation, food, non-metal, wood, and other similar industries. The designation of a large industrial area in the ‘Mobilano’ region is earmarked only in Sambi, Ngemplak and Nogosari Sub-districts, while large industries are not allowed in Simo Sub-district because of its function as the focus area of education and health services.

In addition, the four sub-districts of the study area are agricultural areas that are subject to the Sustainable Food Farms policy which stipulates that land use should not be altered either temporarily or temporally to maintain food availability through incentives-disincentives [3].

**Table 2.** Food Farms Area and Distribution in Boyolali District in 2015 (Ha) [3].

| No | Sub-district Name | Area of Agricultural Land (Ha) | The Sum |
|----|------------------|-------------------------------|---------|
|    |                  | Sustainable Food Farms | Not Sustainable Food Farms | |
| 1  | Nogosari         | 2,199.134                   | 935.175 | 3,134.309 |
| 2  | Simo             | 1,775.450                   | 1,310.133 | 3,085.583 |
| 3  | Banyudono        | 1,559.977                   | 1,668.124 | 3,228.101 |
| 4  | Andong           | 1,337.970                   | 1,664.702 | 3,002.672 |
| 5  | Teras            | 1,329.423                   | 213.328 | 1,542.751 |
| 6  | Ngemplak         | 1,283.104                   | 513.118 | 1,796.222 |
| 7  | Sawit            | 1,252.380                   | 39.558 | 1,291.938 |
| 8  | Klego            | 1,212.184                   | 2,869.116 | 4,081.300 |
| 9  | Sambi            | 1,112.030                   | 1,357.046 | 2,469.076 |
| 10 | Wonosegoro       | 959.613                     | 5,352.776 | 6,312.389 |
| 11 | Karanggede       | 868.410                     | 1,207.546 | 2,075.956 |
| 12 | Mojosongo        | 745.634                     | 1,737.147 | 2,482.781 |
| 13 | Ampel            | 505.527                     | 3,284.347 | 3,789.874 |
| 14 | Boyolali         | 265.2                       | 129.628 | 394.828 |
| 15 | Juwangi          | 91.415                      | 921.466 | 1,012.881 |
| 16 | Selo             | 15.25                       | 2,886.021 | 2,901.271 |
| 17 | Cepogo           | 0                          | 3,454.458 | 3,454.458 |
| 18 | Kemusu           | 0                          | 2,873.543 | 2,873.543 |
| 19 | Musuk            | 0                          | 4,799.132 | 4,799.132 |
| Total |                | 16,512.701                 | 37,216.364 | 53,729.065 |

The creation of a conducive investment climate further encourages investors to enter the Mobilano region. It is expected to increase economic growth, create new jobs, and provide other benefits to raise the welfare of the community. On the other hand, this policy has implications for the conversion of agricultural land and the shift of the economic structure from agrarian to industrial to encourage rural-
urban transformation. Therefore, collaboration and cooperation of all stakeholders, especially from government institutions as policymakers, is needed to select what kind of investment is permitted, how and where it should be developed. In addition, the role of society is also needed in the need of supervision of control over the utilization of space related to the implementation of the investment that will be done.

3.1.5. An increase in accessibility that allows changes in the regional economic structure. Adi Soemarmo Airport as a transportation gateway connecting Subosukowonosraten (Surakarta, Boyolali, Sukoharjo, Karanganyar, Wonogiri, Sragen, and Klaten) both nationally and internationally supported by the Interchange Freeway affects the development of the villages in Ngemplak Sub-district and its surrounding areas including the Simo, Sambi, and Nogosari Sub-districts. The existence of the airport has triggered the development of urban activities such as the rapid growth of industrial activity in Ngemplak Sub-district, especially in Gagaksipat Village. Until 2015, there were about 10 large industries spread in Ngemplak, Sambi, and Nogosari Sub-districts, consisting mostly of the garment industry.

The industry sector is changing the economic structure in the region from mostly agriculture into industry. By 2015, the industrial sector contributed 45 percent of the total GRDP in the four sub-districts with a total employment of 17 percent of the total workforce. The change in the economic structure led to a shift from rural to urban characteristics with the growing settlements in the four sub-districts. Thus, in addition to improving the accessibility of the region, the airport and freeways are also able to encourage urban activity on the outskirts of the Surakarta Metropolitan Region.

However, Adi Soemarmo airport has not been optimized due to a lack of transportation integration between the airport, station, and terminal. This is indicated by the poor relationship between existing means of transportation, as there is no transportation service that connects villages. In some sub-districts in the ‘Mobilano’ area, there are no means of public transportation such as buses that can be used to support people's daily activities such as going to work or school.

In addition, in some areas there is also a lack of terminal facilities; currently, the ‘Mobilano’ region only has a terminal in the Simo Sub-district. This terminal is not big but it plays an important role as it provides a connection to Klego Sub-district, Karanggede Sub-district and even Karanganyar District and Sragen District. Although the lack of terminal facilities causes problems, there is potential that can be developed, i.e., Ngemplak Sub-district plans to build an intermodal station. This station is expected to facilitate access for people to go to other areas by train. Thus, integrated transportation development programs can solve the problems of accessibility and support activities for the community in the ‘Mobilano’ region.

Moreover, the region is a gateway for Boyolali District, which offers the possibility to integrate regions, especially with the city of Surakarta. This potential is triggered by the location of Adi Soemarmo Airport and the toll gate that is planned in the Mobilano area. The planned extension of Adi Soemarmo Airport’s runway further supports this. This development plan aims to improve the function of the airport, thereby serving the needs of passengers of larger aircrafts. On top of this, the runway extension can encourage the addition of aircraft flight destination as an effort to improve connections with other countries and develop Adi Soemarmo Airport as an international airport.

3.2. Evaluation

The spatial structure of metropolitan cities in Asian countries is characterized by the dualism of the formal and informal sectors. Within these cities, formal sectors such as industry and services exist side by side with the informal sector in the form of street vendors, parking attendants, etc. The phenomenon of industrialization leads to disparities; the industrialization that occurred in the city caused residents from rural areas to flock to the city resulting in a large flow of urbanization. The irony is that urbanization is not accompanied by adequate employment in the city, so the migrant population is forced to work in the informal sector that does not require special skills or requirements. This process eventually led to the formation of illegal settlements in the city's area.
In a response to this phenomenon, four models of development emerged in Asia. The first model explains Asian development which is dependent on an advanced foreign country that has advanced technology. Most Asian countries have abundant but untapped natural resources. Therefore, many foreign parties come and invest in Asian countries, affecting the economic progress in Southeast Asia. However, the presence of these foreign parties exacerbates the dualistic structure in which domestic products tend to lose the competition with foreign products. In addition, the presence of foreign investment is primarily focused on big cities, leading to an increasingly visible economic imbalance.

The second model shows that a large population in a region causes the region to become poorer. One reason for this is a reduction of existing natural resources unaccompanied by technological advances. The lack of natural resources causes the country to be unable to export its commodities and result in low investment in the country. These factors cause minimal relations between rural and urban areas.

The third model is a continuation of the second model which is accompanied by a strong political ideology or so-called Chinese characteristics. In this model, economic development begins with local economic disturbances controlled by the bureaucracy; the government dictates the economic activities and the migration between rural and urban areas. The paradigm embraced by this model aims to minimize dependence on foreign parties.

The fourth model is characterized by high population density and few natural resources but balanced with sophisticated technology. Examples are Japan, Korea, and Taiwan which have modern and state-oriented technology capital in continental Europe and America. The first stage in this model is the industrial sector that changes the economy from import-based to export-based, which can strengthen the domestic market in the region. This model describes the spatial transition from an agriculture-based system to the modern industrial system. These changes can improve living and income standards better than other models. In this model, independence in the industrial sector in urban areas cannot be separated from the influence or existence of rural areas. In addition to supplying raw materials (resources) to industrial cities, villages also provide a lot of manpower. This increased infrastructure in the villages and provided accessibility of the village community to the city. Thus, the imbalance that occurs between the village and the city is not too large.

From this explanation, the spatial transformation from rural to urban starts from a change in pattern or tendency from every aspect of forming a region such as the patterns of manpower, settlements, and the land production in rural areas. These changes can occur because of the intervention of the community or without government interference as a result of urbanization.

One example of the phenomenon of rural-urban transformation occurs in the Ngemplak Sub-district in Boyolali District. Ngemplak is one of the largest rice producers in Boyolali District. However, based on data obtained in 2015, the rice productivity in this sub-district has decreased. By 2015, the base or pre-eminent sector in the region has shifted to the industry, trade, and services sectors. Agricultural land that once dominated this area also gradually disappeared by changing function into residential and industrial land. The migration in this sub-district also increases every year along with the increasing number of large, medium, and small industries.

The process of rural-urban transformation in Ngemplak and its surrounding areas including the Simo, Sambi, and Nogosari Sub-districts tends to be influenced by foreign investment in modern industry such as the printing and garment industries. With the availability of natural resources, the investments in the industry cause increased migration flows or commuters from surrounding areas to enter the region. The industry is automatically able to attract residents or especially labour from other areas to the Ngemplak Sub-district. Therefore, Ngemplak Sub-district which was formerly based on agricultural sector has gradually transformed into a region with a base of processing and commercial industries and services. This spatial transformation can be one of the triggers or the starting point for Ngemplak Sub-district, which was originally rural, to one day become a centre of growth for the surrounding areas or to transform into an urban area.
3.3. Results
The development of urban areas in Indonesia or known as urbanization has occurred very rapidly in the last ten years. This is no exception in the Surakarta Metropolitan Region which affects the areas around it. Areas that are also affected by the development of the Surakarta Metropolitan Region include the Sub-districts of Simo, Sambi, Ngemplak, and Nogosari. Initially, these four sub-districts had rural characteristics and were dominated by agricultural activities; they are the largest rice supplier for Boyolali District. However, the development of the Surakarta Metropolitan area influenced the development of the four sub-districts, changing their rural characteristics in urban characteristics.

Previous research conducted by Douglass, Lo, and Salih showed that the transformation of urban villages follows several models such as Southeast Asia, South Asia, East Asia, and China model. The development of the four sub-districts seen from land use, technology, demographic characteristics, human resources, accessibility, and development policy show the transformation model of the Southeast Asian urban village. So that the four sub-districts underwent extensive transformation and are characterized by richness in natural resources, an open domestic market, and low technology.

The study area exhibits several phenomena of agriculture land conversion into industrial and commercial land since 2005 - 2015. The migration of population leads to the conversion of agricultural land. The most rapid development of land use occurred following the road network. In this condition, the landowner of non-built-up land can sell or rent the land to be built area. This is in accordance with the characteristics of Southeast Asia regarding the relationship between landlords and tenants.

The development of human resources between 2011 to 2015 showed a positive development despite the dominance of agricultural activity. Based on the review of the human resources condition of the four sub-districts, the study area matches the Southeast Asian rural-urban transformation model. This is because of the dualism of agricultural and non-agricultural activities seen from the number of workers who dominate in four districts affected by the development of Surakarta Metropolitan Region. In addition, natural resources are abundant as seen from the number of agricultural labour reaching 34 percent. However, agricultural produce is sold raw and has not undergone processing due to the low availability of technology.

The development of investment into the study area is in the form of the garment industry and other labour-intensive industries. The Boyolali District’s “Pro Investment” policy also supports the industrial development in the study area. Foreign investment that began to emerge in the form of modern industry makes urban dualism increasingly visible in the study area. This is because the study area is also the largest rice producer in Boyolali District, while the land for Sustainable Agriculture Food Farms is slowly transformed into urban activities. Meanwhile, developing industries are not in accordance with the available natural wealth. Therefore, the availability of natural resources is not utilized optimally. This results in abundant natural resource outputs in exports plus the absence of emerging technologies to support the process of optimizing natural resources. So, there is a mixed phenomenon between rural and urban characteristics that are not clear.

4. Conclusion
The model of rural-urban transformation in the Surakarta Metropolitan Region was evaluated based on a comparison between field data of Simo, Sambi, Ngemplak, and Nogosari Sub-districts in Boyolali District with model characteristics by Lo, Shalih, and Douglass [12]. This comparison shows that the Southeast Asian Model is in accordance with Indonesian administrative locations in South East Asia. It is in accordance with the characteristics of natural resources are abundant but cannot be utilized because human resources still tend to be low despite the increase and low technology used. In addition, the efforts to create a conducive investment climate illustrate the dependence on the investors from within and outside the region. Therefore, many outsiders, even from abroad, who come and invest in this region will affect the economic progress. The theory found in 1998 by Lo, Salih, and Douglass [12] is still relevant to the current dynamics of life in the new urban agenda.

This study, of course, has shortcomings given the limitations of data obtained such as economic data due to limited availability and a relatively short time for field surveys of approximately two weeks. In
addition, the authors are still inexperienced in research considering they are in the 6th semester of their undergraduate study at the Department of Urban and Regional Planning, Faculty of Engineering, Diponegoro University. Research in relation to rural-urban transformation in the Surakarta Metropolitan Region is still insufficient given the enormous challenge in creating a sustainable planet. Thus, this paper opens a new discussion on how to create a system of sustainable development in the Surakarta Metropolitan Region.

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