Urban Expansion and Welfare Change in a Medium-sized Suburban City: Surakarta, Indonesia

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Abstract

This study observes the socio-spatial dynamics in the suburbs of a medium-sized city, particularly considering the extent to which shifting land use has influenced people's welfare. This case study selected suburban Surakarta, a medium-sized metropolitan city in Central Java Province, Indonesia. The methods employed were descriptive statistics and spatial analyses. Considering the data availability, unit of analysis was urban or rural villages (*kelurahan* or *desa*). The results show that the development follows the pattern of a regional network, but the spatial dynamics are quite different in each direction. Besides, the shift of land use from agriculture to urban land has not directly affected poverty reduction. In the study area, the increase in industrial land use showed a weak positive correlation with the addition of pre-prosperous families. On this basis, local governments should pay more attention to the existence of the native residents in developing suburbs so that they are not harmed by the shift in land use from agricultural to developed urban land.

Keywords

Urban expansion, welfare change, suburban city, spatial dynamics, metropolitan development

Introduction

The development of metropolitan regions may increase the quality of life of their inhabitants; however, it may also endanger the sustainability of the regions, and even the nation (Buchori & Sugiri, 2016; Buchori, Sugiri, Maryono, Pramitasari and Pamungkas, 2017; Chen, Gao, & Chen, 2017; Liu, He, Wu, &

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Webster, 2010; Sugiri, Buchori, & Soetomo, 2011). Any strong conflict between economic growth, social development and environmental concerns, widely known as the three pillars of sustainable development, is the main hindrance to the achievement of sustainable development (United Nations, 2014; World Commission on Environment and Development, 1987). Regarding this issue, the socio-spatial dynamics of a region will significantly influence its regional performance in gaining sustainability.

Urbanization is an important issue concerning the achievement of sustainable development (Buchori et al., 2017; Childers, Pickett, Grove Ogden, & Whitmer, 2014; Firman, 2009; Tian, Ge, & Li, 2017; United Nations, 2014; World Commission on Environment and Development, 1987). Some factors like natural growth due to birth, rural to urban or urban to urban migration, the change of local or national regulations, urban extension and the change of administrative boundaries may affect the process of urbanization (UN-HABITAT, 2010). Urbanization generally occurs because of migration from villages to cities, and this process can be a movement away from the traditional rural character to a more urbanized one (Legates & Hudalah, 2014). This can comprise not only the society, economy and culture but also ecological and environmental aspects (Wu & Zhang, 2012). In this regard, urbanization occurs in urban, peri-urban and suburban areas, and eventually in rural areas. Such urbanization is acknowledged as 'in situ urbanization' (Gong, Liang, Carlton, Jiang, Wu, Wang, & Remais, 2012; Makita, Fèvre, Waiswa, Bronsvoort, Eisler, & Welburn, 2010; Purnamasari, Yudana, & Rini, 2017; Ruet, Gambiez, & Lacour, 2007). In this sense, the change of lifestyle of the community from rural to more urbanized is also characterized as urbanization, no matter where it happens.

The fast-growing urbanization of city development creates metropolitan regions, with urban expansion extending into larger areas, crossing over the administrative borders of the core city, and forming suburbs in its surroundings (OECD, 2013; Taubenböck, Esch, Felbier, Wiesner, Roth, & Dech, 2012). A city's development and urbanization changes its socio-spatial aspects, not only in the core city but also its suburbs (Acselrad et al., 2005; Banzhaf, Reyes-Paecke, Müller, & Kindler, 2013). The dynamics of these socio-spatial aspects often raise various social, economic and environmental issues (Banzhaf et al., 2013). A comprehensive understanding of the socio-spatial dynamics of the core city and its suburbs is therefore important to ensure the sustainability of city development, for large as well as small- and medium-sized cities.

In relation to a city's size, many scholars seem to be more interested in the socio-spatial dynamics of large-sized (metropolitan) cities (see, e.g., Al-sharif & Pradhan, 2016; Banzhaf et al., 2013; Guastella & Pareglio, 2017; Hudalah & Firman, 2012; Hudalah, Viantari, Firman, & Woltjer, 2013; Inouye, de Sousa, de Freitas, & Simões, 2015; Jain, Siedentop, Taubenböck, & Namperumal, 2013; Malaque & Yokohari, 2007; Murphy, 2007; Pourebrahim, Hadipour, & Bin, 2011; Puertas, Henríquez, & Meza, 2014; Schlesinger, Drescher, & Shackleton, 2015; Walcott & Pannell, 2006; Winarso, Hudalah, & Firman, 2015; Wu & Zhang, 2012; Wu, Zhao, Zhu, & Jiang, 2015; Taubenböck, Wegmann, Roth, Mehl, & Dech, 2009, 2012). However, studies on small- and medium-sized cities include Chen et al. (2017), who studied land use dynamics and rural settlement transitions in Huisan, China; and Fahmi, Hudalah, Rahayu and Woltjer, (2014), who observed urban expansion in Cirebon, Indonesia. Also, Setyono, Yunus, and Giyarsih (2016) investigated the spatial pattern of urbanization and small cities development in Central Java, Indonesia, while Hsieh, Hu, Chia and Liu (2014) researched the patterns and spatial dynamics of industrial districts in Hsincu, Taiwan. Shi, Sun, Zhu, Li and Mei (2012) analysed growth types and growth density distribution in Lianyungang City, China. Sridhar and Narayanan (2016) investigated the population and employment suburbanization in Gulbarga, Karnataka, India.

As a developing country, Indonesia has experienced a significant growth of urbanization affecting both urban and rural areas over the last several decades. In Java, the most rapidly growing island in Indonesia. Urbanization has significantly influenced its inhabitants (Buchori & Sugiri, 2016;

Buchori et al., 2017; Sugiri & Buchori, 2016a; Sugiri, Buchori, & Ma'rif, 2015) with land use change from rural to more urban-based activities being rapid (Buchori & Sugiri, 2016; Buchori, Sugiri, Hadi, Wadley, & Liu, 2015; Buchori et al., 2017; Firman & Dharmapatni, 1994; Hudalah & Firman, 2012; Sejati, Buchori, & Rudiarto, 2019; Sugiri et al., 2011). Large-sized cities having more than one million inhabitants, like Jakarta, Bandung, Semarang, Surabaya and Yogyakarta, grow more quickly than others (Buchori & Sugiri, 2016; Buchori et al., 2017; Hudalah & Firman, 2012). In doing so, they act as the core cities in forming the metropolitan regions. Medium-sized cities like Malang, Surakarta, Cirebon, Tegal, Magelang and Pekalongan also grow significantly and some have even seen the growth of young metropolitan regions (Buchori et al., 2017). This development greatly influences their surrounding regions.

In the western part of Java, two metropolitan regions have formed. The largest is Jabodetabek, with Jakarta as the core city, but the region also includes the cities of Bogor, Depok, Tangerang and Bekasi. Together, these comprise three autonomous *kabupaten*s (regencies or rural governments), that is, the regencies of Bogor, Tangerang and Bekasi (Hudalah & Firman, 2012). Jabodetabek's size is much greater than other metropolitan areas, and it has come to be known as 'megapolitan' (Buchori et al., 2017; Firman, 2009). The other metropolitan region is Bandung Raya, with Bandung as the core city, and the areas of West Bandung, Sumedang, Cimahi and Bandung Regency also included. More broadly, Jabodetabek has influenced this region by characterizing the urban belt of Jakarta–Bandung in about 200 km, representing a fast growing mega urban region (Firman, 2009).

In the eastern part of Java, there are the two metropolitan regions of Gerbangkertosusilo (Gresik, Bangkalan, Mojokerto, Surabaya as the core city, Sidoarjo and Lamongan), and Malang Raya (Batu Regency, Malang City as the core city and Malang Regency). Gerbangkertosusilo is a counterbalanced development of Jabodetabek on the eastern side of Java. It extends in a southern direction, forming a corridor to Malang Raya (Buchori et al., 2017).

In the central part of Java, Semarang and its surrounding areas form a metropolitan region called Kedungsepur, an acronym of Kendal, Demak, Ungaran or Semarang Regency, Semarang City and Purwodadi. This region benefits greatly from its location as a connecting hub between Jakarta and Surabaya (Buchori & Sugiri, 2016). On the southern side, Yogyakarta, the capital of the province of Yogyakarta Special Region, has formed Kertamantul, involving Yogyakarta as the core city and its two neighbourhood regencies of Sleman and Bantul (Buchori et al., 2017; Firman, 2010). Between Kedungsepur and Kertamantul, a lower intensity metropolitan region has developed, called Subosukowonosraten (Surakarta, Boyolali, Sukoharjo, Karanganyar, Wonogiri, Sragen and Klaten). Surakarta is the core city, and acts as a connecting hub between Kedungsepur and Kertamantul.

Surakarta is the smallest core city in Java's metropolitan regions. In terms of population size, it can be categorized as a medium-sized city. However, this city has been growing significantly with the rise in regional accessibility, marked by the opening of a toll road connecting Jakarta–Semarang–Surakarta–Surabaya. According to data from the Statistics Office, Surakarta alone had 570,876 inhabitants in 2017. Together with its suburbs, the region had about 1,911,837 inhabitants.

Urban expansion here tends to follow the road pattern connecting Surakarta with other cities, forming a palm pattern. In the suburbs between the road corridors, fast-changing land use and shifts in livelihood are indicated, alongside an occurrence of in situ urbanization. Regarding these issues, this study aims to investigate the socio-spatial dynamics of the suburbs of a medium-sized city, which in this case was Surakarta. It represents a medium-sized city potentially growing due to both its geographical position, and the intensive development of transport infrastructure in Java. The observed suburbs were therefore parts of the surrounding regencies belonging to the Solo Raya metropolitan region (Figure 1). It is expected that this article will accompany existing publications on the inquiry of socio-spatial dynamics in the suburbs of medium-sized cities in Indonesia.

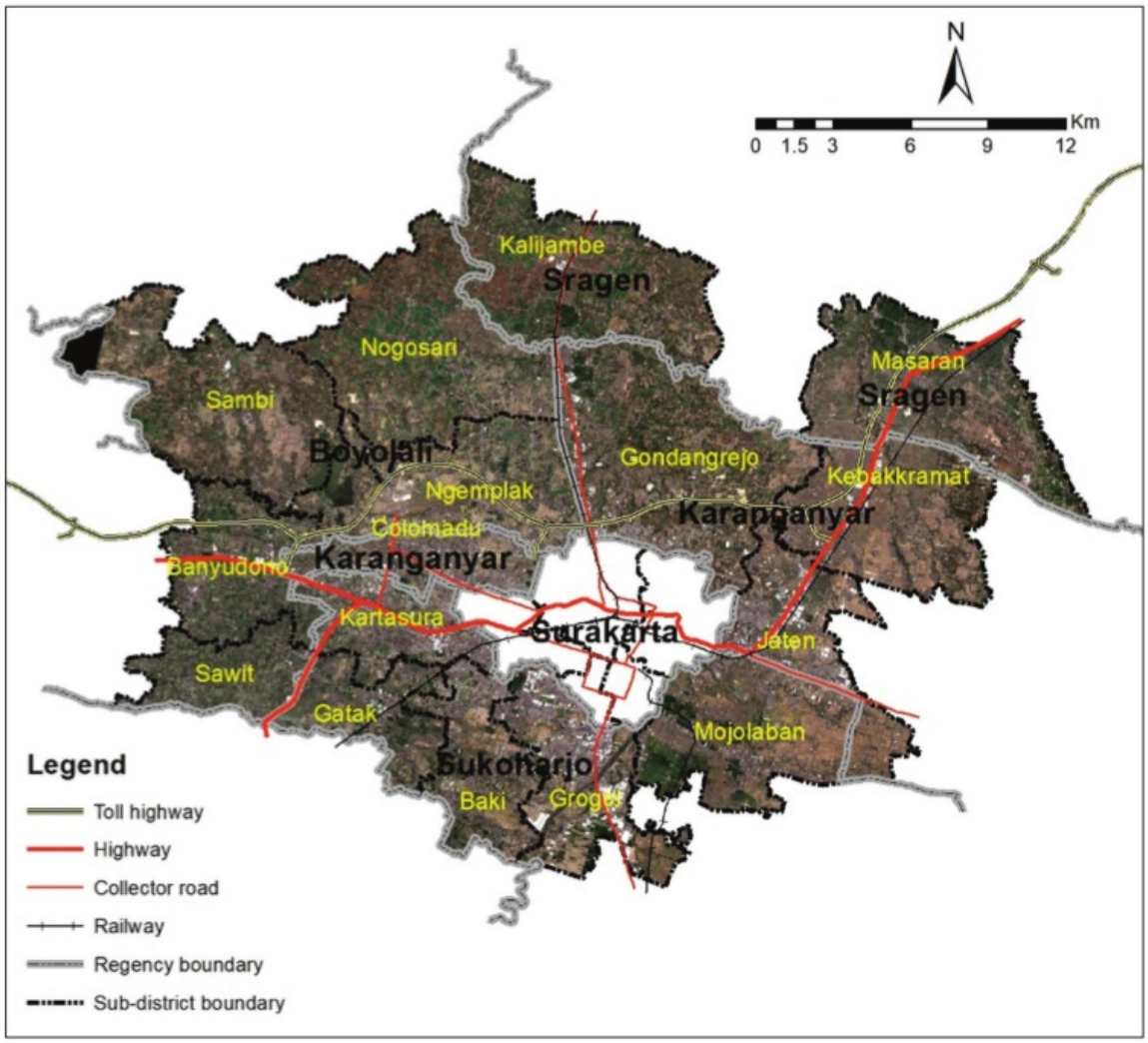

Figure 1. Study Area

Source: Processed from Landsat8 2017.

Sub-urbanization and Social Welfare Improvement

Migration may generate urbanization due to the need of migrants to seek improved welfare by accessing urban areas (Mieszkowski & Mills, 1993). However, the rapid development of the urban population often causes overcrowding, which in turn leads some residents to move to the suburbs; this process is commonly known as the sub-urbanization phenomena (Feng, Zhou, & Wu, 2008; Garcia-López, 2010; Sridhar & Narayanan, 2016; Sugiri & Buchori, 2016b).

Many factors can stimulate the sub-urbanization process, one of which is the high cost of housing in urban areas. This forces people to look for cheaper housing alternatives in peripheral areas (Liu et al., 2010). However, these factors have now undergone various shifts. In the 1980s, the process of sub-urbanization in China was triggered by government policies, marked by the existence of government

relocation programmes, old-city rehabilitation and formation of satellite towns. Now, the new form of the sub-urbanization process is triggered more by the construction of suburban villas and affordable housing, rising private car ownership, the decentralization of industry and the development of large sub-urban shopping malls and retail parks (Feng et al., 2008).

The economic attraction of the private sector is a feature of the sub-urbanization process, known as 'market-oriented active sub-urbanization' (Feng et al., 2008). According to Aguilar (2008), the development of suburbs now represents a type of independent city, which typically has its own centre. This new shape of core city expansion often follows major road connections to surrounding cities (Adeel, 2010; Aguilar, 2008), while developments in the suburbs tend to follow a low-density pattern with polycentric islands, or an expanded periphery with a linear development of higher density (Garcia-López, 2010). This is different from the previous conditions, where the suburbs tended to have poor accessibility and facilities. In this case, the process of transitioning from village to city is increasingly important because each region has its own pattern and is influenced by its city structure, geographical physical condition and administrative and political policies (Aguilar, 2008; Aguilar, Ward, & Smith Sr, 2003; Mieszkowski & Mills, 1993; Sugiri & Buchori, 2016b; Zhang, Yue, Liu, Fan, & Wei, 2018).

Urban expansion in suburbs is intriguing to study, because it contributes to changes in socio-economic conditions and the environment (Sugiri & Buchori, 2016b). The emergence of various industrial activities has made the region more attractive in bringing in migrant workers and this has accelerated the urban expansion process. While this has improved economic conditions in the community, among other benefits there have also been negative effects, like the emergence of environmental problems. In the last few decades, the development of informal housing and industries in suburbs which are still rural in nature has also been a major feature of the urbanization process (Aguilar, 2008; Firman, 2009; Liu et al., 2010; Wang, Wang, & Wu, 2009). In this case, land use changes are acceptable as long as the changes are well planned and do not override sustainability aspects.

Land use change from agriculture to industry or trade and business potentially increases the economic activities of the local community. The development of industrial or trade and business activities, either formally or informally, is expected to provide new employment opportunities that can eventually increase economic activities. However, it is not always proportional to the increase in human welfare (Gar-On Yeh & Li, 1999). In some cases, urbanization, which was expected to improve welfare, even resulted in increased poverty. The Indonesian case study of Dewi and Rudiarto (2013) showed that land use conversion from agriculture to other uses made many people, who were originally farm labourers, lose their livelihoods. The low level of education and limited skills possessed exacerbated the situation and the local poor people became worse off. Therefore, the current study complements knowledge on the impact of urbanization on suburbs and welfare.

Study Area and Methods

Surakarta, often called Solo (less commonly spelled Sala), is a medium-sized city in Indonesia experiencing impressive growth and development (Buchori et al., 2017). Surakarta's urban areas have been expanding to its surrounding regions, which are becoming suburbs of Surakarta. Their growth tends to follow the pattern of the regional road system, that is, the roads connecting Surakarta to Sragen, Wonogiri and Yogyakarta/Semarang. The dominant urban activities are industry, trade and business, and there is also a residential area.

The study area was adjusted as the suburbs delineated by the administrative borders of the subdistricts (*kecamatan*) have been significantly influenced by the urban development and activities of Surakarta

City. It covers an area of about 56,551 hectares and is inhabited by a population of 1,340,961. Administratively, it consists of 16 subdistricts, five of which belong to Boyolali Regency (Sawit, Banyudono, Sambi, Ngemplak and Nogosari), five to Sukoharjo (Mojolaban, Grogol, Baki, Gatak and Kartosuro), two to Sragen (Kalijambe and Masaran) and four to Karanganyar (Jaten, Colomadu, Gondangrejo and Kebakkramat). The administrative border was used due to the availability of socio-economic data and as required for the analysis unit, which in this case is an urban or rural village. Totally, 258 units were analysed.

This study applied a quantitative approach based on descriptive statistics and spatial analyses with the help of geographic information system (GIS) that has been similarly applied in previous studies (Buchori et al., 2017; Buchori, Sukmawati, & Pramitasari, 2015; Sejati, Buchori, & Rudiarto, 2019). The first stage was to observe the shift in land use based on maps from 2005 and 2017. These were developed from satellite images from LandsatTM7 for 2005, and Landsat8 for 2017, using a supervised classification technique. In addition, the 2017 land use was also verified through field observation in 2018. The analysis unit was an urban or rural village (*kelurahan* or *desa*), which is the smallest administrative unit for which socio-economic data are available from the Indonesian Statistics Office. Due to the analysis requirement, the land use classification was limited to industry, trade and business, residential area and agriculture. This limitation simplified the analysis, because the main changes in activities were expected in these kinds of land use.

The land use maps were then superimposed on the administrative map to produce time series information about the types of land use by an urban village/villages. These maps were then compared to search the relationships between data and information. To observe the link between land use changes and socio-economic conditions, descriptive statistics and correlation-test analyses were employed. The socio-economic information on urban/rural villages gathered through the secondary survey in 2018 concerned population, number of households and number of pre-prosperous families (*keluarga pra sejahtera*), one of the categories of families in Indonesian government terminology to describe those that are relatively poor, in 2005 and 2017. It was unfortunate that the number of pre-prosperous families was the only indicator of welfare found during the survey. For this, the results of field observation were also used to cross-check the data, and correlation-test analyses were applied to perceive the relationships between the increase or decrease of pre-prosperous families and the shift of each land use.

Findings and Discussion

Generally, the typology of changes in the study area can be classified into four types, corresponding to the four cardinal directions: (a) high-growing intensity of industry in the eastern direction along the arterial road connecting Surakarta and Sragen; (b) high-growing intensity of developer-based residential areas and sporadic establishment of industry in the northern direction; (c) high-growing intensity of trade and business districts, supported by developer-based residential areas and large-scale garment industries in the southern direction along the collector road connecting Surakarta and Wonogiri and (d) high-growing intensity of residential areas and trade activities in the western direction, along the arterial road connecting Surakarta and Yogyakarta or Semarang.

Furthermore, Figure 2 shows the land use map of the study area in 2005 and 2017, processed from satellite images. The comparison between the maps provides a general description of land use change in this period. As shown in the figure, many agricultural areas surrounding the main city, Surakarta, had shifted into built-up areas for various urban activities. Quantitatively, Table 1 shows the change of land use during 2005–2017, detailed at sub-district level.

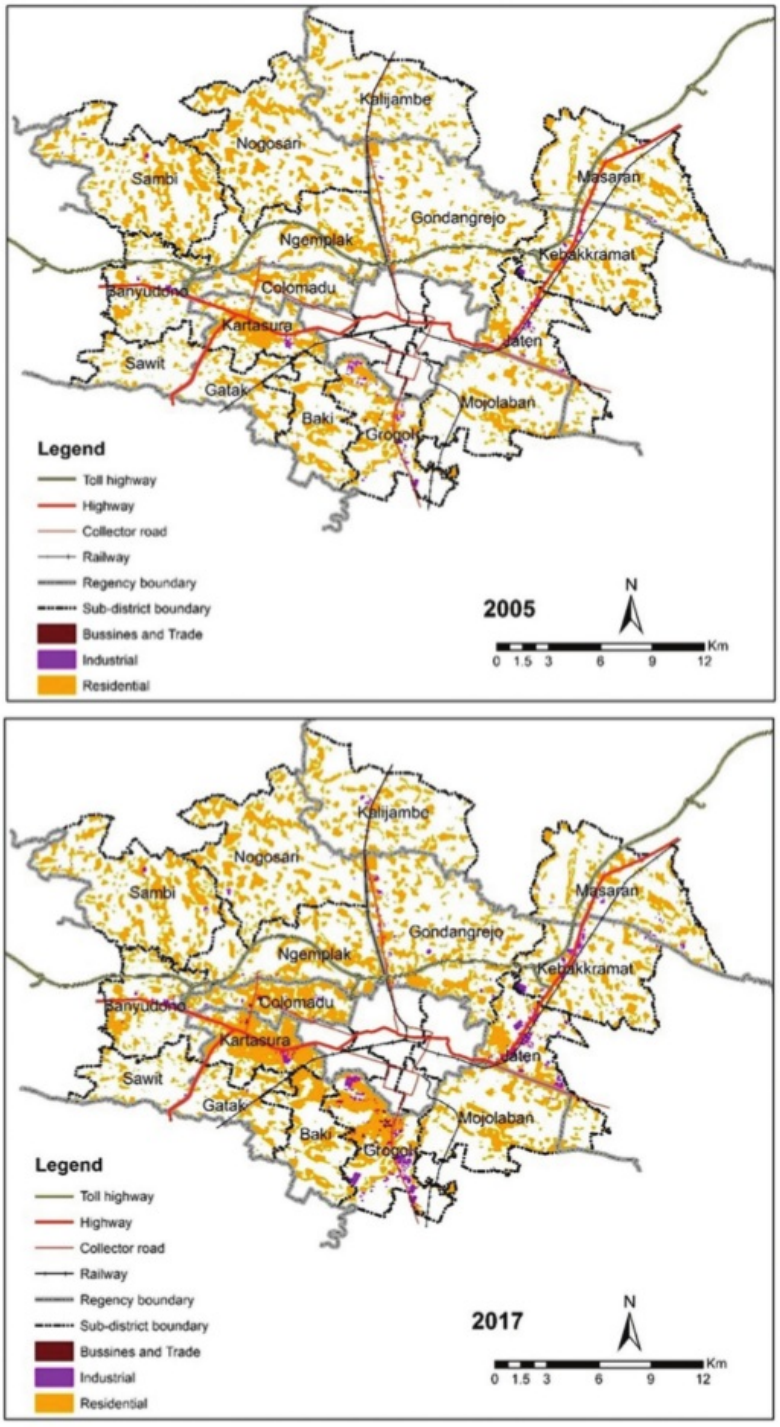

Figure 2. Land Use in 2005 and 2017

Source: Processed from LandsatTM7 2005 and Landsat8 2017.

Table 1. The Change of Land Use by Subdistrict During 2005–2017

No.	Regency (*Kabupaten*)	Subdistrict (*Kecamatan*)	Residential Area (ha)			Industrial Area (ha)			Business Trade (ha)		
			2005	2017	Increase	2005	2017	Increase	2005	2017	Increase
1	Boyolali	Sawit	271.44	292.45	21.01	0.99	3.24	2.25	0.00	0.00	0.00
2		Banyudono	520.61	620.20	99.59	15.60	28.90	13.30	0.00	0.00	0.00
3		Sambi	1,384.30	1,437.85	53.55	10.17	14.31	4.14	0.00	0.00	0.00
4		Ngemplak	903.46	1,105.58	202.13	2.25	6.12	3.24	1.08	1.62	0.54
5		Nogosari	1,420.49	1,483.34	62.85	0.00	7.65	7.65	0.00	0.00	0.00
6	Sukoharjo	Mojolaban	852.16	1,001.70	149.55	2.10	11.79	9.68	0.32	0.36	0.04
7		Grogol	907.05	1,249.72	342.67	89.05	226.82	137.77	4.41	18.36	13.95
8		Baki	572.17	784.07	211.90	1.22	3.47	2.25	0.00	0.36	0.36
9		Gatak	431.81	511.31	79.50	1.89	6.57	4.68	0.00	0.00	0.00
10		Kartasura	904.78	1,369.77	464.99	25.37	41.66	16.29	2.25	8.56	6.31
11	Karanganyar	Jaten	681.45	816.26	134.81	74.74	162.72	87.99	0.04	2.07	2.03
12		Colomadu	533.39	906.71	373.32	4.41	26.08	21.68	1.08	9.60	8.52
13		Gondangrejo	1,073.31	1,565.32	492.00	12.78	57.18	44.40	0.00	0.00	0.00
14		Kebakkramat	866.31	903.77	37.46	40.88	94.04	53.16	0.00	0.00	0.00
15	Sragen	Kalijambe	770.22	919.49	149.26	0.00	10.62	10.62	0.00	0.00	0.00
16		Masaran	969.17	1,011.20	42.03	8.84	40.17	31.34	0.00	0.00	0.00
	Total		13,062.11	15,978.74	2,916.63	290.28	741.35	450.43	9.18	40.93	31.75

Source: Processed from LandsatTM7 2005 and Landsat8 2017.

Overall, the most intensive change of activity occurred in the subdistricts belonging to Sukoharjo in the south and Karanganyar Regency in the west. The establishment of Solo Baru, administratively located in Sukoharjo, has attracted the development of Surakarta on the southern side of the city. Presently, many trade activities have developed in this area (see Figure 3), consisting of retail department stores, shopping centres, and hospitality and culinary venues. These trade and business areas are surrounded by well-planned residential areas, developed by nationally reputable developers. On the southern side, especially along the road connecting Surakarta and Wonogiri, many garment industries have also been established. However, it is a unique phenomenon that among these land uses represented by urban activities, many rice fields in enclaves are still to be found.

The northern part of Solo Raya metropolitan region is dominated by residential development and sporadic growth of industrial activities (see Figure 4). During 2005–2017, housing areas for lower- and middle-income persons were intensively developed in Gondangrejo, which occupies areas that were once rice fields or moorland. A few industrial buildings have also been established in locations relatively far from the city centre, following the road connecting Surakarta and Purwodadi, the capital of Grobogan Regency. However, there is only one large industry in Kalijambe subdistrict at present, possibly due to the policy of the Boyolali government in determining a 300-hectare industrial estate in Ngempak and Ampel subdistricts.

In the Surakarta–Sragen corridor, there was a significant change in three subdistricts traversed by the arterial road connecting Surakarta and Surabaya. These are Jaten, Kebakkramat and Masaran subdistricts.

Figure 3. Southern Side of the Suburbs of Surakarta

Source: Field survey in 2018.

Figure 4. Northern Side of the Suburbs of Surakarta

Source: Field survey 2018.

In this corridor, industrial activities are growing along the arterial road but become fewer with the increasing distance. Accompanying these industrial activities, agricultural land uses in this corridor have changed into built-up areas, as shown in Figure 5.

Residential and low-scale trade activities have grown in the western direction. In the path of Surakarta–Kartosuro, the accelerating development was triggered by the role of Kartosuro City as a hub between Surakarta, Yogyakarta and Semarang. On this path, trade and service activities occur along this corridor, together with the development of residential areas in its surroundings. Industrial activities had already been growing in this direction before 2015. However, additional industrial activities have also appeared in the corridor of Kartosuro–Boyolali. The industrial development in this corridor is benefited by its location in the regional lane connecting Surakarta and Semarang. In the future, the existence of the Tanjung Mas port in Semarang, improvement to the quality of the arterial road and the new toll road connecting this area with the north coast of Java since December 2018, are expected to attract more industrial investors. Surakarta is thus becoming the second city after Semarang as a hub in the toll road system of Jakarta–Surabaya.

Furthermore, the changing intensity of each land use can be seen in Figures 6–8. As shown in Figure 6, there has been a siginificant increase in residential areas on the northern side of Surakarta. The 2015 land use dominated by agricultural activities, especially rice and dry fields, has provoked people and developers to build new residential areas in these areas. Moreover, many new industrial activities have

Figure 5. Eastern Side of the Suburbs of Surakarta

Source: Field survey in 2018.

sprung up in the west, south and a little to the east along the regional road network, as shown in Figure 7. This is because in 2005 the intensity of industrial activities in the west was quite high, and so the growth of industrial activities was mostly directed to the east, which was still dominated by agricultural land. Likewise to the south, the growth of industrial activities was triggered by pre-existing trade and service areas. During the period 2005–2017, the growth of trade and service activities was sporadic, following the regional roads. The increase to the south was relatively low because its intensity in 2005 was already high.

Two indicators often used to measure the occurance of urbanization are population density and the proportion of built-up area. Figure 9 represents the shift of population density by village or urban village from 2005 to 2017. It shows that the population growth in the southern and western parts of the region is more rapid than in the others. In this case, Kartosuro City appears separate from Surakarta in 2005 but has become interconnected in 2017. The development of urban activities to the south was triggered by the development of Solo Baru, while that to the west seemed to be affected by the intensive interactions between Surakarta and Yogyakarta or Semarang. The intersection of these three cities is Kartosuro. Therefore, the corridor of Surakarta–Kartosuro is located on a regional lane. This fact is distinctive because even though the rapid development of both corridors is the same, their characteristics are different. The pull of development to the west is impacted by the triangular regional interactions between Yogyakarta, Solo and Semarang, famously called Joglosemar, while the southward pull is affected more by Solo Baru and the large scale of trade and settlement areas built by big developers/investors. It is not

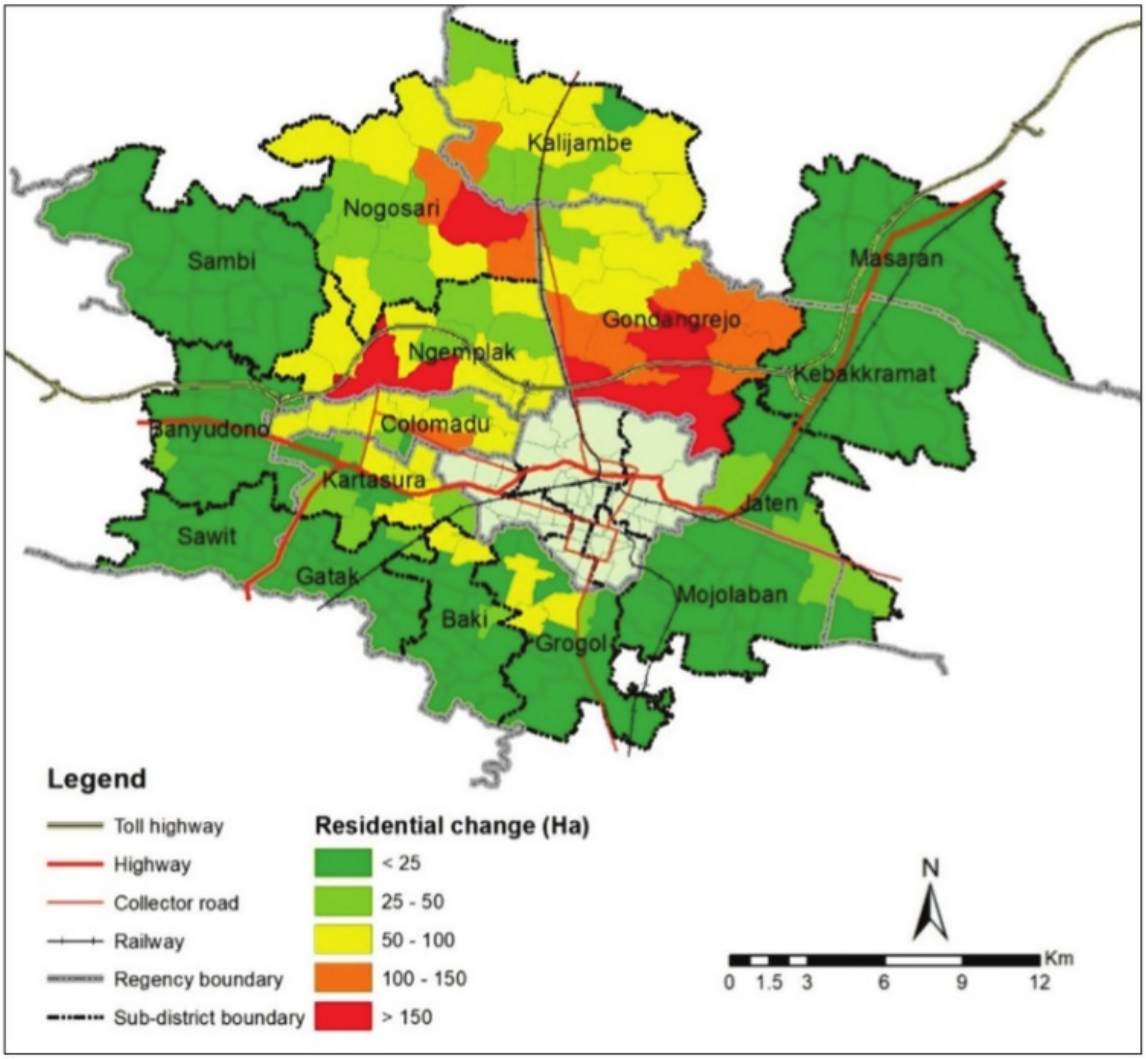

Figure 6. The Change of Residential Areas Between 2005 and 2017

Source: The authors.

on the path of national road connectivity, but only on a collector road connecting Surakarta and Wonogiri City, the capital of Wonogiri Regency.

The changing pattern between the proportion of built-up area and the population density is quite similar. In this case, the change in the west and south is relatively higher than in other directions for the reason given earlier. The changing pattern of built-up ratio can be spatially seen in Figure 10 in more detail.

Meanwhile, Table 2 shows the loss of agricultural areas that were changed into urban built-up functions by the subdistrict during 2005–2017. The loss of agricultural areas reached 3,398.82 ha. They were categorized into residential, industrial, and trade and business areas. It revealed that the new built-up areas were mostly established in agricultural areas. Unfortunately, many of them were productive rice

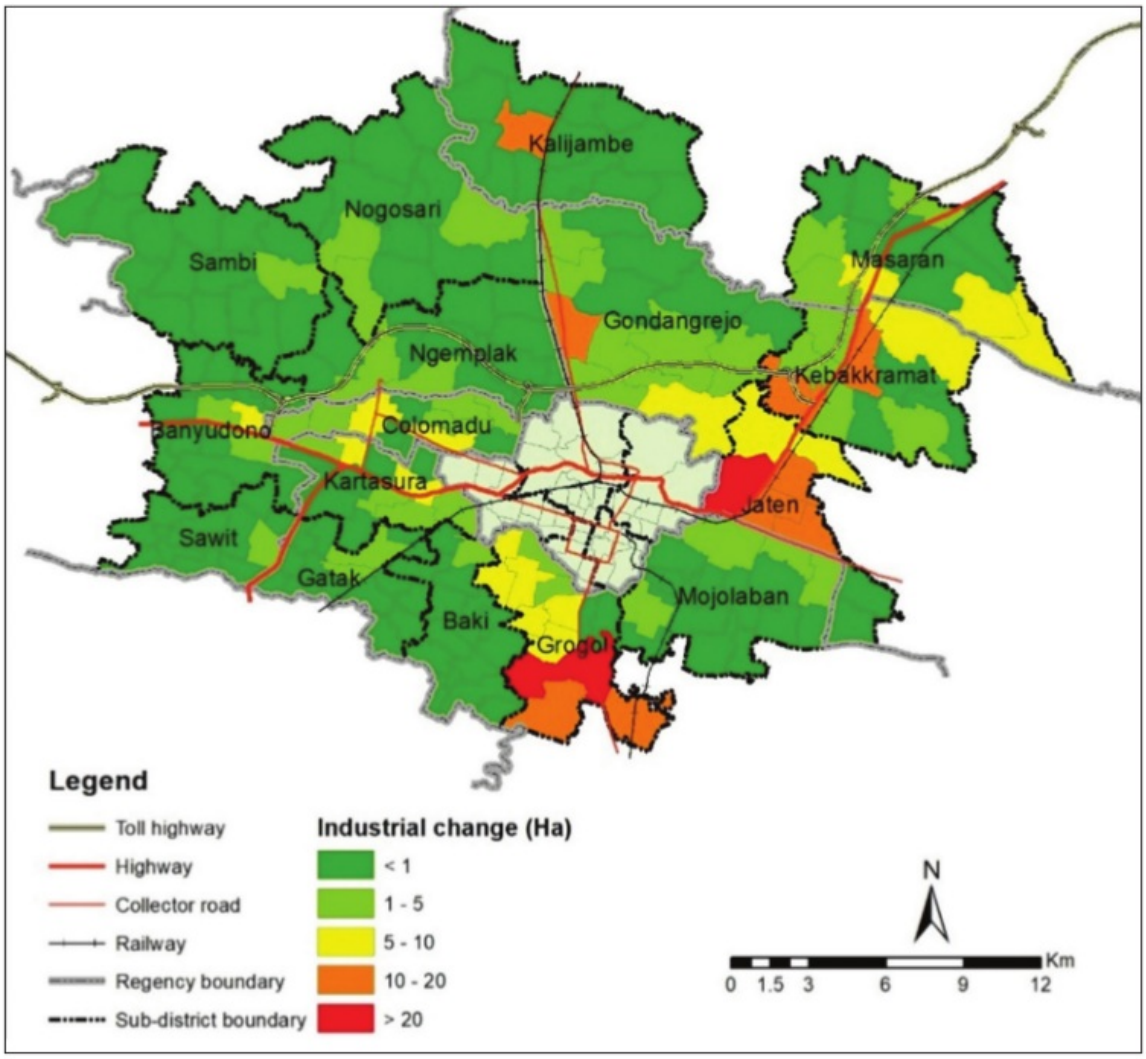

Figure 7. The Change of Industrial Areas Between 2005 and 2017

Source: The authors.

fields, either rainfed or irrigated. Figures 3–5 and 11 also show that the new buildings, especially the factories, stood surrounded by the paddy fields. The development of these factories has triggered the growth of residential areas and other supporting activities in the vicinity. In this case, the need for settlements for industrial workers who were usually local migrants has increased. The same occurred in the new built-up areas for trade and business. Their existence has spurred the development of their surroundings, especially residential areas for the upper middle class. All these developments occurred by acquiring agricultural areas. If not controlled, this condition could endanger the sustainability of food security because what was mostly lost were the fertile agricultural lands.

One of the instruments that can be used to ensure that the development is sustainable is spatial planning (Scott et al., 2013; Suroso & Firman, 2018). Indonesian Law 26/2007 on Spatial Planning orders

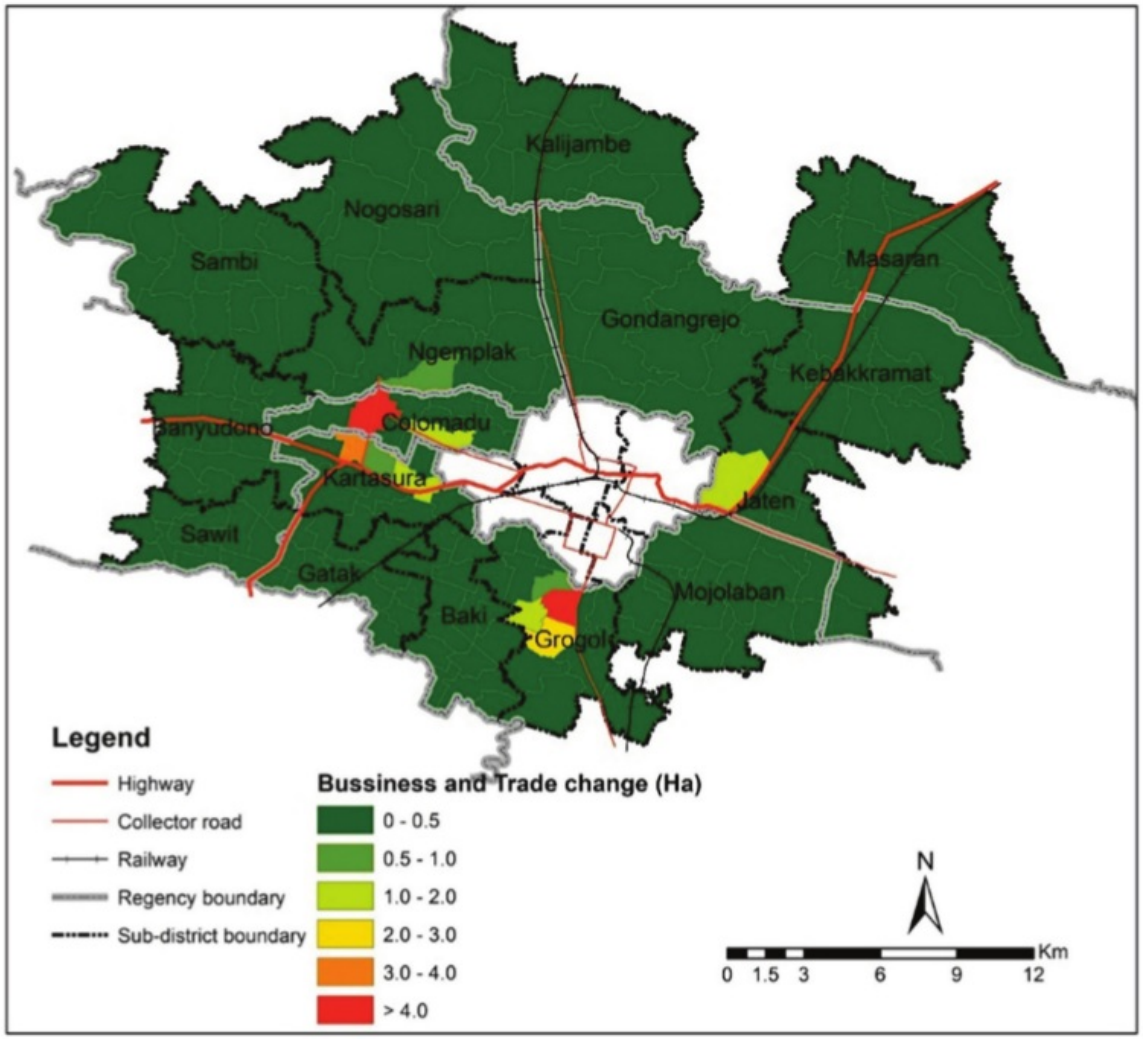

Figure 8. The Change of Trade and Bussiness Areas Between 2005 and 2017

Source: The authors.

that the nation, every province and every regency/city should have a spatial plan. Based on Government Regulation (GR) 26/2008 on the National Spatial Plan and Presidential Regulation (PR) 28/2012 on the Java–Bali Spatial Plan, several National Strategic Urban Regions have been developed for Java's big cities and their surrounding urban areas, such as Jabodetabek, Kedungsepur and Gerbangkertosusila. In fact, Indonesian spatial planning is often unable to anticipate the rapid growth of urban development. In the case of the study area, Surakarta City has already had the City Spatial Plan for 2011–2031. Boyolali, Sukoharjo and Sragen have also developed their Regency Spatial Plan for 2011–2031. Meanwhile, Karanganyar has already had the Regency Spatial Plan for 2013–2032. As a metropolitan region, Surakarta City and its surroundings should also have a spatial plan as a Provincial Strategic Urban Region. Unfortunately, this plan has not yet been formulated. Because urban development in the suburbs

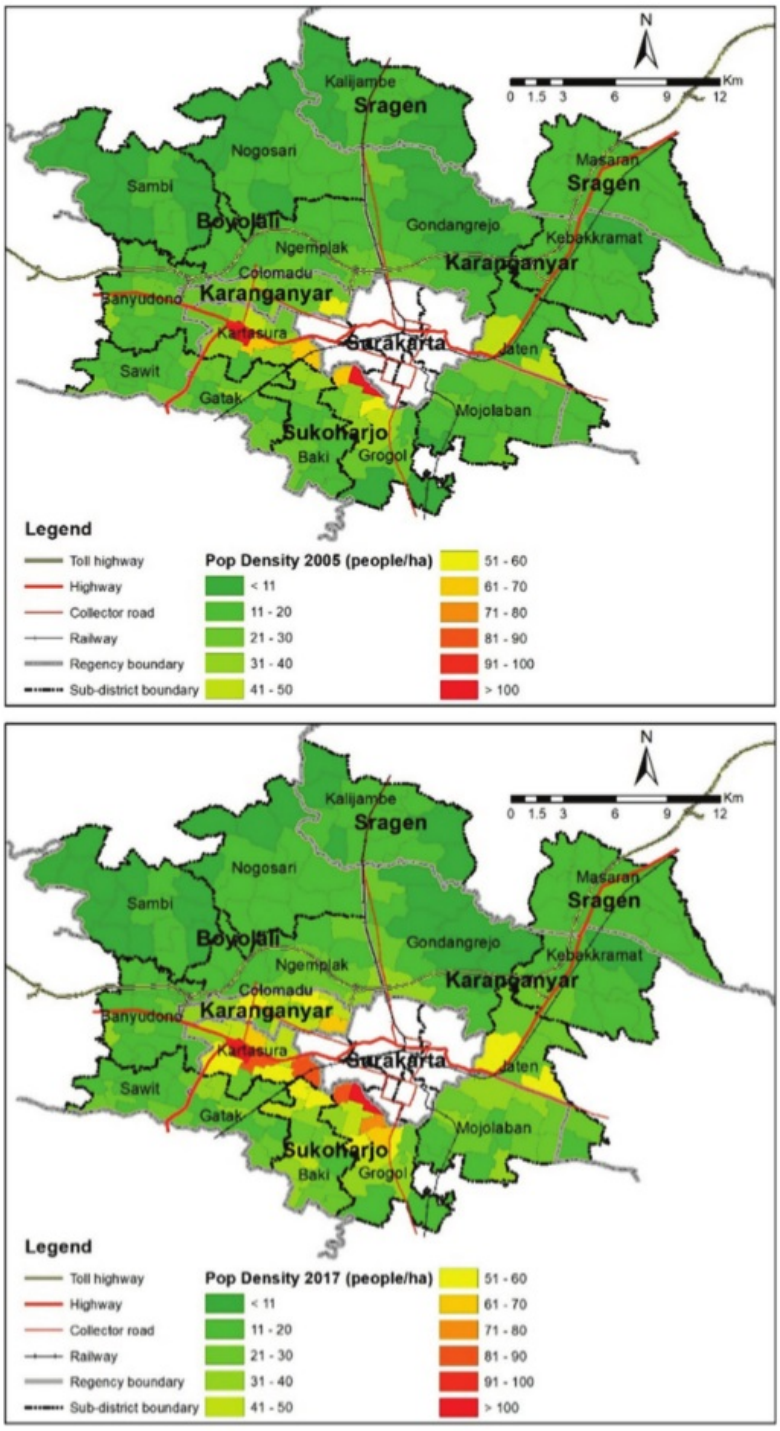

Figure 9. Population Density in 2005 and 2017

Source: The authors.

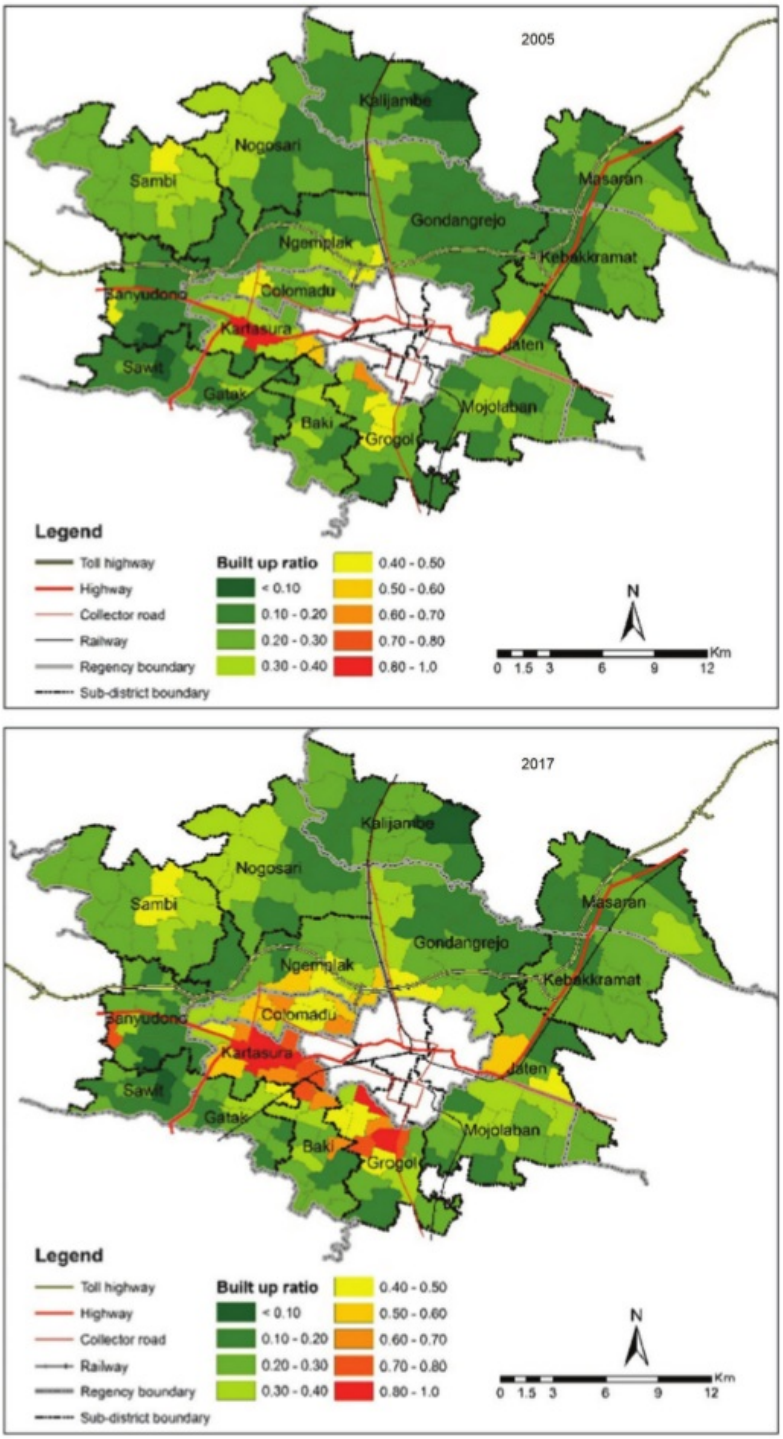

Figure 10. Built-up Ratio in 2005 and 2017

Source: The authors.

Table 2. Land Use Change from Agricultural to Urban Built-up Areas During 2005–2017

No.	Regency (*Kabupaten*)	Subdistrict (*Kecamatan*)	Land Use Change (ha)		
			Agricultural to Residential Area	Agriculture to Industrial Area	Agriculture to Business and Trade
1	Boyolali	Sawit	21.01	2.25	0.00
2		Banyudono	99.59	13.30	0.00
3		Sambi	53.55	4.14	0.00
4		Ngemplak	202.13	3.24	0.54
5		Nogosari	62.85	7.65	0.00
6	Sukoharjo	Mojolaban	149.55	9.68	0.04
7		Grogol	342.67	137.77	13.95
8		Baki	211.90	2.25	0.36
9		Gatak	79.50	4.68	0.00
10		Kartasura	464.99	16.29	6.31
11	Karanganyar	Jaten	134.81	87.99	2.03
12		Colomadu	373.32	21.68	8.52
13		Gondangrejo	492.00	44.40	0.00
14		Kebakkramat	37.46	53.16	0.00
15	Sragen	Kalijambe	149.26	10.62	0.00
16		Masaran	42.03	31.34	0.00
	Total		2,916.63	450.43	31.75

Source: The authors.

was not covered by the City Spatial Plan of Surakarta, their development was not properly planned and tended to grow by nature.

For the purpose of this study, the next analysis looks at the change of pre-prosperous families in the period of 2005 and 2017 by rural/urban village. Figure 12 shows that most suburbs of Surakarta experienced an increase of pre-prosperous families. The most significant increase occurred in the rural/urban villages in the south and east, although a slight increase appeared in those in the north. Compared to the land use changes, the increase of pre-prosperous families occurred in the rural/urban villages where the increase of industrial land use was relatively high. This fact implies two possibilities: the first is that the new industries caused the residents who were originally farmers to lose work opportunities (see Dewi & Rudiarto, 2013), and the second is the existence of migrants from other regions seeking a fortune as workers in industry. In the case that some are unskilled labour, the number of pre-prosperous families could increase. Because this matter has not been covered by this study, a micro scale of further studies with a detailed primary survey is therefore needed to clarify the situation.

Furthermore, Table 3 shows the correlation between the increase/decrease of pre-prosperous families and the change of each land use. The results show that, generally, pre-prosperous families have a weak positive correlation with land use change. On the one hand, there is a small positive correlation with the land use change for industries and settlements. This measure is in accordance with the visual analysis seen by comparing the map of the change in pre-prosperous families with the maps of

Figure 11. Western Side of the Suburbs of Surakarta
Source: Field survey in 2018.

land use change for industries and settlements. This fact is an unfavourable indication for the development of suburbs in the study area because the establishment of industrial activities and settlements that was expected to result in an increase in people's welfare has not occurred (see Gar-On Yeh & Li, 1999). On the other hand, there is a negative correlation, although to a very small degree, between the increase in pre-prosperous families with the increase in trade and business land use. This is a positive indication because the number of pre-prosperous families has declined in the suburbs where trade and business activities were established. However, this study could not answer whether the increase in trade and business land use was the cause of the decline in the pre-prosperous families yet because there might be other factors that have also affected. To ensure this indication, it recommends further investigation.

The urbanization process occurring in the suburbs of Surakarta is more appropriately referred to as a 'sub-urbanization' than 'in situ urbanization'. This is because the process of urbanization here is due more to the urban expansion from the city of Surakarta and the migrants were city residents looking for better housing in the suburbs. Moreover, it was also triggered by the increasingly high price of core city lands. The urban expansion that usually follows the existing major roads (Adeel, 2010; Aguilar, 2008) was not affected by Solo Baru, which as a development was supported by big investors. This might have happened because the development of Solo Baru was in accordance with the political situation and policy at that time. Therefore, the development process of the study area confirms previous studies in stating

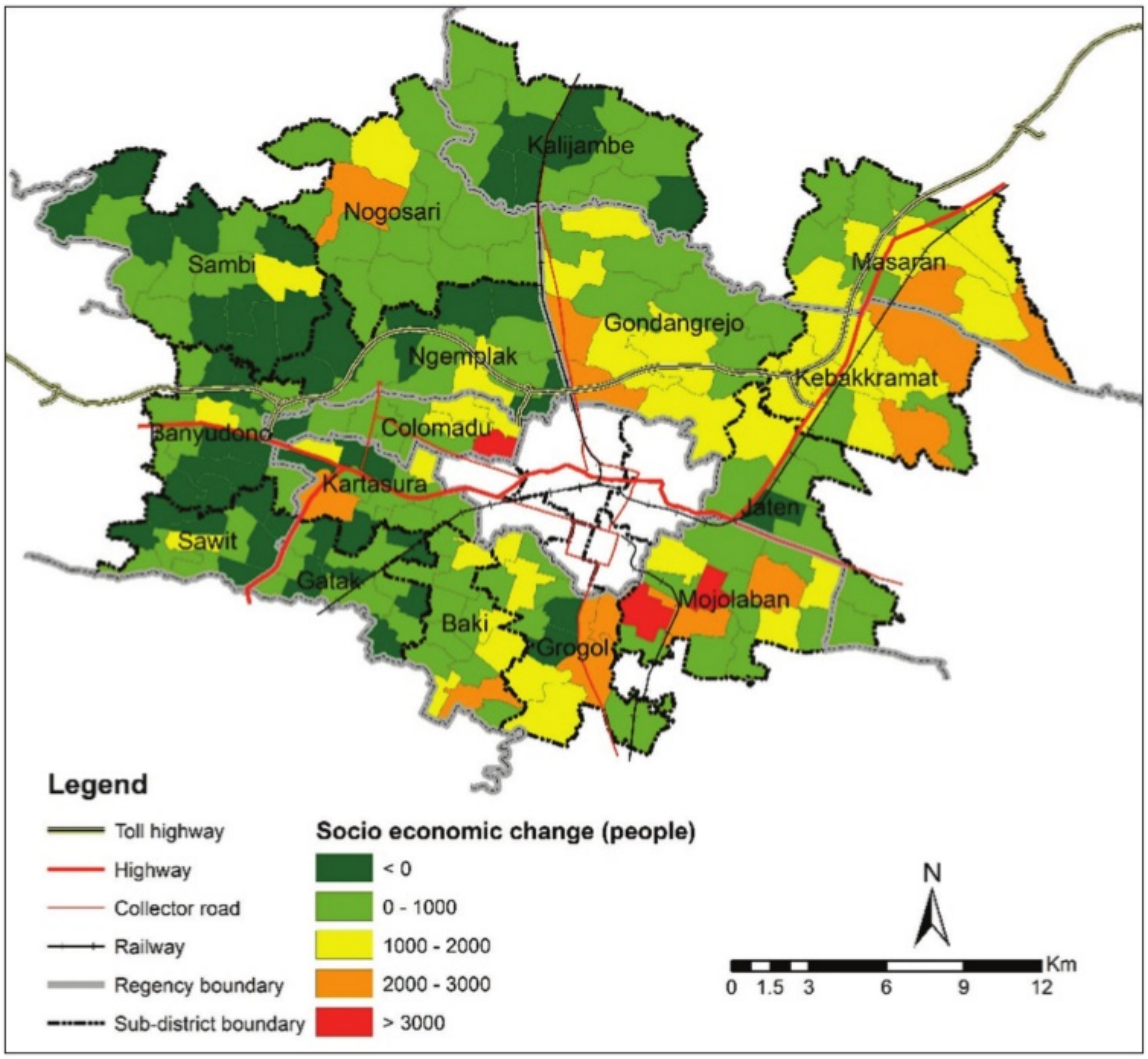

Figure 12. The Change in Pre-prosperous Families

Source: The authors.

Table 3. Correlation Between the Change of Pre-prosperous Families and Land Use Change

Change of Pre-prosperous Families	Residential Change	Industrial Change	Trade and Business Change
R^2 (Pearson correlation)	0.153	0.244	−0.095
Sig. (2-tailed)	0.028	0.000	0.176

Source: The authors.

that the transition from rural to urban in suburbs is affected by city structure, physical conditions and political policies (Aguilar, 2008; Aguilar et al., 2003; Mieszkowski & Mills, 1993; Sugiri & Buchori, 2016b; Zhang et al., 2018).

In general, the process of urban expansion in the suburbs of a medium-sized city as shown in this case study is relatively similar to that of bigger cities, except for the speed and intensity. There is a changing process from rural to urban in the surrounding areas following regional lines or towards the centre of new activities. The growth of industrial activities has also been able at a lower level to form the structure of the metropolitan area, and this is the same tendency as seen in Jabodetabek (Hudalah et al., 2013). Although clustered, their characteristics, which are mostly labour based, also tended to locate in unplanned industrial areas, not in certain industrial parks.

Conclusion

This study has successfully demonstrated that the spatial transformation in the Solo Raya metropolitan region has a different pattern of urbanization, designated by physical changes, changes in activities and shifting in land use that impact on urban policy. Several driving factors showed that industrialization has impacted the suburbs of a medium-sized city as a distinctive phenomenon in the process and theory of urbanization. The findings also confirm that the urbanization occurring in the suburbs of a medium-sized city can be either in situ or suburbanization. Thus, suburbanization occurs not only in a primary but also medium-sized city where land use and prosperity standards are the main factors that can influence the spatial dynamics of their suburbs. As a matter of fact, this study has succeeded in confirming that the dichotomy of rural and urban zones should be carefully considered because the suburbs can undergo a process of suburbanization and become urban areas that have very few rural activities. In this context, the term 'rural–urban linkage' could be more appropriately used in regional development than as a characterization of urban and rural zones.

Urban expansion usually follows the pattern of regional roads connecting to other cities, particularly the large ones. The same situation happened in the Solo Raya metropolitan region, where Surakarta is the core city. The expansion is growing significantly along the regional roads leading towards Semarang/Yogyakarta and Surabaya. However, the expansion to the south is an exception because it is not located on a regional road and is more affected by the establishment of the large-scale trade and business area of Solo Baru. This area is increasingly developing with the emergence of large-scale garment industries located on collector roads in the direction of Wonogiri.

This study also shows that the change of agricultural to other urbanized land uses in the suburbs has not directly reduced poverty. In the study area, the increase of industrial land use is even correlated to a small degree with the addition of pre-prosperous families. In this case, the expectation that the development of industrial activities can improve people's welfare has not materialized. This phenomenon is not different from that happening in the larger metropolitan regions, where urban expansion in suburbs has eliminated the native residents' livelihoods. As for the suburbs of Surakarta as a medium-sized city, the influence of land use change in socio-spatial dynamics is less perceptible compared to that of large metropolitan regions. Nevertheless, the fact that the increase in industrial activities has not affected a reduction in pre-prosperous families should be considered. From this case study, the lesson to be learnt is that policy determination for suburban development should pay more attention to the existence of native residents so that they are not harmed. For this, a strategy that can accommodate local employers in the development of industrial activities in suburbs is a necessity.

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PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13

PAGE 14

PAGE 15

PAGE 16

PAGE 17

PAGE 18

PAGE 19

PAGE 20

PAGE 21

PAGE 22

PAGE 23

PAGE 24