

## JURNAL KEPENDUDUKAN INDONESIA

*p-ISSN : 1907-2902 (Print)*

*e-ISSN : 2502-8537 (Online)*

### DPSIR MODEL AS A TOOL TO ASSES LAND CONVERSION TARIFF POLICY IN YOGYAKARTA

#### *(MODEL DPSIR SEBAGAI METODE PENILAIAN KEBIJAKAN KONVERSI LAHAN DI YOGYAKARTA)*

Nina Novira<sup>1</sup>, Syarifah Aini Dalimunthe<sup>2</sup>, Aditya Pandu Wicaksono<sup>3</sup>,  
Nur Indah Sari Dewi<sup>4</sup> dan Triana Sefti Rahayu<sup>5</sup>

<sup>1</sup> State University of Medan, North Sumatera

<sup>2</sup> Research Center for Population, Indonesian Institute of Sciences

<sup>3</sup> Pembangunan Nasional Veteran University, Yogyakarta

<sup>4,5</sup> Gadjah Mada University

\*Corresponding author: [ninanovira@unimed.ac.id](mailto:ninanovira@unimed.ac.id)

#### **Abstrak**

*Perubahan pemanfaatan lahan di pertanian ke non pertanian di Provinsi Daerah Istimewa Yogyakarta (DIY) adalah penyebab utama berkurangnya lahan pertanian produktif. Meningkatnya jumlah penduduk menyebabkan permintaan akan lahan bertambah. Sulitnya memenuhi kebutuhan lahan untuk pembangunan di perkotaan semakin massif terjadi. Model DPSIR digunakan untuk dasar penilaian dampak terhadap kebijakan tariff yang sudah diimplementasikan untuk mengurangi laju konversi lahan. Berdasarkan analisis, pendorong utama terjadinya konversi lahan adalah migrasi. Kondisi tekanan terhadap lahan memiliki implikasi terhadap dimensi ekonomi, dimensi kelingkungan dan dimensi social. Ketiga dimensi ini menunjukkan bahwa degradasi lahan semakin terjadi yang pada akhirnya mengancam ketahanan pangan dan memunculkan polusi. Sebagai respon, pemerintah daerah menerbitkan PERDA No. 53 Year 2007 mengenai otorisasi pemanfaatan lahan di DIY. Artikel ini akan membahas bagaimana DPSIR model dimanfaatkan untuk menilai implementasi kebijakan tersebut.*

**Kata Kunci :** DPSIR, Penilaian, Perubahan Pemanfaatan Lahan, Kebijakan Pemanfaatan Lahan

#### **Abstract**

Land use change from agricultural land to non-agricultural purposes in Yogyakarta Special Province (DIY) is the main factor leading to the decrease of agricultural land. The increasing population growth has led to a higher demand for land, which is contributing to the rapid land use changes. Land scarcity has led to a change in land utilization within the city and in the surrounding area. The DPSIR Model is used as the basis for the impact assessment analysis on the tariff policy implementation regarding to the controlling of the land use change. Driving force in this model is migration and the pressure is land use change. The state is divided into three categories, state of economic dimension, environmental dimension, and social dimension. These have caused impacts on land degradation, threats to food security, and pollution. As the response to this, the government introduced the policy PERDA No. 53 Year 2007 about authorizing land use in DIY. This paper is intended to explain how the DPSIR model is used to assess the policy implementation.

**Keywords:** DPSIR, Assessment, Land Use Change, Land Use Policy.

## INTRODUCTION

Urbanization has pronounced implication on environmental, social, economic and political dimension. In relation to the urban population growth, DIY should have space and several facilities especially housing and basic infrastructure such as communication, transportation and other social facilities. Population growth has significant effect on urban extension. Land location has determined its value especially its price. The closer the distance of the land to the city centre, the price will be more expensive

(Randal, 1987). City has an effect to the hinterland in the form of economic, social and cultural activity.

Yogyakarta Special Region hereinafter abbreviated DIY, is chosen as the case study area because it represents one of the provinces in Indonesia which is unique and distinctive. One of the unique and privileges is that DIY is led by a king who became governor as head of government. DIY Province was famous for being the students and cultural city. DIY hosts one of the best universities in Indonesia. Literally student from all over Indonesia come to study in these universities. DIY's landscape is characterised by volcanic area in the north down to coastal area in the south. The best universities are located relatively in the north. The northern area has also a milder climate, the air temperature is fairly lower than in the southern part. This has led the northern area to be the more prestigious area. This area experienced a massive land use change especially for university building, student homes, and shops. Land use change issue in DIY is derived by population density. This was done by mainly converting rice fields. Percentage of paddy field is decreasing and the settlement is increasing significantly. Urban area of DIY is just as big as 15.5 km<sup>2</sup> in 1970. The area has expanded dramatically to 63.6 km<sup>2</sup> in 2000 (Marwasta, 2010). In 1990 the paddy field is 19.86% of the DIY area, but in 2006 the area of paddy field is only 14.74%. In 2006 the built-up area was increasing from 15.74% to 28.07% (LUPIS Indonesia, 2010).

Land use change potentially rising many problems such as reduction in groundwater availability, water quality degradation, increasing pollution in the city, and urban micro climate changes. In addition to the above problems, changes in land use are also not in accordance with the spatial structure that has been established by the government and posts treats to the course of sustainable development in DIY. Many people who want to change agricultural land into

settlement because agriculture did not give adequate income. The land price offered is tempting when compared to the income from agriculture. To reduce the rate of land use change, which tends to be more rapid, the government has issue some regulations. However this has never been assessed properly. This paper aims to (1) describe land use change in DIY and (2) assess two regulations that targets in controlling land use change in DIY. The growing population and economy have demanded the increasing construction of both social economy and housing complexes. Since there is limited space in the inner parts of the city, some functions have moved out to the periphery and the change of agricultural land use to non-agricultural land use has taken place concomitantly. If this phenomenon is not addressed promptly and properly, some detrimental impacts will appear.

The understanding of land use change in DIY is gained through observation, literature study, and expert interview. The assessment of the land conversion tariff policy is done by modifying DPSIR model. The Driving Force – Pressure – State – impact – Response (DPSIR) model is proposed by the European Environmental Agency and it is widely known and adopted by many European national and institutions (Guipponi, 2002), (Odermatt, 2004) DPSIR is originally developed for environmental impact assessment with the driving force of human activities and economic sector that gives pressure to the environment (Kristensen, 2004). In this case study, however, the DPSIR model is adapted for the use to assess land use policy implementation, putting the policy as the driving force to the problem.

## THE STUDY AREA

The Yogyakarta Special Region (DIY) has one municipality and four regencies; Bantul, Sleman, Kulon Progo, and Gunung Kidul regency, and Yogyakarta Municipality. DIY has varied morphological condition from mountainous area to coastal area. DIY consists of various physiographical units i.e. Merapi Volcano, Southern Mountain, Kulonprogo Mountain, and Bantul Graben. Each of those physiographical units has certain potential and condition both physical condition and social condition. Physical condition deals with water availability, soil fertility, and natural hazard. Different physical condition emerge different land use type.

Sleman Regency is located in the northern part on the slopes of Merapi volcano, which is an active volcano, Sleman regency of the most economically productive, because it has a lot of colleges include Gadjah Mada

University. Kulon Progo Regency is located in the western part, Bantul regency located in the southern part, and Yogyakarta municipality located in the middle of Yogyakarta Special Region. DIY tends to develop more to the north. Sleman regency is more prosperous, resulting better infrastructure.

Yogyakarta municipality is the provincial capital, located in the southern part of the Sleman regency. Yogyakarta municipality is the economic center of Yogyakarta Special Region. It is an urban area and covered with almost 80% settlement with dense population. The morphology of this area is flat with good accessibility, facilities are also adequate, supporting advanced economies. Land use change issue in DIY is derived by population density. The sectors affected by land use change issue are agricultural, social-cultural, and economic sectors. In agricultural sector, land use change can be analysed from agriculture land or paddy field decrease converted to non-agriculture land or build up area for settlement. Percentage of paddy field is decreasing and the settlement is increasing significantly.

Bantul regency is located in the south with flat morphology. It is now starting to face more rapid land use change, due to the influence of the growth of the municipality of Yogyakarta. Another factor is the rapidly increasing land price in Sleman area. Bantul becomes an alternative since it is also located just at the south of Yogyakarta Municipality, not very far from the city centre. This has reduced the availability of land in Bantul. Land use change has increased along with the increasing Population growth. Livelihoods of the people is dominated by agricultural activities as paddy field is still quite wide and this region is very suitable for agricultural use of wetlands, due to land condition and water availability.

Kulonprogo regency is located in western part of DIY. The physiographic configuration is hilly in northern part and flat in the southern part. The water condition in this regency is from spring in northern part with dry land agricultural, whereas in southern part agricultural system is wet agricultural land or irrigated paddy field. The population growth is lower than Sleman regency, because there is not many migrants coming into this regency. It is also influenced by economic progress; economic progress in Kulon Progo regency is not as fast in Sleman regency. Livelihood of the people is also dominated by agriculture.

Gunung Kidul regency is located in eastern part of DIY – a physiographic configuration of Gunung Kidul regency is mountainously and limestone's – is much

less on average, due to unfavourable soil characteristics and limited irrigation especially on slopes. The hydrology characteristic is much less, so this regency always droughts in every dry season and needs water dropping from other regency. The population growth in Gunung Kidul regency is the lowest than the other regency in DIY. In this regency the total population is the lowest because people who came out or emigrants slightly more than the immigrants, because of economic problems. Physiographic conditions can affect the economic problems, so it needs the support of other regencies in terms of economy.

## PREVIOUS STUDIES

Land use that breaks landscape plans tends to create problems, either social, environmental, or economic problems; therefore, policy to promote land utilization based on landscape plans is required. One method to do this is by applying land and building tax disincentive; therefore, a systematic and operational method in calculating land and building tax disincentive based on deviation of tax object utilization from landscape plans is required.

Several studies of land use tariff policy have been accomplished throughout Indonesia. One of the studies was conducted by (Sisiana, 2005). The research took place in Karawang one of West Java's rice field concentrations. Acceleration of development and fast population growth on Karawang where the land availability is limited causes field stress that push the change of land use from wetland to dry land. Real Property Tax (PBB) to State Government of Karawang is the main income sources, where the value strongly depends on fiscal potential, that stated by two determinants which are areas and its NJOP.

Another research in respect to land tax is conducted by (Purwanta, 2008). This research tries to analysis and to know whether the change of land use from wetland to residence estate causes of property NJOP difference. The expected benefits are input for PBB policy and input for develops a data base that can use together by many departments. Hypothesis that will be tested is the change of land use from wetland to residence estate expected causes of property NJOP difference. The 1998 digital topography map derived to be the 1998 digital land use map, then crossed over with the 2002 digital land use map, the product is the map of land use change from 1998 to 2002. Observation did to know the condition of land use on 2004, and the result plotted to the 2002 digital land use map, that produce the map of land use change from 2002 to 2004. From

level assessment analysis with degree of confident 95% known that statistically the average NJOP of residence estate and its market value is not the same, where NJOP of residence estate stated lower than its market value or under assessment.

## **RAPID LAND USE CHANGE IN DIY**

DIY Rapid LUCC is triggered by rapid population growth and infrastructure improvement. Population growth deals with human activities, which can directly alter the physical environment. More population increases the demand for settlement and trigger economic activities as well. The growth in population is mainly influenced by incoming migration, either to study or to have a second home. DIY is blessed with so many good images, which in the end, attracts more people to come. The image of having good high education, low living cost, friendly local people, convenient, and many other have become magnet that pulls more and more people. This of course drives new settlement and infrastructure development. RPJMD DIY in year 2009-2013 stated that population growth in DIY in between year 2003-2007 has increasing with average 1.1% per year.

Infrastructures improvements may also be one of the reasons to migrate to DIY, which can also effect Land use change. Infrastructure factors are related to the road and transportation improvement, while people need good access and comfortable transportation for doing their activities. Average annual growth of motor vehicle in city is 13% per year (BAPPEDA DI Yogyakarta, 2009).

Starting from 2008, the public transportation has already operated “trans Jogja” using “buy the service system” (purchasing system of government services to private for operating the public transportation). This facility has already operated 48 pieces of bus Trans Jogja, 76 shelters which is completed by ticketing machine and computer network. Those will be increased based to the supporting society. The government is also improving combination method between bus, railway and flight transportation services. Thus, it is becoming easier to travel by bus, train and airplane. Even though traditional transportation such as pedi-cab and horse carriage is still being maintained by the government, but those urban heritages precisely become another attraction of DIY.

## **THE MODIFIED MODEL**

The government has reacted to this by formulating a local government regulation in Regional Regulation

(PERDA) DIY Nr. 5 Year 1999 about Spatial Planning. This regulation determines the purpose of each parcel of land and the further spatial development should follow the plan. Unfortunately the implementation is not as smooth as it is supposed to be (Iqbal and Budhi, 2008). The lack of implementation has led to uncontrolled sprawl of housing development (Subanu, 2008).

Since 1999 Indonesia implement the Local Government Autonomy regulated in Law Nr. 22 Year 1999 and further revised in Law Nr. 32 Year 2004. This has caused a tremendous change in governance in Indonesia. With this law, the local governments have the power and are entitled to govern the territory. This also implies to the implementation of PERDA DIY Nr. 5 Year 1992, which is a policy taken at the provincial level. The Regency and Municipality have the authority to simply implement the policy or to publish further supporting regulation. In DIY, Sleman Regency and Yogyakarta Municipality have realized the rapid land conversion in the region and are concerned about the consequences that may occur. This has driven the government of Sleman Regency and Yogyakarta Municipality to publish Head of Regency Regulation (PERBUP) Sleman Nr. 8 Year 2009 and Mayor’s Regulation (PERWAL) Yogyakarta Nr.53 Year 2007 about Land Use Designation Permission.

### **A. The Land Conversion Tariff**

Head of Regency Regulation (PERBUP) Sleman Nr. 8 Year 2009 and Mayor’s Regulation (PERWAL) Yogyakarta Nr.49 Year 2008 about Land Use Designation Permission regulate in detail the mechanism and tariff for converting a parcel of land in Sleman Regency and Yogyakarta Municipality.

- An area of minimum 100 m<sup>2</sup> for Yogyakarta Municipality and 600 m<sup>2</sup> must have a letter of permit to convert the use of land to another function.
- The land conversion consists of stages: from wet agricultural land (wet rice field) to dry agricultural land and from dry agricultural land to settlement or to business area.
- The conversion from wet agricultural land to business area must go through these stages
- The conversion tariff is calculated using the formula

$$CT = CI \times LP \times LA$$

- CT : Conversion tariff (Rp.)  
 CI : Conversion index (%)  
 LP : Land price, based on the price from the tax office (NJOP: Tax Object Price)  
 LA : Area of land to be converted (m<sup>2</sup>)

Table I: Land Conversion Index In Yogyakarta Municipality (%)

Land area (m <sup>2</sup> )	Dry land agriculture	Settlement	Business area
100 – 500	1.25	0.25	0.5
501 – 1,000	1.5	0.3	0.6
1,001 – 5,000	2	0.4	0.8
5,001 – 10,000	2.5	0.5	1
>10,000	3	0.6	1.2

Source: PERWAL No. 49 Year 2008

## B. The implementation

The implementation of Regional Regulation (PERDA) DIY Nr. 5 Year 1999 about land use planning runs somehow not effective. The grand master plan as a product of this regulation is on the scale of 1:5,000, which is used as a reference to grant development permit, is not sufficiently detail to decide whether a parcel of land deserves a permit. The granting permit officials often use their own interpretation to grant a permit. Together with low enforcement, an ineffective regulation is the outcome (Subanu, 2008).

Land conversion tariff for Yogyakarta Municipality was published in 2007 and in 2009 for Sleman Regency. The implementation runs fairly strict. The conversion proposal coming to the permission office will then be evaluated, if permission is considered, an assessment team will visit the site to thoroughly assess the location and its association. If all the criteria is fulfilled the permission will be published. All of these processes must be followed and passed in order to convert land use. According to LUPIS Indonesia (2010) these regulations are rigorously obeyed. Unfortunately, this does not mean that land conversion problem is solved. The tariff gives chances for misapplication.

## The DPSIR

### Driver

The underlying driver in this study is the rapid land use change in DIY that has drawn the attention of the

policy makers driving them to formulate and publish regulations to slow down, if not stop, the land conversion. These regulations act as the proximate driver. From four Regencys and one Municipality, only Sleman Regency and Yogyakarta Municipality that have published supporting regulation for the Regional Regulation (PERDA) Nr. 5 Year 1999 about Spatial Planning Act published by the government of Yogyakarta Special Province (DIY). The supporting regulation only obliged land of minimum of 100 m<sup>2</sup> in Yogyakarta Municipality and 600 m<sup>2</sup> in Sleman Regency to obtain land conversion permit.

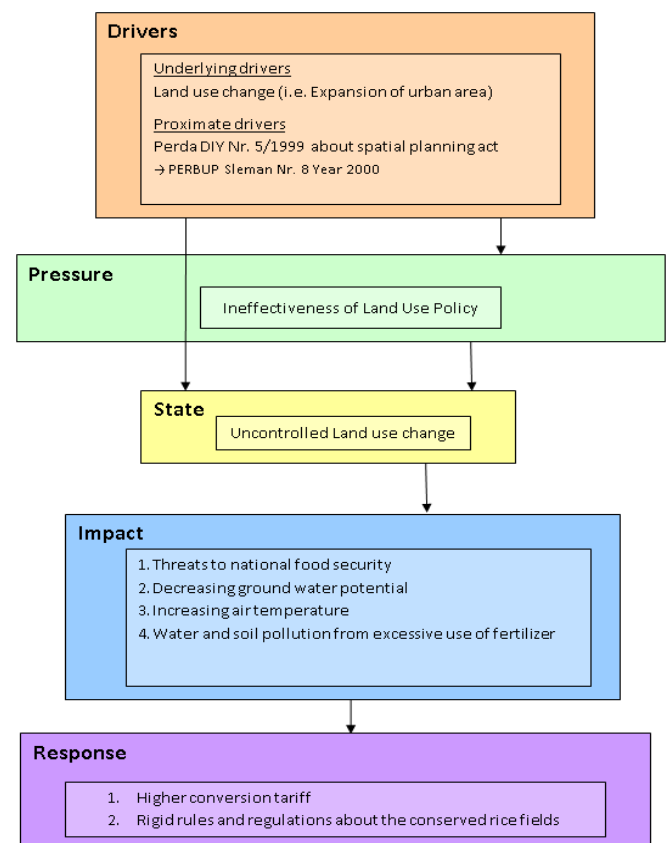


Fig. 1. The DPSIR Diagram of this study.

This means that land conversion for areas less than the above mentioned width does not need to acquire any permission. The amount of the land conversion tariff applied is also an issue. It is considered to be way too cheap when compared to the value the land could get after being converted. The calculation of the tariff is based on the land price set by the tax office (NJOP: Tax Object Price), which is usually very low in comparison to the market price of the land. This way, the tariff is not a hindrance for converting land use.

### Pressure

The pressure in this study is the misapplication of the land conversion tariffs.

## State

The land conversion tariff was introduced to hinder rapid land use change and further to control it. The chances of misapplication in the land conversion tariffs lead to uncontrolled land use change in a different form.

## Impact

The uncontrolled land use change in DIY from agricultural land to other functions has posed threats to food security either local or national. With the assumption that rice need per capita per day is 0.3 kg, the need of rice is 101 kg per capita per year. With inhabitant in DIY 3,468,500 lives, the need of rice is tons/year while current production is 798.232 tons/year.

(Adji, Marwasta & Nurjani, 2007) has done a study on the impact of land use change to ground water in DIY, and the result is that land conversion has decreased water table in DIY of 40 cm/year. When the land is functioned as agricultural land, rain water infiltrates to the soil and further percolates freely to the groundwater. After it was converted to non-agricultural uses, such as settlement or other built-up areas, very less water could infiltrate the soil to recharge the groundwater. Land conversion has also suspected to be one of the reasons of increasing air temperature in DIY. A study in Citarum river basin by Agus et al in 2002 showed that urban land use has 2° C higher temperature than agricultural land use measured in three different areas with the same altitude (Agus, et al., 2002).

## Response

In order to mitigate the impact of ineffective policy intended to control land conversion, response from the government is needed. This can be done by revising existing land conversion tariff. A focused group discussion was held to collect feedback from expert, representatives of government institution, and academician. Potential possible responses to improve the land conversion tariff are as following:

1. Smaller minimum area that requires a permit for land conversion

The minimum area that requires a permit for land conversion in Sleman Regency is 600 m<sup>2</sup>. This is considered to be too wide. After the land conversion tariff is implemented, the big investors do stop their expansion of new housing estates and business

complex. But new smaller developer developing smaller housing estates are mushrooming. This becomes a new trend in Sleman Regency. Smaller minimum area that obliged to obtain a permit for land conversion is expected to hinder these small housing estates.

### 2. Higher land conversion tariff

The existing land conversion tariff is calculated based on the land price by the tax office for tax calculating purposes (NJOP). This price is far below the real market price of the land, resulting a very low conversion tariff. Conversion tariff policy introduced as an instrument to control land use change could not function properly. Higher conversion tariff is expected to have more impact to land conversion process. The mechanism proposed is to calculate the conversion tariff using NPOP instead of NJOP. NPOP the price set by considering potential value the land could get when converted to certain land use. This way is a parcel of land is to be converted to industry or business area, the NPOP would be very high.

### 3. Development of land conversion tariff in all Regencies in DIY

Currently, land conversion tariff policy existed only in Sleman Regency and Yogyakarta Municipality. Since the implementation of the policy, Sleman Regency, the Regency with very active and rapid land conversion, have shown a decreasing trend of new land conversion. But the developer is moving to Bantul Regency where such tariff does not exist. In order to hinder this, land conversion tariff must also be introduced in Bantul Regency as well as Kulon Progo and Gunung Kidul Regency.

## CONCLUSION

Land conversion becomes one of major issue on development country. In the case of Yogyakarta province, implemented land tariff policy couldn't control this phenomenon. The calculation of the tariff is based on the land price set by the tax office (NJOP: Tax Object Price), which is usually very low in comparison to the market price of the land. This way, the tariff is not a hindrance for converting land use. Following action should be taken to overcome land use conversion: Smaller minimum area that requires a permit for land conversion, higher land conversion tariff, and development of land conversion tariff in all Regencies in DIY.

**ACKNOWLEDGMENT**

The authors would like to thank Prof. Dr. Junun Sartohadi of Gadjah Mada University as the Leader of the LUPIS Indonesia Team and Prof. Desmond McNeil of University of Oslo, Norway as the Supervisor.

**REFERENCES**

- Adji, T. N., Marwasta, D., & Nurjani, E. (2007). *Pemodelan recharge air tanah tahunan Kotamadya Yogyakarta*. Yogyakarta: Fakultas Geografi.
- Agus, F., Watung, R. L., Suganda, H., Tala'ohu, S. H., Wahyunto, Sutono, S. Kundarto, M. (2002). *Assesment of environmental Multifunction of paddy farming in Citarum river basin West Java,Indonesia. Multifunction and AgriiculturalLand Conversion*. Bogor: Puslitanak Departemen Pertanian.
- BAPPEDA DI Yogyakarta. (2009). *Rencana Pembangunan Jangka Menengah 2009-2013*. Yogyakarta: BAPPEDA.
- Guipponi, C. (2002). *From the DPSIR reporting framework to a system for a dynamic and integrated decision making process*. European Policy and Tools for Sustainable Water Management. Venice: Italy.
- Iqbal, M., & Budhi, G. S. (2008). *Perspective of Agri-Environment Service Incentives in Indonesia, Developing Countries and OECD Members*. Forum Penelitian Agro Ekonomi, 1-16.
- Kristensen, P. (2004). *The DPSIR framework. Comprehensive Assesment of the Vulnerability of Water Resources to Environmental Change in Africa River Basin*. Nairobi.
- LUPIS Indonesia. (2010). *Proposing Scenarios to Overcome Land Use Change in Yogyakarta*. Graduate and Post-Graduate Workshop. Yogyakarta: Gadjah Mada University.
- Marwasta, D. (2010). *Urban Growth versus Smart Growth: Towards Yogyakarta Slow City*. (p. 10). Yogyakarta: Gadjah Mada University.
- Odermatt, S. (2004). *Evaluation of Mountain Case Studies by Means of Sustainability Variables: A DPSIR Model as an Evaluation Tool in the Context of the North-South Discussion*. Mountain Research and Development, 336-341.
- Purwanta, B. (2008). *Metode Penentuan Disinsentif Pajak Bumi Bangunan Berdasarkan Penyimpangan Pemanfaatan Objek pajak Terhadap Rencana Tata Ruang*. Bandung: Bandung Institute of Technology.
- Randal, A. (1987). *Resource economics: An economic approach to natural resource and environmental policy*. New York: John Wiley and Sons Inc.
- Sisiana, E. (2005). *The Implication of Land Use Change from Wetlan Into Residence Estate on Property NJOP in Karawang*. Bandung: Bandung Institute of Technology.
- Subanu, L. (2008). *Governing urban development in Dualisting Societies: A Case Study of The Urban Region of Yogyakarta,Indonesia*. In T. Kidokoro, N. Harata, L. P. Subanu, J. Jessen, A. Motte, & E. P. Seltzer (Eds.), *Sustainable City regions : Space,Place and Governance*. Japan: Springer.

