An empirical examination of sustainable metropolitan development in Semarang City, Indonesia

by Imam Buchori Et Al.

Submission date: 31-May-2020 09:26AM (UTC+0700)
Submission ID: 1334939159
File name: ainable_metropolitan_development_in_Semarang_City,_Indonesia.pdf (3.06M)
Word count: 8079
Character count: 45067

Australian Planner

ISSN: 0729-3682 (Print) 2150-6841 (Online) Journal homepage: http://www.tandfonline.com/loi/rapl20

An empirical examination of sustainable metropolitan development in Semarang City, Indonesia

Imam Buchori & Agung Sugiri

To cite this article: Imam Buchori & Agung Sugiri (2016): An empirical examination of sustainable metropolitan development in Semarang City, Indonesia, Australian Planner, DOI: 10.1080/07293682.2016.1151905

To link to this article: http://dx.doi.org/10.1080/07293682.2016.1151905

Published online: 22 Feb 2016.

Submit your article to this journal

Article views: 8

View related articles

View Crossmark data

Full Terms & Conditions of access and use can be found at
http://www.tandfonline.com/action/journalInformation?journalCode=rapl20

Download by: [George Mason University] **Date:** 18 March 2016, At: 11:00

AUSTRALIAN PLANNER, 2016
http://dx.doi.org/10.1080/07293682.2016.1151905

Routledge
Taylor & Francis Group

An empirical examination of sustainable metropolitan development in Semarang City, Indonesia

Imam Buchori and Agung Sugiri

Department of Urban and Regional Planning, Faculty of Engineering, Diponegoro University, Semarang, Indonesia

ABSTRACT

In the urban and regional context, conflicts between economic growth and environmental concerns are so intense that sustainable development might be elusive. Evidence indicates that the spatial dynamics in many Indonesian metropolitan regions are not in accordance with sustainability. This research is thus aimed at empirically examining sustainable metropolitan development of Semarang City, based on a model proposed by Sugiri, Buchori, and Soetomo [2011. "Sustainable Metropolitan Development: Towards an Operational Model for Semarang Metropolitan Region." *The International Journal of Environmental, Cultural, Economic and Social Sustainability* 7 (5): 301–324]. The methods mainly involve spatial analysis using GIS and comparison of statistical data, supported by complementary qualitative information. The results show that the spatial development of Semarang City tends to be unsustainable, based on important indicators. However, the availability of such local initiatives as spatial plans and environmental impact studies should be considered essential in ensuring sustainable development. In addition, the growth of small-scale industries is prospective to increase public involvement in productive activities.

ARTICLE HISTORY
Received 12 February 2015
Accepted 4 February 2016

KEYWORDS
Sustainable development; metropolitan; empirical examination

Downloaded by [George Mason University] at 11:00 18 March 2016

Introduction

Sustaining development needs to ensure intra- and inter-generational equity through integrating the economy and the environment (WCED 1987). From an economic point of view, regional development means increasing gross regional product; however, it can also cause negative impacts to the environment. In turn, it will affect the application of fairness among generations. That is why economic growth should not overlook environmental issues.

The extent of environmental damage is affected by various factors, such as human activities, population growth, poverty, and unemployment. In strategic regions having important roles in Indonesian development, rapid economic growth is inflicting damage to the environment. Pressure of the population and environmental changes, intensity of the economic activities, as well as land scarcity issues, are becoming increasingly important. In Java, land conversion aimed at increasing economic growth also leads to flooding and loss of natural resources. According to Irawan (2005), land conversion in Java reached 43,600 ha/year, 75% of which was for housing. Meanwhile, 13% of land conversion was for industry, 8% for commercial use and 5% for other activities. Similar problems also occur beyond Java, where the average conversion rate is even higher (66,560 ha/year). Problems associated with land conversion have shown that recent practices of spatial planning and management are often not good enough to ensure sustainable regional development.

In Indonesia, the principles of equity have not been applied appropriately in regional and metropolitan development. The emphasis on economic growth concentrated in urban centres can pressure the environment of surrounding areas. This situation can lead to unbalanced development in land conversion and inequality in infrastructure (UNDP 2006). Saptana (2007), for example, shows that, during the last four decades, national development has battled worsening poverty, unemployment, and social disparities. A development process that tends to focus on growth of output, which in practice is dominated by the role of government and private sectors, is often perceived as the cause of this problem.

The Semarang Metropolitan Region (SMR), one of the important regions in Java, is no exception. Administratively, it comprises two cities, that is, Semarang and Salatiga, and four regencies (*kabupatens*), that is, Kendal, Semarang, Demak, and Grobogan (Figure 1). The whole area is usually called *Kedungsepur*, an acronym of the names of the cities and regencies. Within it, rural activities are still dominant.

Previous studies show that SMR has already experienced spatial problems threatening the sustainability of its spatial dynamics. The problems exist especially in terms of spatial interaction, such as inefficiency in the use of energy in regional transportation (Soetomo

CONTACT Imam Buchori i.buchori@undip.ac.id
© 2016 Taylor & Francis

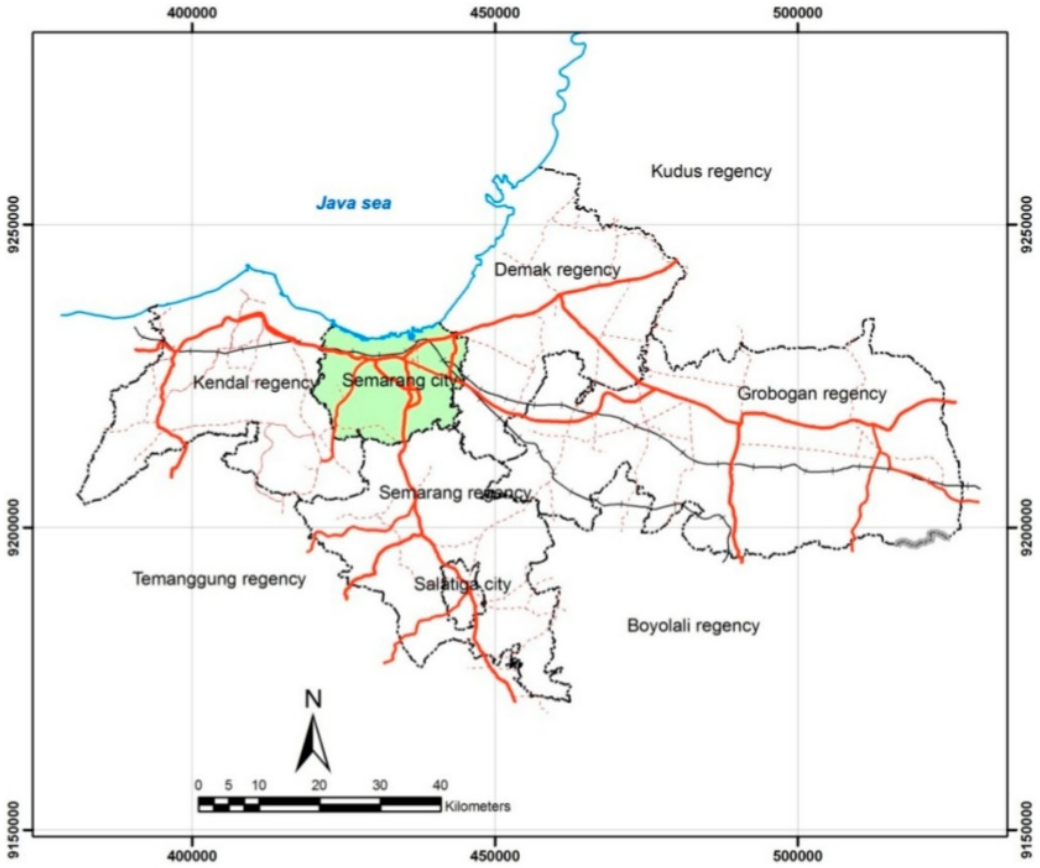


Figure 1. Semarang city in the constellation of SMR.

2009). The growth rate of motor vehicles is relatively high (2.5%/year), which affects the rate of traffic accidents, especially by private vehicles (80%) (Kompas Newspaper 2009). Motor vehicles also contribute significantly to urban air pollution, that is, about 97–99% of CO-gas to the air.

The level of emissions is not only determined by the volume of traffic and the number of vehicles, but also by traffic patterns and circulation in the urban areas, especially downtown. Congestion that often occurs in big cities can lead directly to an increase in fuel consumption and vehicle emissions. It is thus not surprising that the transportation sector is one of the largest fuel consuming sectors in addition to households and industry (Sjafruddin 2010).

The extensive growth process of the SMR could also imply ineffective regional development, particularly in terms of infrastructure supply. That the residential areas presently extend to land that should not be converted because of preservation concerns (Khadiyanto 2005; Soetomo 2009) and the infrastructure development that is still conventional in the sense that the supply is partial and un-integrated (Susila 2008) are just two examples. This situation can lead to an unfortunate outcome, such as a lack of quality economic growth, traffic congestion, and dislocation in road usage. In addition, urban and rural relationships can fail to alleviate poverty and to minimise economic inequality. It can be seen in the fluctuation in the incidence of poverty and the increase in population since 2000, as well as in the increase of spatial inequality.

With such indications in hand, this study starts with a hypothesis: there could have been an unsustainable development in SMR in the sense that coming generations would be endowed with less development potential. Semarang City as the core of the SMR is expected significantly to contribute to the unsustainability. For this reason, this study aims empirically to examine the sustainability of its development. Results of the examination should be perceived as a preliminary sustainability assessment of the situation of the whole SMR.

Assessment framework: the model of sustainable metropolitan development

Studies of, and efforts to ensure, sustainable urban and regional development have been undertaken all over

Downloaded by [George Mason University] at 11:00 18 March 2016

Downloaded by [George Mason University] at 11:00 18 March 2016

the globe, especially since the important milestone of sustainable development study, the Brundtland Report (WCED 1987), was launched. In the developed world, for example, a study assessing sustainable urban development of the European Union (EU) has been accomplished (Cornier 2012). Cornier has assessed 53 cities, utilising about 20 indicators and classified them into groups or profiles of sustainability. In general, Northern cities are considered more successful, and various approaches among the EU countries are observable. The results contribute significantly to the effort to integrate strategies for sustainable urban development of the EU.

Meanwhile, among many sustainable development studies in China, Chan and Shimou (1999) have studied the nation's urbanisation process. As for Ghana, achievement and challenges in sustaining development have been analysed by Domfeh, Ahenkan, and Bawole (2012), focusing on key policy issues like poverty reduction, health, water and sanitation, energy, population growth, and environmental policies. Of the Nepal case, Poudel (2011) has recommended a strategic framework to optimise environmental, social and financial benefits so that sustainable development can be ensured. Local wisdom called the Asta-Ja (literally means eight Ja) contributes significantly to the framework, nominating eight aspects, that is, water, land, forest, medicinal/aromatic plants, manpower, animals, plants, and climate.

In Indonesia, on the other hand, studies have also been undertaken by scholars, although results of practical implementation are still incomplete. Among the earlier ones, research by Firman and Dharmapatni (1994) has found out that negative externalities of development activities within the Jakarta Metropolitan Region (JMR) deteriorated the environmental quality. So much occurred, despite the availability of various plans and programs at practically all levels (from national to local) to deal with the externality problems. That is why the study urged that an environmental management framework be applied in the JMR and it should be under the control of a metropolitan authority or a central agency superior to the corresponding provinces' authorities.

Unfortunately, the recommendation has never been implemented. The situation prevails despite the worsening problems of unsustainability as seen in more recent and remarkable studies (Firman 2004, 2009; Hudalah and Firman 2012). The rapid growth of the JMR and the Bandung Metropolitan Region (BMR) has resulted in a high growth belt of about 200 km length (Firman 2009). Negative externalities have also been observed in this area, and they have worsened the preceding problems of spatial segregation in the JMR (Firman 2004).

It is apparent, then, that a model of sustainable metropolitan development suitable for assessing the SMR is needed. This section discusses the model of sustainable metropolitan development developed by Sugiri, Buchori, and Soetomo (2011) as the assessment framework of this study. The discussion starts by elaborating the meaning of sustainability in regional development, followed by an explanation of the model.

Sustainability in regional development

The classic definition of sustainable development is 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED 1987, 43). This definition conveys the importance of two kinds of equity, namely intra- and inter-generational. While intra-generational equity is concerned with fulfilling people's needs and aspirations within generations, inter-generational equity is related to the responsibility of the present generation to convey at least the same level of development potential to future generations (see e.g. Tisdell 1993; Toman 1994; Hanley, Shogren, and White 1997).

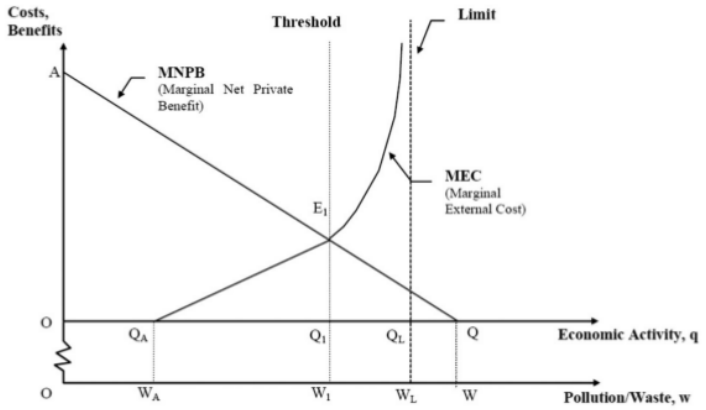
Although various perceptions of sustainable development exist, one thing is in common, that equity is essential for sustaining development. Hence, to be sustainable, a development should incorporate equity in such a way that both outcome and opportunity are equitably distributed within generations while maintaining capability for future ones.

An important idea emerging from the concept of sustainable development is that it needs an integration of environmental concerns into development activities to achieve development objectives for the present generation and to maintain development on a sustainable path. Ensuring sustainable development, then, requires a comprehensive perception of inter-related needs involving people and the natural environment (see e.g. Fowke and Prasad 1996).

In regional development, if carrying capacity is not to be exceeded by economic activities, it implies that the latter should deal carefully with the environment. This main idea can be explained from an economic view as seen in Figure 2.

Figure 2 develops a graphical analysis used in the environmental economics literature (see e.g. Pearce and Turner 1990; Turner, Pearce, and Bateman 1993), combined with the ideas of environmental carrying capacity, threshold and limit (see e.g. Mitchell 1979; Kozlowski 1993; Munro 1995), to explain in what condition sustainability can be ensured.

In the figure, environmental deterioration is simplified in terms of a level of pollution or waste. It is also assumed that the greater the level of economic activity the greater the pollution. There are two elements in the figure, that is, the polluter and the externality. The polluter side (i.e. actors in economic activities) is shown by MNPB (Marginal Net Private Benefit) curve, which is



Source: Developed from Pearce and Turner (1990)

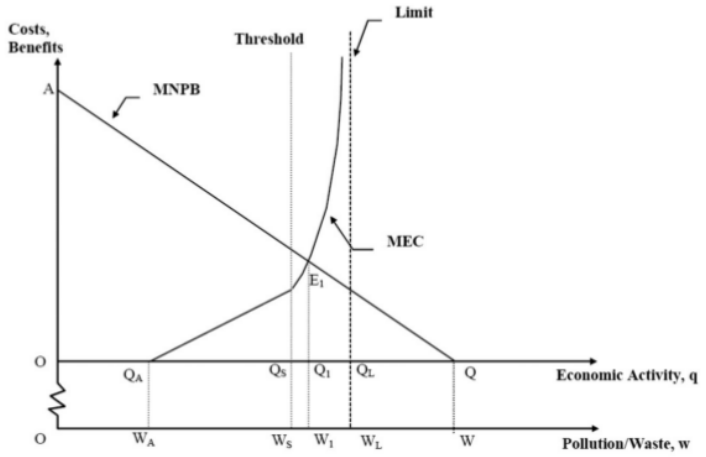
Figure 2. Hypothetical analysis of the optimal and sustainable situations. Source: Developed from Pearce and Turner (1990).

Downloaded by [George Mason University] at 11:00 18 March 2016

revenue minus cost in marginal terms. On the other hand, the externality, that is, the sufferer, is shown by MEC (Marginal External Cost) curve. It is assumed for inferior or negative goods or services that an increase in economic activities or the quantum of products will be followed by an increasing externality.

Figure 2 shows that assimilative capacity of the environment is to receive OW_A wastes without inducing any externality cost. So, the MEC curve begins just after the economic activities exceed OQ_A. Without any consideration of externalities, because the market mechanism fails to capture them, economic activities would be developed to the OQ level since the maximum benefit is gained (the area of OAQ). This situation is a market failure in environmental externalities because the externality cost due to economic activities is not taken into account. It might also not be sustainable since economic activities can exceed the capacity of the environment to support them. The environmental limit may be at the OQ_L level of economic activity. It means that the environment cannot receive more than the OW_L level of pollution because it would be destroyed.

For sustainability purposes, economic activities should not exceed the carrying capacity of the environment. Carrying capacity can be defined as 'the maximum intensity of use an area will continuously support under a management programme without inducing a permanent change in the biotic environment' (Burden and Randerson 1972; in Mitchell 1979, 178). Determining carrying capacity assumes 'ecological and behavioural thresholds beyond which the biophysical environment deteriorates and user enjoyment declines' (Mitchell 1979, 178). Meanwhile, 'a threshold to further development is encountered if it cannot extend to a new area, produce additional



Source: Developed from Pearce and Turner (1990)

Figure 3. Hypothetical analysis of an 'optimal but not sustainable' situation. Source: Developed from Pearce and Turner (1990).

output, achieve higher quality, or accelerate production, without involving an increase of investment, social or ecological cost' (Kozlowski 1993, 19). Thus, beyond an environmental threshold, the marginal externality cost would become much higher, represented by the much steeper MEC curve in Figure 2. Economic activities are thus sustainable and achieve maximum benefit for the society at OQ_1 level. The benefit is equal to the area of OAE_1Q_A and the maximum pollution level is OW_1.

Between the threshold and the limit, the level of economic activity is not efficient for the society. This situation would lead to inequity since the externality cost suffered by society would be much higher. On the other hand, environmental deterioration caused by economic activities may be difficult to cure. Thus, the situation is not sustainable since it does not encourage intra- and inter-generational equity. If the polluter is to pay the externality cost of pollution, then the equilibrium of E_1 will be achieved. The level of economic activity will be at the sustainable level, OQ_1.

The situation described above, however, applies only in the case that sustainability and optimality can both be met at the OQ_1 level of economic activity. One could argue that optimality does not have to agree with sustainability because 'many economic activities that are unsustainable may be perfectly optimal, and many that are sustainable may not even be desirable, let alone optimal' (Beckerman 1994, 193). This view acknowledges the trade-off between sustainability and equity purposes (Schrecker 1998). It is thus possible that optimality does not coincide with inter-generational equity, the situation of which is explained in Figure 3.

In Figure 3, the environmental threshold only allows, say, OW_S level of pollution. Meanwhile, optimality is achieved at the equilibrium point of E_1. In this situation, however, the level of economic activities (OQ_1) exceeds the environmental threshold and is considered unsustainable. On the contrary, if sustainability is to be achieved, the maximum activities permitted would be OQ_S, which is obviously not optimal according to economic calculations.

However, technology can help the situation described above in two ways. First, progress in waste treatment could allow more economic activities to emit lower levels of pollution. The OQ_1 level of economic activity, for example, with improved technology may release only OW_S pollution so that optimality, as well as sustainability, can be achieved. Second, innovation in technology may allow substitutions of natural capital with man-made capital. If this is the case, then the environmental threshold in Figure 3 may move right to, say, W_1 so that sustainability does not have to conflict with optimality.

The model of sustainable metropolitan development

Sustainable metropolitan development, as defined by Sugiri, Buchori, and Soetomo (2011), is development at the metropolitan level that is able to ensure intra- and inter-generational equity for the inhabitants without compromising the ability of other regions to do the same. It sits in accordance with the famous definition of sustainable development by WCED (1987) as well as with previous studies' definitions of sustainable regional or metropolitan development (Chan and Shimou 1999; Sugiri 2009). The emphasis on equity principles is derived from the model of equity-based development (Sugiri 2009), which deems equity as fairness in the development process and justice in the distribution of development outcomes. On this basis, Sugiri, Buchori, and Soetomo (2011) move on to develop a model of sustainable metropolitan development (Figure 4).

The approach in constructing the model is apparently system-based, although it is not explicitly mentioned. A metropolitan region is considered as an open spatial system where the elements interact dynamically within the region and with other region's elements. The principle of a functional region is applied, in the sense that interactions among the elements within the region are more intense than those between the internal and the external elements. The result is the sustainable welfare of the population.

It should be noted that concepts or models of sustainable metropolitan development for developing countries are still rare and may not be comparable from one to another. However, Sugiri et al.'s vision seems to be more developed than that of Chan and Shimou (1999), especially in the conception of four basic capabilities of a metropolitan function and structure, which is not explicitly mentioned in Chan and Shimou, and in recognising strategic policy issues. It may be due to the different backgrounds and locally specific issues between the case of China for Chan and Shimou, and Indonesia for Sugiri et al.

According to the model, to be sustainable, a metropolitan development should encourage its structure and function to ensure capability to achieve four fundamental goals or objectives. The framework has also proposed 11 strategic issues for the reformulation of development policy. Although the above four goals are inter-related, so are the strategic issues; some issues are connected more to certain goals than the others. The first four issues are related mostly to the achievement of the first goal, while the fifth and sixth issues relate to the second goal. On the other hand, the seventh, eighth, and ninth issues are mostly related to the third goal, and the last two issues are with the fourth goal.

Downloaded by [George Mason University] at 11:00 18 March 2016

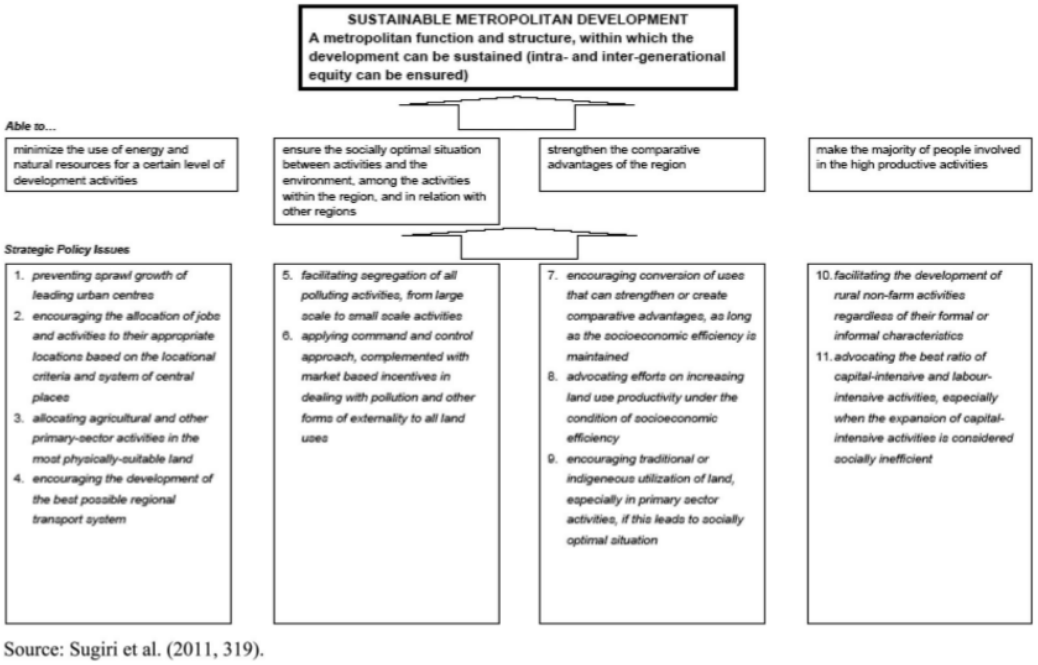


Figure 4. The model of sustainable metropolitan development. Source: Sugiri, Buchori, and Soetomo (2011, 319).

Downloaded by [George Mason University] at 11:00 18 March 2016

Waypoint

Previous studies have developed a model of sustainable metropolitan development, which is applicable to the SMR and other metropolitan regions in Indonesia, but need to be further elaborated and enhanced. This way, not only would contribution to knowledge and science be effective, but also the benefits for metropolitan development practices would be significant.

Methods

This research uses a positivist approach, in which empirical data are utilised to assess the hypothesis. The assessment is based on the principles of equity within and between generations in the development of metropolitan regions, as formulated by Sugiri, Buchori, and Soetomo (2011). Based on the model discussed previously, the objectives, strategies, and indicators are briefly explained in the discussion part of this paper. The assessment is based on those indicators.

The indicators are measured over two periods of time. The data used are mainly quantitative, supported by qualitative information if necessary. The methods for gathering the data involve surveys of relevant institutions, such as Statistics Office of Semarang City, Semarang City Government, Transportation Office of Semarang City, and City Agency for Development Planning of Semarang, and interviews with key informants, particularly the responsible persons of those institutions. Also, relevant data and information resulted from previous studies, including PhD-dissertations, are used to substitute the required data. The analyses used are mainly statistical and spatial comparisons between two different time points in the data. GIS-based techniques like superimpose, proximity, and neighbourhood analyses are used to obtain the required spatial information about built-up areas, sprawl areas, growth trends, etc. At the end of the discussions, the sustainability of each strategy is classified into three categories, that is, low, fair, and good, based on the results of a comparison of the adjusted indicators. However, the third, ninth, and tenth strategies are excluded because they are suitable just for rural areas.

Discussions

The four objectives as the basis of the assessment are: (1) minimising the use of energy and natural resources for a certain level of development; (2) ensuring a socially optimal situation regarding negative externalities between socio-economic activities and the environment, among activities within the region, and in relation to other regions; (3) strengthening the comparative advantages of the region; and (4) making the majority of people able to be involved in productive activities.

Minimising the use of energy and natural resources

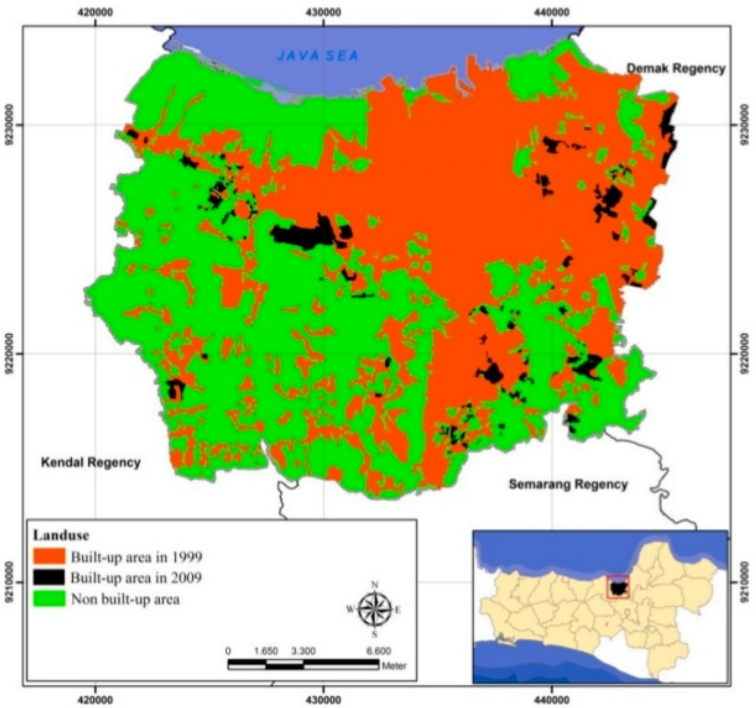
The first objective is achievable through four strategies, that is (a) preventing the growth of urban sprawl that

has a high dependence on the main city or downtown area, (b) encouraging the allocation of employment and activities to their appropriate locations based on the location criteria and the system of central places, (c) encouraging the development of the best possible regional transport system, and (d) allocating agricultural and other primary-sector activities to the most physically suitable land.

The first strategy seems to assume that monocentric urban form is the best for sustainability purposes. However, pondering more deeply on how to avoid or minimise the inefficient cost of sprawl, which can be done through polycentric urban form as well (see e.g. Gollner 1996), it is not about monocentric or polycentric form that matters. This strategy can prevent unnecessary use of energy caused by the increasing total length of journeys especially the journey to work (Gollner 1996; McMahon 1997). It employs two indicators, that is, the proportion of built-up and of sprawl areas. Since identifying the sprawl areas is difficult, the indicator of the proportion of sprawl area is replaced by the proportion of built-up areas in the fringe zones of Semarang City. The method used is an overlay analysis between the built-up area map in 1999 and that of 2009. The results are shown in Figure 5 and Table 1.

The proportion of built-up area to the total area of Semarang City has increased from 47.68% to 50.54%, that is an increase of 2.86% from 1999 to 2009, mostly occurring in the fringe zones. It occurs because the majority of new residential areas have been located in the fringe, while the built-up area in the core of the city, particularly in the North part of Semarang, has decreased. The outcome is perhaps affected by inundation by the sea (*rob*, in local terminology). To some extent, it indicates that the occupation of space in the suburbs of Semarang City tends to be unsustainable.

This particular result is perhaps different to that of the Greater Jakarta Region (GJR) where a polycentric urban form has been established at the more mature stage. Hudalah et al. (2013) have found out that manufacturing industries deconcentrated from Jakarta City to its peripheral and surrounding areas have absorbed the main proportion of the job seekers. Furthermore, it has spatially been the main factor in changing the metropolitan structure towards a polycentric one. Up to this stage, the structural change process of the GJR is to a significant extent comparable to that in the developed world around two decades ago (see e.g. Gollner 1996; Van der Laan 1998). However, this may not be the case of Semarang City where scattered pattern is still apparent.



Source: Authors' analysis

Figure 5. Comparison between the built-up area in 1999 and 2009. Source: Authors' analysis.

Downloaded by [George Mason University] at 11:00 18 March 2016

Table 1. Increase of built-up areas.

Area	1999		2009		
	Area (ha)	Proportion	Area (ha)	Proportion	Increase (ha)
Built-up area	18,360.51	47.68%	19,499.07	50.63%	1138.56
Built-up area in the core of the city	6459.32	16.77%	6458.79	16.77%	−0.53
Built-up area in the fringe zone	11,901.54	30.91%	13,040.61	33.86%	1139.07
Semarang City	38,509.30		38,509.30		

Source: Authors' analysis.

The second strategy requires two indicators, that is, the increase in trip generation rates between suburbs and the downtown area and the interpretation of Origin–Destination (O–D) patterns. As for the first indicator, the annual growth of trip generation in the fringe areas (9.41%) is higher than that in the core (8.45%), as shown in Table 2. Meanwhile, Figure 6 representing the O–D pattern shows that the dependency of suburbs on the downtown is relatively high. It indicates that the majority of people living in the suburbs go to the downtown for their daily activities, such as journey to work, to shop, and even to study.

A study by Ismiyati (2011) indicates that the accessibility to downtown areas is one of main preferences of Semarang residents when they choose their home location in the suburban areas. The increase in mobility from suburban to downtown areas denotes a trend towards unsustainability in urban development, particularly in the inefficient consumption of transport energy.

The third strategy, about agricultural activities, is not applied in the assessment due to its lesser applicability to the metropolitanizing Semarang. Agriculture is the lowest priority in the development policy of the local government.

Meanwhile, the fourth strategy can be explained by three indicators, that is, the growth rate of private cars, of motorbikes, and of public transport vehicles (*angkutan kota*/*angkot* in local terminology). As shown in Table 3, private vehicle ownership (car and motorcycle) significantly increased from 2000 to 2010. Compared with the growth of population, it is much higher. On the other hand, the number of city public transport vehicles (*angkot*) has decreased (−3.27%). The result suggests that people, at the margin, prefer to use private rather than public transportation.

This trend will endanger the sustainability of city development, particularly in fossil fuel consumption.

Table 2. Trip generation in the suburbs and downtown areas.

Suburb/downtown Area	1998	2008	Annual growth rate
Trip generation of districts (*kecamatans*) located in the fringe areas of the city (Ngaliyan, Mijen, Gunungpati, Banyumanik, Tembalang, and Pedurungan)	4661	11,455	9.41%
Trip generations in the downtown's districts located in the core of the city	14,416	32,456	8.45%

Source: Masrianto (2012).

It is worth noting that premium gasoline consumed by majority of private and public modes in Indonesia is still subsidised by the government. Thus, the higher the usage of fuel energy, the more the government has to spend its subsidy budget.

Ensuring a socially optimal situation regarding negative externalities

The second objective contains two strategies: (a) facilitating segregation of all polluting activities, from large scale to small scale, and (b) applying a command and control (CAC) approach, complemented with market-based instruments (MBIs), in dealing with pollution and other forms of externalities of all land uses.

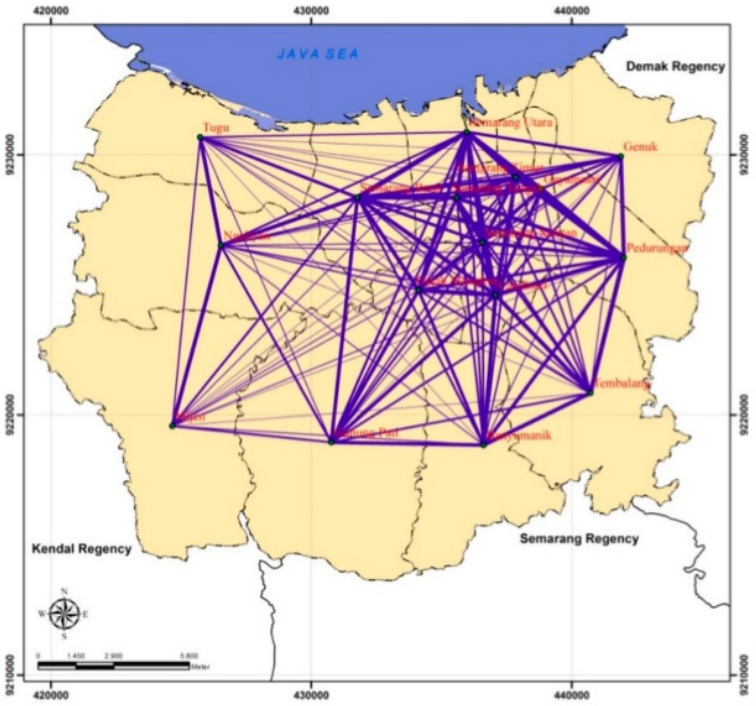
The first strategy has two indicators, that is, the extent of successful implementation of the City Master Plan, and the availability of incentive-disincentive mechanisms for polluting industries. Based on the discussion with Bappeda's officials (the City Agency for Development Planning), it emerges that, although the City Master Plan (RTRW *Kota*) has already been used to control the city's development, it has not been effective enough to this point.

All development permits should refer to the master plan, since the Law 26/2007 on Spatial Management provides a mechanism of civil and criminal sanctions for violations in the process of issuing permits. However, the annual projects of the City itself, which should have been guided by the City Master Plan, tend to rely on the political will of the Mayor or the sectoral policies of local agencies. The *Musrenbang* (planning and development forum) deemed as the most important forum for discussing city development involving key stakeholders (including all City's agencies) rarely refers to the City Master Plan for guidance in proposing and appraising projects.

At the same time, discussion also reveals that the government of Semarang City has not yet developed any local regulations (*Peraturan Daerah*) about incentive-disincentive mechanisms for polluting industries. The second indicator thus has a zero value.

To what extent the second strategy is applied can be seen in three indicators of CAC approach, that is, local regulations of industrial development, of environmental impact assessments (EIAs), and of detailed spatial plans for industrial development. Indicators of MBIs, such as the application of pollution taxes or

Downloaded by [George Mason University] at 11:00 18 March 2016



Source: Masrianto, 2012

Figure 6. The Origin–Destination pattern of Semarang in 2008. Source: Masrianto 2012.

mechanisms for community complaint resolution, are not found in Semarang City.

Regulation of industrial development is available in the Master Plan of Semarang 2010 legalised through the Local Regulation (*Peraturan Daerah*) no. 5/2004, which has been evaluated and renewed for the planning period of 2011–2031. This Semarang 2011–2031 Master Plan is effectuated by Local Regulation no. 14/2011.

Meanwhile, an EIA for industrial areas is available for Genuk district (*kecamatan*), located on the north side of Semarang City. Unfortunately, EIAs for small-scale industries located in a footloose way in the city are not available.

Detail spatial planning for industrial development is accommodated by the Local Regulation no. 9/2004 on the Detailed Spatial Plan for the Genuk district for the period of 2000–2010 and the Local Regulation no. 15/2004 on the Detailed Spatial Plan for the Ngaliyan and Tugu districts for the same period. Meanwhile, medium- to large-scale industrial areas are not planned in other districts. Thus, the availability of detailed plans for industrial development is adequate.

Table 3. Growth rate of transport vehicles.

Population and type of mode	Year 2000	Year 2010	Annual growth rate
Population	1,309,667	1,555,984	1.74%
Private motorbike	86,975	119,019	3.19%
Private car	21,344	44,660	7.66%
Minibus (city public transport/ *angkot*)	1198	859	−3.27%

Source: *Kantor Statistik* (Statistics Office) (2000, 2010).

Strengthening the comparative advantages of the region

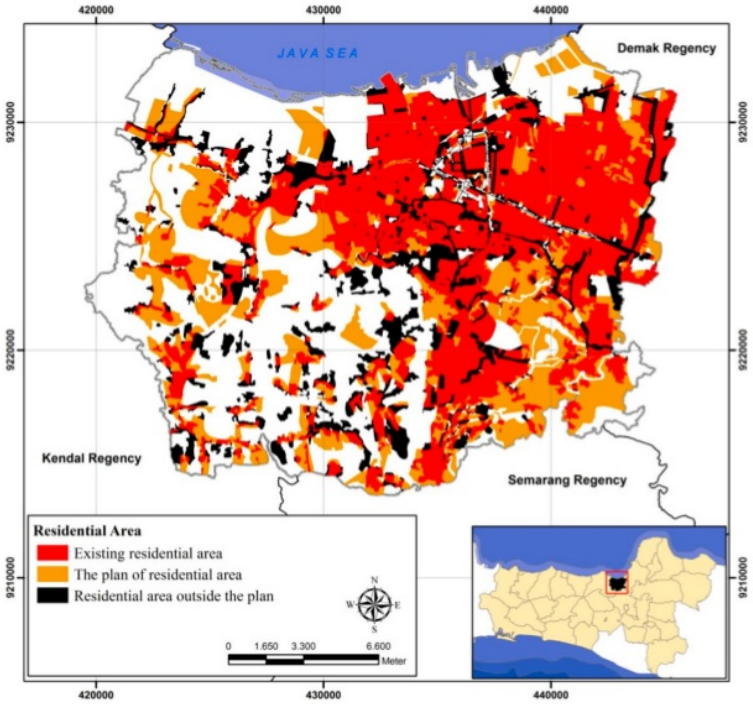
The third objective has three strategies: (a) encouraging conversion of uses that can strengthen or create comparative advantages, as long as socio-economic optimality is maintained, (b) advocating efforts to increase land use productivity under a condition of socio-economic optimality, and (c) encouraging traditional or indigenous utilisation of land, especially in primary-

Table 4. Deviation of land use.

Land use	Area (hectare) Master Plan (2000–2010)	Existing (2009)	Land use outside the plan (ha)	Percentage of deviation to the plan (%)
Residential area	19,435.93	16,791.53	4583.06	23.58
Industrial area	2603.16	1313.12	502.60	19.31
Trade and services area	2892.21	234.95	85.73	2.96
Public infrastructure and facilities	2874.13	1160.31	465.51	16.20

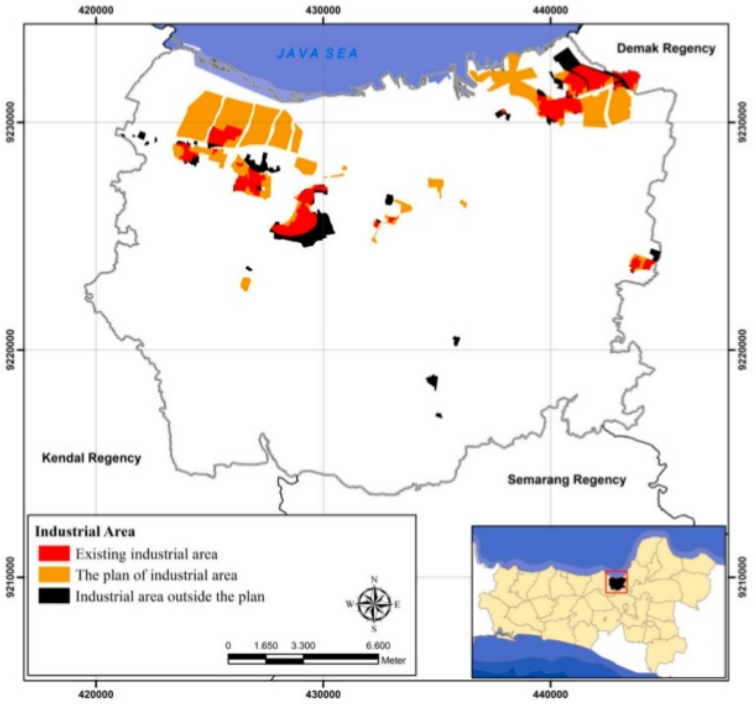
Source: Authors' compilation.

Downloaded by [George Mason University] at 11:00 18 March 2016



Source: Authors' analysis

Figure 7. Residential areas located outside the planned areas (City Master Plan 2000–2010). Source: Authors' analysis.



Source: Authors' analysis

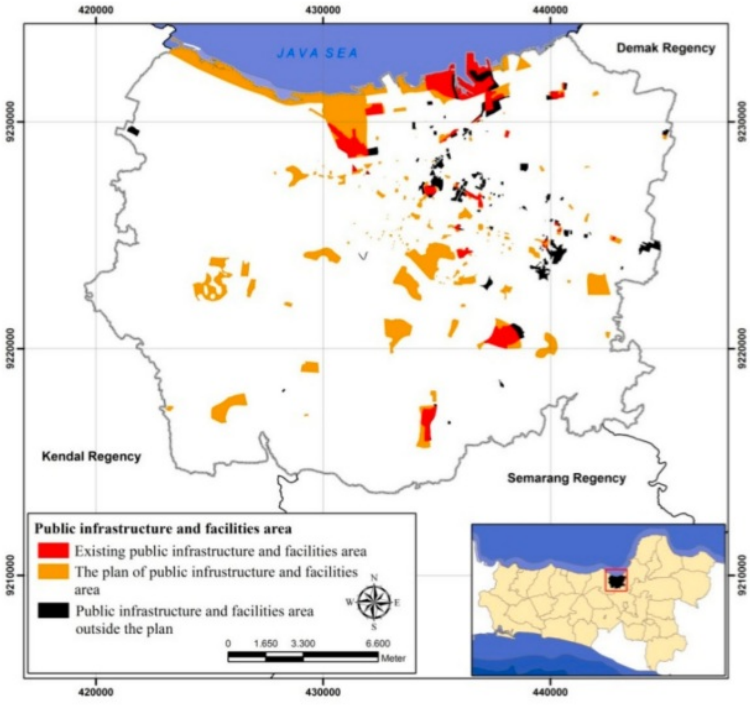
Figure 8. Industrial areas located outside the planned areas (City Master Plan 2000–2010). Source: Authors' analysis.

Downloaded by [George Mason University] at 11:00 18 March 2016

Downloaded by [George Mason University] at 11:00 18 March 2016

Source: Authors' analysis

Figure 9. Trade and service areas located outside the planned areas (City Master Plan 2000–2010). Source: Authors' analysis.



Source: Authors' analysis

Figure 10. Public infrastructure and facilities located outside the planned areas (City Master Plan 2000–2010). Source: Authors' analysis.

Table 5. Growth rate of non-farm indicators.

Indicator	Year 2000	2006	2010	Annual growth rate (%)
Small-scale industry	11,346	10,669	50,206	23.13
Small-scale market	NA	119	119	0.00
Proportion of jobs in small-scale activities	0.41	0.53	0.44	
(a) Jobs in small-scale activities	339,914	457,635	407,284	1.10
(b) Total jobs	833,367	867,617	927,747	1.18

Source: *Kantor Statistik* (Statistics Office) (2000, 2010).

sector activities, if it leads to a socially optimal situation. Among those strategies, the third will not be used in this study because it is more relevant to rural areas.

The first strategy has two indicators, that is, the availability of incentive-disincentive mechanisms for land use and the percentage of land use deviation from the plan. Based on interviews with Bappeda's representatives, it transpires that the zoning regulation, which is deemed as the appropriate spatial form for incentive-disincentive mechanisms, has not been available in both the City Master Plan and the recently available City Detailed Master Plans (*Rencana Detail Tata Ruang Kota*/RDTRKs) for the 16 districts. However, Law 26/2007 orders that a Detailed Plan has to contain zoning regulation. Thus, according to Bappeda, in the revised edition of RDTRKs still in the drafting process, this measure will be accommodated.

Table 4 shows the deviation of land uses from those allocated in the City Master Plan. Residential area has the highest deviation, 23.58% being developed outside the planned area. Among the land uses, the trade and service area has the lowest deviation. As a result, it can be concluded that the deviation between the existing land use (2009) and the land use plan regulated in the City Master Plan 2000–2010 is relatively high (see Figures 7–10).

Meanwhile, there is only one indicator for the second strategy, that is, availability of local spatial regulations. Semarang City has already had a Spatial Master Plan and 16 Detailed Master Plans based on districts, developed in 2000. Regarding Law 26/2007, which orders the city government to revise its spatial master plan to adapt to the Law's provisions, the City Master Plan has been renewed in 2009 and was legalised in 2011. Meanwhile, the Detailed Master Plans are now being revised and adapted to the new City Master Plan. Thus, it can be said that this strategy has been achieved.

Make the majority of people involved in productive activities

The fourth objective has two strategies: (a) facilitating the development of rural non-farm activities regardless of their formal and informal characteristics and (b) advocating the best ratio of capital-intensive and labour-intensive activities, especially when the expansion of capital-intensive activities is considered socially sub-optimal.

The first strategy can be assessed by three indicators, that is, the growth rate of small-scale industries, of small-scale markets, and the proportion of jobs in small-scale activities with the total jobs. Table 5 shows that the annual growth rate of small-scale industry is relatively high (23.13%). The number of small-scale markets and the share of jobs in small-scale activities are constant. Those facts indicate that the sustainability of Semarang City around the strategy for facilitating the development of rural non-farm activities is in fair to medium condition.

Meanwhile, the second strategy has just one indicator, that is, the ratio between a labour-based LQ (Location Quotient) and a GDRP-based LQ (Gross Domestic Regional Product). Table 6 shows that the manufacturing industry is the economic base of Semarang City (LQ > 1.00) while agriculture is not (LQ < 1.00). It is logical for a city with high level of urbanisation like Semarang.

In addition, in 2000 the labour-based LQ of industries was higher than the GDRP-based one. This result means that the industries are more labour intensive compared with the activities in Central Java Province, in which Semarang is situated. Unfortunately, it became more capital intensive by 2010, which is not allied to the second strategy that advocates labour-intensive activities. These facts indicate that, as far as the strategy is concerned, Semarang City has assumed an unsustainable trend.

Table 6. Labour-based LQ and GDRP-based LQ.

No	Sector	Labour 2000	Labour 2010	GDRP (in thousand Rupiah) 2000	GDRP (in thousand Rupiah) 2010
Semarang City					
	Agriculture	47,575	43,557	172,834.90	507,478.99
	Industries	188,674	171,712	3,597,955.58	10,485,836.89
	Total	236,249	215,269	3,770,790.48	10,993,318.88
Central Java Province					
	Agriculture	6,135,828	1,066,842	30,181,351.72	86,372,005.95
	Industries	2,276,679	2,815,292	33,618,628.42	146,155,156.78
	Total	8,412,507	3,882,134	63,799,980.14	232,527,162.73
LQ-value					
	Agriculture	0.28	0.74	0.10	0.12
	Industries	2.95	1.10	1.81	1.52

Source: *Kantor Statistik* (Statistics Office) (2000, 2010).

Downloaded by [George Mason University] at 11:00 18 March 2016

Downloaded by [George Mason University] at 11:00 18 March 2016

Table 7. Results of the assessment.

Objective	Strategy	Assessment (level of sustainability)
Minimise the use of energy and natural resources for a certain level of development activities	Preventing growth of urban sprawl	Low
	Encouraging the allocation of employment and activities to their appropriate locations based on location criteria and system of central places	Low
	Allocating agricultural and other primary-sector activities to the most physically suitable land	NA
	Encouraging the development of the best possible regional transport system	Low
Ensure a socially optimal situation regarding negative externalities between socio-economic activities and the environment, among the activities within the region, and in relation to other regions	Facilitating segregation of all polluting activities, from large scale to small scale	Fair
	Applying a CAC approach, complemented with MBIs in dealing with pollution and other forms of externalities to all land uses	Fair
Strengthen the comparative advantages of the region	Encouraging conversion of uses that can strengthen or create comparative advantages, as long as the socio-economic efficiency is maintained	Fair
	Supporting efforts to increase land use productivity in a condition of socio-economic efficiency	Good
	Encouraging traditional or indigenous utilisation of land, especially in primary-sector activities, if this leads to a socially optimal situation	NA
Make the majority of people involved in the productive activities	Facilitating the development of rural non-farm activities regardless of their formal or informal characteristics	NA
	Advocating the best ratio of capital-intensive and labour-intensive activities, especially when the expansion of capital-intensive activities is considered socially inefficient	Fair

Source: Authors' Analysis.

Results of the assessment

Table 7 shows the results of the assessment. It reveals that, overall, the regional development of Semarang City tends to be unsustainable. Among the applications of the 11 strategies, only one of them is considered good. Another four strategies are fair; three strategies are low while three other strategies are not used due to the inapplicability in urban areas.

Conclusion

The results show that the current spatial development of Semarang City tends to be unsustainable. However, the availability of important local initiatives such as spatial plans and environmental impact studies should be considered as essential endeavours to ensure sustainable development. Besides, the growth of small-scale industries is also prospective to increase public involvement in productive activities.

For further development, the city government of Semarang should pay more attention to important indicators, such as: the increase of built-up and sprawl areas; the increase of trip generation in the fringe; the increase of private car and motorcycle ownership; ineffective law enforcement of local regulations to reduce externalities; and ineffective facilitation to gain local comparative advantages.

Important notes apply to the model of sustainable metropolitan development used for the assessment. Firstly, it should be clearly defined whether an objective or a strategy is applicable to urban, rural or both areas. The indicators developed should, therefore, be suited to the characteristics of the area being assessed. Secondly, data limitations are the main barrier to the application of this model. Experience in Semarang City, as the most developed city/region in the SMR, shows that some data needed are not available. Most probably, data that are not available in the most developed region would likewise not be available in less developed ones. Thus, further model development should consider data availability for the whole region (cities and municipalities involving in the metropolitan area). For this purpose, the indicators developed for each strategy should be readjusted. However, the results of this study show that the model is, generally, suitable to assess the sustainability of metropolitan development.

Acknowledgements

The authors would like to thank the anonymous referees for their useful comments and suggestions. The authors are also indebted to Dr David Wadley of the University of Queensland for the useful discussion, proofreading and language editing of this article. However, any flaw found in this article is solely the authors' responsibility.

Funding

This paper is based on the research funded by a grant from the Faculty of Engineering, Diponegoro University in 2012.

Downloaded by [George Mason University] at 11:00 18 March 2016

References

Beckerman, W. 1994. "Sustainable Development: Is it a Useful Concept?" *Environmental Values* 3 (3): 191–209.

Chan, R. C. K., and Y. Shimou. 1999. "Urbanization and Sustainable Metropolitan Development in China: Patterns, Problems and Prospects." *GeoJournal* 49: 269–277.

Cornier, T. 2012. "The Urban Sustainable Development in European Union Through Ranking: A Tool for Governance or a Report of Territorial Disparities?" *International Journal of Environment and Sustainable Development* 11 (1): 64–86.

Domfeh, K. A., A. Ahenkan, and J. N. Bawole. 2012. "Is Sustainable Development Achievable in Ghana? An Analysis of Ghana's Development Policy Achievements and Challenges." *International Journal of Environment and Sustainable Development* 11 (3): 304–317.

Firman, T. 2004. "New Development in Jakarta Metropolitan Region: A Perspective of Spatial Segregarion." *Habitat International* 28: 349–368.

Firman, T. 2009. "The Continuity and Change in Mega-Urbanization in Indonesia: A Survey of Jakarta-Bandung Region (JBR) Development." *Habitat International* 33: 327–339.

Firman, T., and A. I. Dharmapatni. 1994. "The Challenges to Sustainable Development in Jakarta Metropolitan Region." *Habitat International* 18 (3): 79–94.

Fowke, R., and D. Prasad. 1996. "Sustainable Development, Cities and Local Government: Dilemmas and Definitions." *Australian Planner* 33 (2): 61–66.

Gollner, A. V. 1996. "To Sprawl or not to Sprawl: A Journey to Work Perspective." *Australian Planner* 33 (3): 136–141.

Hanley, N., J. F. Shogren, and B. White. 1997. *Environmental Economics in Theory and Practice*. London: MacMillan Press.

Hudalah, D., and T. Firman. 2012. "Beyond Property: Industrial Estates and Post-Suburban Transformation in Jakarta Metropolitan Region." *Cities* 29 (1): 40–48.

Hudalah, D., D. Viantari, T. Firman, and J. Woltjer. 2013. "Industrial Land Development and Manufacturing Deconcentration in Greater Jakarta." *Urban Geography* 34 (7): 950–971.

Irawan, B. 2005. "Konversi Lahan Sawah: Potensi Dampak, Pola Pemanfaatannya dan Faktor Determinan [Paddy Field Conversion: Impact Potency, Usage Pattern and Determinant Factor]." *Forum Penelitian Agro Ekonomi* 23 (1): 1–18.

Ismiyati. 2011. "Mobilitas transportasi dikaitkan dengan pemilihan tempat tinggal di kawasan pinggiran Kota Semarang [Transportation mobility relating to home location choice in the fringe areas of Semarang City]," Doctoral Dissertation, Unpublished, Doctoral Program in Architecture and Urbanism, Diponegoro University, Semarang.

Kantor Statistik (Statistics Office). 2000. *Semarang Dalam Angka* [Semarang in Numbers]. Semarang: Kantor Statistik.

Kantor Statistik (Statistics Office). 2010. *Semarang Dalam Angka* [Semarang in Numbers]. Semarang: Kantor Statistik.

Khadiyanto, P. 2005. *Tata Ruang Berbasis Pada Kesesuaian Lahan* [Spatial Management Based on Land Suitability]. Semarang: Diponegoro University Press.

Kompas Newspaper. 2009. Semarang butuh pembenahan transportasi [Semarang Needs Transportation Improvement], March 16. Accessed January 3, 2012. http://travel.kompas.com/read/2009/03/16/22453036/Semarang.Butuh.Pembenahan.Transportasi.

Kozlowski, J. 1993. "UET Method: A planning Tool for Sustainable Development." In *Towards Planning for Sustainable Development: A Guide for the Ultimate Environmental Threshold (UET) Method*, edited by J. Kozlowski, and G. Hill, 16–32. Avebury: Aldershort.

Masrianto. 2012. *Pengaruh peubahan struktur ruang kota terhadap aksesibilitas, studi kasus: Kota Semarang* [Impact of spatial structure change to accessibility, case study; Semarang City], Doctoral Dissertation, Unpublished, Doctoral Program in Architecture and Urbanism, Diponegoro University, Semarang.

McMahon, E. T. 1997. "Stopping Sprawl by Growing Smarter." *Planning Commissioners Journal*, 26 (Spring): 4–5.

Mitchell, B. 1979. *Geography and Resource Analysis*. London: Longman.

Munro, D.A 1995. "Sustainability: Rhetoric or Reality?" *A Sustainable World: Defining and Measuring Sustainable Development*, edited by T.C. Trzyna, 27–35. Sacramento: International Center for the Environment and Public Policy (ICEP) for IUCN.

Pearce, D. W., and R. K. Turner. 1990. *Economics of Natural Resources and the Environment*. New York: Harvester Wheatsheaf.

Poudel, D. D. 2011. "A Strategic Framework for Environmental and Sustainable Development in Nepal." *International Journal of Environment and Sustainable Development* 10 (1): 48–61.

Saptana, S. P. 2007. *Analisis Keunggulan Komparatif dan Kompetitif Komoditas Kentang dan Kubis di Wonosobo Jawa Tengah* [Comparative and Competitive Analysis of the Commodities of Potatoes and Cabbage in Wonosobo, Central Java]. Bogor: BPPP.

Schrecker, T. 1998. "Sustainability Growth and Distributive Justice: Questioning Environmental Absolutism." In *Sustainability and Ecological Integrity: Concepts and Approaches*, edited by J. Lemons, L. Estra, and R. Goodland, 218–234. Dordrecht: Kluwer.

Sugiri, A., I. Buchori, and S. Soetomo. 2011. "Sustainable Metropolitan Development: Towards an Operational Model for Semarang Metropolitan Region." *The International Journal of Environmental, Cultural, Economic and Social Sustainability* 7 (5): 301–324.

Sjafruddin, A. 2010. Pembangunan infrastruktur transportasi untuk menunjang pembangunan berkelanjutan berbasis ilmu pengetahuan [Transportation Infrastructure Development to Support Sustainable Development Based on Science]. Accessed January 3, 2012. http://www.opi.lipi.go.id/data/1228964432/data/130867103213197035 73.makalah.pdf.

Soetomo, S. 2009. *Urbanisasi dan Morfologi, Proses Perkembangan Peradaban dan Wadah Ruang Fisiknya: Menuju Ruang Kehidupan Yang Manusiawi* [Urbanisation and Morphology, Development Process and its Spatial Dimensions: Towards Civilized Life Space]. Yogyakarta: Graha Ilmu.

Sugiri, A. 2009. "Redressing Equity Issues in Natural Resource-Rich Regions: A Theoretical Framework for Sustaining Development in East Kalimantan, Indonesia." In *Environmental Ethics: Sustainability and Education*, edited by E. Weber, 107–35. Oxford: Inter-disciplinary Press.

Susila, H. N. 2008. "Konsep sistem informasi terpadu berbasis strategy maps dan balanced scorecard dalam pembangunan infrastruktur dasar perkotaan [Concept of Integrated Information System Based on Strategy-maps and Balanced Scorecard in the Development of Basic Urban Infrastructure]." Master Thesis, Unpublished, Master of Urban and Regional Development, Diponegoro University, Semarang.

Tisdell, C. A. 1993. *Environmental Economics: Policies for Environmental Management and Sustainable Development*. Aldershot: Edward Elgar.

Toman, M. A. 1994. "Economics and Sustainability: Balancing Tradeoffs and Imperatives." *Journal Land Economics* 70 (4): 399–413.

Turner, R. K., D. W. Pearce, and I. Bateman. 1993. *Environmental Economics: An Elementary Introduction*. Maryland: Johns Hopkins University Press.

UNDP (United Nations Development Programme). 2006. *Human Development Report 2006, Beyond Scarcity: Power, Poverty and the Global Water Crisis*. New York: Palgrave Macmillan. Accessed January 3, 2012. http://dspace.cigilibrary.org/jspui/bitstream/123456789/20135/1/Human%20Development%20Report%202006%20Beyond%20Scarcity%20Power%20poverty%20and%20the%20global%20water%20crisis.pdf?1.

Van der Laan, L. 1998. "Changing Urban Systems: An Empirical Analysis at Two Spatial Levels." *Regional Studies* 32 (3): 235–247.

WCED. 1987. *Our Common Future*. Oxford: Oxford University Press.

Downloaded by [George Mason University] at 11:00 18 March 2016

An empirical examination of sustainable metropolitan development in Semarang City, Indonesia

ORIGINALITY REPORT

11%	6%	6%	6%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.inter-disciplinary.net Internet Source	2%
2	Submitted to Fatih University Student Paper	1%
3	Agung Sugiri, Nany Yuliastuti, Jawoto Sih Setyono, Rukuh Setiadi. "Prospects of Low Emission Development in Industrial Sector of Central Java", Journal of Physics: Conference Series, 2019 Publication	1%
4	halshs.archives-ouvertes.fr Internet Source	1%
5	Submitted to Universitas Diponegoro Student Paper	1%
6	Imam Buchori, Agung Sugiri, Maryono Maryono, Angrenggani Pramitasari, Istiqomah T.D. Pamungkas. "Theorizing spatial dynamics of metropolitan regions: A preliminary study in	<1%

	Java and Madura Islands, Indonesia", Sustainable Cities and Society, 2017 Publication	
7	i-scholar.in Internet Source	<1%
8	www.scilit.net Internet Source	<1%
9	Submitted to University of Greenwich Student Paper	<1%
10	Amnon Frenkel. "A Land-Consumption Model: Its Application to Israel's Future Spatial Development", Journal of the American Planning Association, 12/31/2004 Publication	<1%
11	ijs.cgpublisher.com Internet Source	<1%
12	Submitted to Macquarie University Student Paper	<1%
13	Sugiri, Agung, and Ananda Kustanti Putri. "Equity Issues in Benefits Distribution: The Case of Kreo Cave Tourism in Semarang, Indonesia", Journal of Sustainable Development, 2015. Publication	<1%
14	J. Kozlowski. "Ultimate environmental threshold: An alternative tool for planning sustainable	<1%

development", Sustainable Development, 1993
Publication

15	Submitted to Liverpool John Moores University Student Paper	<1%
16	geografie.ubbcluj.ro Internet Source	<1%
17	Roy Brouwer, Chris De Blois. "Integrated modelling of risk and uncertainty underlying the cost and effectiveness of water quality measures", Environmental Modelling & Software, 2008 Publication	<1%
18	www.ielrc.org Internet Source	<1%
19	Domfeh, Kwame Ameyaw, Albert Ahenkan, and Justice Nyigmah Bawole. "Is sustainable development achievable in Ghana? An analysis of Ghana's development policy achievements and challenges", International Journal of Environment and Sustainable Development, 2012. Publication	<1%
20	L. Dsikowitzky, Dwiyitno, E. Heruwati, F. Ariyani, H. E. Irianto, J. Schwarzbauer. "Exceptionally high concentrations of the insect repellent N,N-diethyl-m-toluamide (DEET) in surface waters	<1%

	from Jakarta, Indonesia", Environmental Chemistry Letters, 2014 Publication	
21	www.aph.gov.au Internet Source	<1%
22	Pribadi, Didit Okta, and Stephan Pauleit. "The dynamics of peri-urban agriculture during rapid urbanization of Jabodetabek Metropolitan Area", Land Use Policy, 2015. Publication	<1%
23	www.scribd.com Internet Source	<1%
24	edoc.gfz-potsdam.de Internet Source	<1%
25	media.isdrs.org Internet Source	<1%
26	usir.salford.ac.uk Internet Source	<1%
27	www.effectuation.org Internet Source	<1%
28	Durga D. Poudel. "A strategic framework for environmental and sustainable development in Nepal", International Journal of Environment and Sustainable Development, 2011 Publication	<1%

29	www.scopus.com Internet Source	<1%
30	Submitted to American Public University System Student Paper	<1%
31	Submitted to The University of Manchester Student Paper	<1%
32	Imam Buchori, Pangi Pangi, Angrenggani Pramitasari, Yudi Basuki, Anang Wahyu Sejati. "Urban Expansion and Welfare Change in a Medium-sized Suburban City: Surakarta, Indonesia", Environment and Urbanization ASIA, 2020 Publication	<1%

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	On		

An empirical examination of sustainable metropolitan development in Semarang City, Indonesia

GRADEMARK REPORT

FINAL GRADE

/100

GENERAL COMMENTS

Instructor

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