Influence Assessment of Built-Up Area Development to The Physical Environment, Social and Economic Aspects in Yogyakarta City Using Spatial-Statistical Analysis

By Ani Apriani

Influence Assessment of Built-Up Area Development to The Physical Environment, Social and Economic Aspects in Yogyakarta City Using Spatial-Statistical Analysis

To cite this article: S Fathurrohmah *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **313** 012005

Influence Assessment of Built-Up Area Development to The Physical Environment, Social and Economic Aspects in Yogyakarta City Using Spatial-Statistical Analysis

S Fathurrohmah[1]**, A Apriani**[2]**, S Haryatmi**[3]**, Danardono**[4]

[1,2] Sekolah Tinggi Teknologi Nasional Yogyakarta, Indonesia
[3,4] Universitas Gadjah Mada, Indonesia

Email: septianafath@gmail.com

Abstract. The urban physical development in Yogyakarta occurs continuously due to the high intensity of the economic activity in the service provision and trade sector. This physical development is considered to give a negative impact to the physical, social, and economic environment. This study aims to get an overview regarding the effect of the growth of the built area in Yogyakarta to the physical, social, and economic environment. This study utilizes both quantitative and qualitative approach. The land use change is assessed qualitatively by utilizing the spatial analysis method to figure out the expansion of the built area. The spatial analysis is also utilized to figure out the impact of development based on the community perceptions and put the finding of this study on the map. Meanwhile, the quantitative approach is utilized to conduct a statistical analysis in order to examine the level of influence of built-up area development on the physical, social, and economic aspect of each district in Yogyakarta City.

Keywords: *Mangrove, conservation priority, criticality level, coastline dynamic*

1. Introduction

As it has been stipulated in the Regulation Number 2/2010 regarding the Provincial Spatial Plan, Yogyakarta is placed at the highest rank in the spatial structure plan. Yogyakarta is prepared to grow in the future as a big city. Yogyakarta is also the most important part in the Yogyakarta Urban Conurbation Area (Kawasan Perkotaan Yogyakarta/KPY). KPY itself is delineated as the center of national activity (Pusat Kegiatan Nasional/ PKN), which will bear the function as the center of the social and economic activity at the international, national, and regional level [1].

Yogyakarta is also notable as the center of the culture and education. The service and trade sector in Yogyakarta may contribute significantly to the toal GDP. The growth of these economic activities has consequently stimulated the physical development in Yogyakarta [2,3]. This physical development has resulted into both positive and negative effect. On the one hand, this is needed to support the development of the social and economic activity. On the other hand, this may jeopardize the physical, social, and economic environment.

This research is conducted to figure out the effect of the physical development to the physical environment, social, and economic activity. Both qualitative and quantitative analysis are utilized in this research. As the part of the qualitative approach, the spatial analysis is utilized to identify the land use change. This approach is also utilized to figure out the spatial distribution of the physical development effect based on the citizen point of view. Meanwhile the quantitative approach is utilized to conduct a statistical analysis to figure out the effect of physical development on the physical environment, social, and economic aspect in every districts in Yogyakarta.

2.   **Data and Methods**
a.   The analysis of the land use change

The main variable in this study is the percentage of the land use change from the non-built area to the built area [4]. This represents the physical change in an area. This percentage is obtained by comparing the converted land with the total area in each district. The land use data is obtained by interpreting the satellite imagery [5,6] from the Google Earth in 2007 and 2018. The interpretation is conducted by utilizing supervised image classification approach. The result is then overlaid by using the intersect method to figure out the amount of land use change in each district [7].

b.   The effect of the land use change on the social, economic, and physical environment.

The assessment to the social, economic, and physical environment is based on the citizen's point of view. To assess the physical environment variable, the indicators consist of the water quantity and quality, ground water absorption, air temperature, air pollution, climmate, land use, and the availability of the green space. The social variable consists of the community organization, social interaction, local custom, daily behaviour, and the quality of live. Meanwhile, the economic variable consists of the rate of migration, the rate of labour force, economic structure, daily expenditure and revenue, the shift of job, and the number of education, religious, and health facilities. The average score from the assessment done by the citizen is then analyzed by utilizing the Pearson-Correlation Tes together with the land use change variable.

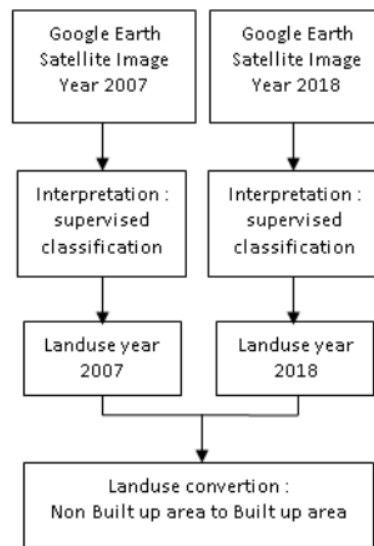The scheme of the research method could be seen in the Figure 1.

Figure 1. Scheme of Research Method

3.   **Result andDescription**

The high resolution of satellite imagery is utilized to identify the land use change. The satellite imagery is interpreted digitally based on the supervised classification approach to obtain the land use information in each district in Yogyakarta. The land use is classified into built and non-built area. Built area consists of housing, building, structures, and the paved oped space. Meanwhile the non-built area is defined as the riverside vegetation and the non-paved open space. Figure 2 shows the result of the land use interpretation while Figure 3 shows the result of overlay analysis between two land use maps from different years.
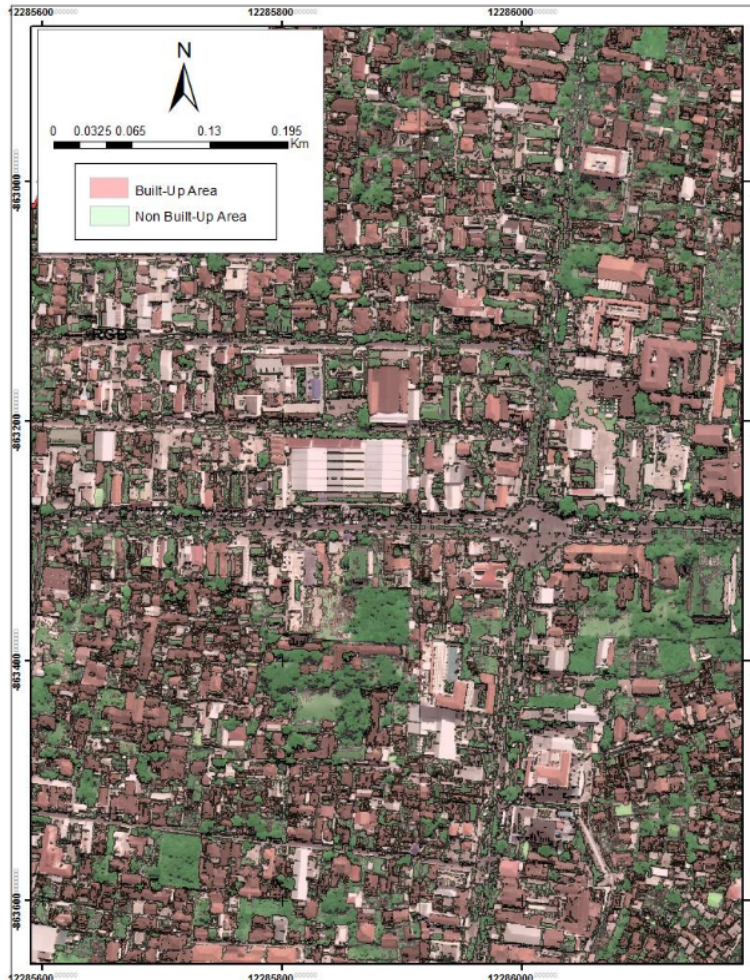
Source : Analysis (2018)
Figure 2. Exampel of Landuse Interpretation Result (Jetis District)

The unit analysis to identify the land use change is the administrative area of 14 districts in Yogyakarta. The result shows that there are four districts where the land use change does not occur. Those districts are Danurejan, Ngampilan, Pakualaman, and Tegalrejo. Meanwhile, the highest amount of the land use change occurs in Gondokusuman district, where 64.96 Ha of land is converted from the non-built area. The amount of land use change is also high in Mergangsan and Mantrijeron district. However, if it is observed from the percentage of the land use change, there are 4 districts with the highest rate of land use change, which are Kraton, Gondokusuman, Wirobrajan, and Mergangsan. Among districts in Yogyakarta, the percentage of land use change in those four districts is higher. Those four districts are located close to the city center and crossed by the primary arterial road. The percentage of the land use conversion could be seen in Table 1.
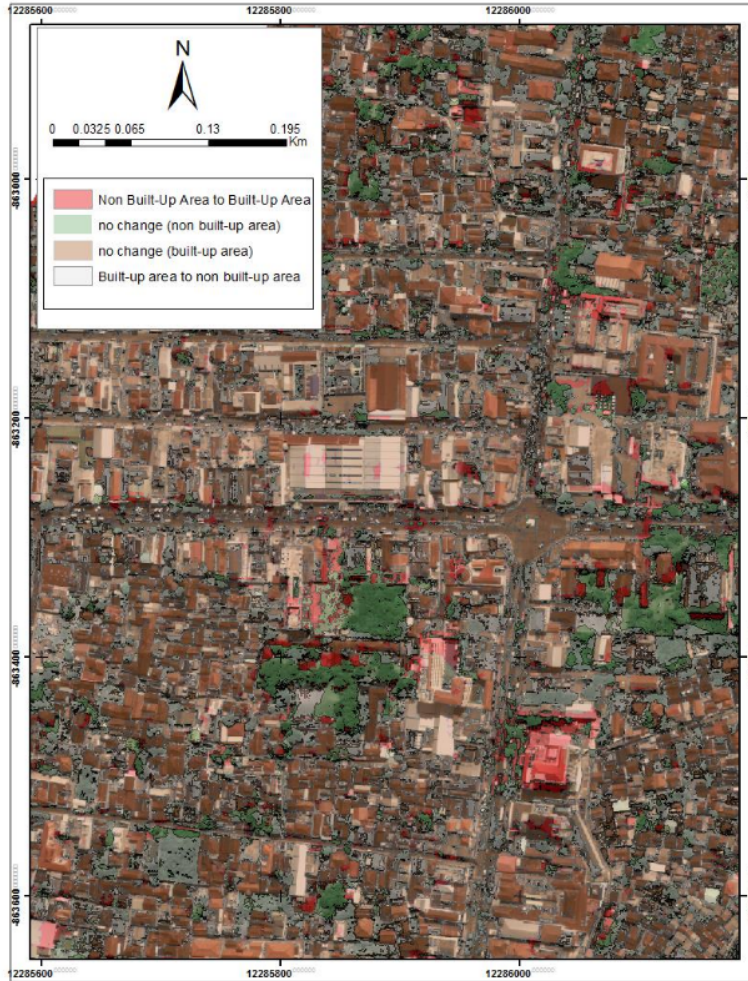
Figure 3. Example of Land-use Changes Identification Result (Jetis District)

Table 1. Area and Percentage of Landuse Convertion (Non Built-up Area to Built-up Area)

District	Area of Landuse Convertion (Ha)	Tota Area (Ha)	Percentage
Danurejan	0	93, 83	0
Gedongtengen	3, 59	91, 69	3.91
Gondokusuman	64, 96	414, 10	15.69
Gondomanan	9, 28	102, 10	9.09
Jetis	13, 89	177, 88	7.81
Kotagede	15, 79	317, 90	4.97
Kraton	26, 35	157, 72	16.71
Mantrijeron	28, 77	278, 17	10.34
Mergangsan	34, 52	246, 62	13.99

Ngampilan	0	75, 00	0
Pakualaman	0	78, 85	0
Tegalrejo	0	317, 44	0
Umbulharjo	9, 44	816, 46	1.16
Wirobrajan	26, 83	185, 50	14.46

Source : GIS Analysis (2018)

a. Correlation Between the Land Use Change with the Physical Environment Condition in Yogyakarta

The Pearson-Correlation analysis is performed to figure out the correlation between the land use change and the physical envirinment condition. The test result can be seen in the Table 2.

**Tabel 2.** Result of Pearson Correlation Assessment (Landuse Convertion vs Physical Environment

Correlations

		Perubahan Lahan	Aspek Lingkungan
Perubahan Lahan	Pearson Correlation	1	.580*
	Sig. (2-tailed)		.030
		14	14
Aspek Lingkungan	Pearson Correlation	.580*	1
	Sig. (2-tailed)	.030	
	N	14	14

*. Correlation is significant at the 0.05 level (2-tailed).

Source : Analysis (2018

The test shows that the correlation between those two variables has the significance value of 0.03 ($p<0,05$). This shows that the land use change has a significant correlation with the physical environment condition. The Pearson Correlation coefficient also has a positive sign, which could be interpreted that both variable has a positive correlation. It means that when the amount of the land use conversion increase, the environment quality will decrease. Figure 4 shows the effect of the land use change on the environment aspect.

Figure 4. Graphic of Pearson Correlation Assessment Result (Landuse Convertion vs Physical Environment Aspect)
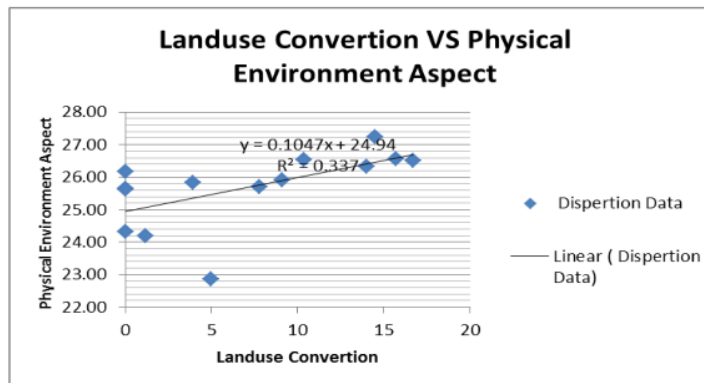
Source : Analysis (2018)

As it is shown in the Figure 4, the formula has the R^2 of 0,337, which means that the land use change may give 33.7% effect to the environment condition, while 63.3% is influenced by the other factors.

b.   Correlation between the land use change on the social and cultural condition in Yogyakarta
      The Pearson Correlation test is again performed to figure out the correlation between the land use change and the social and cultural condition in Yogyakarta. The test result is shown in the Table 3.

Table 3. Result of Pearson Correlation Assessment (Landuse Convertion vs Socio-Cultural Aspect)

Correlations

		Perubahan Lahan	Aspek Sosial Budaya
Perubahan Lahan	Pearson Correlation	1	.272
	Sig. (2-tailed)		.347
	N	14	14
Aspek Sosial Budaya	Pearson Correlation	.272	1
	Sig. (2-tailed)	.347	
	N	14	14

Source : Analysis (2018)

The test result shows that the correlation between those two variables has the significant value of 0.347 ($p>0,05$). This means that the land use change does not have any correlation with the social cultural condition in Yogyakarta.

c.   Correlation between the land use change and the economic condition in Yogyakarta
      The Pearson Correlation test is performed to figure out the correlation between land use change and the economic condition. Table 4 shows the test result.

Table 4. Result of Pearson Correlation Assessment (Landuse Convertion vs the economic condition Aspect)

Correlations

		Perubahan Lahan	Aspek Ekonomi
Perubahan Lahan	Pearson Correlation	1	.020
	Sig. (2-tailed)		.946
	N	14	14
Aspek Ekonomi	Pearson Correlation	.020	1
	Sig. (2-tailed)	.946	
	N	14	14

Source : Analysis (2018)

The test of correlation shows the significance value of 0.946 ($p>0,05$). This means that there is no correlation between the land use change and the economic condition in Yogyakarta.

4.   **Conclusion**
      Districts located on the close proximity with the City Center and crossed by the main road have the relatively high percentage of land use change in Yogyakarta. This land use change does not take effect on the social, cultural, and economic condition of the population in Yogyakarta. The finding shows that the land use change correlates with the quality of the physical environment only.

6. References

[1] Bappeda DIY 2010 *Peraturan Daerah Provinsi Daerah Istimewa Yogyakarta Nomor 2 Tahun 2010 Tentang Rencana Tata Ruang Wilayah Provinsi Daerah Istimewa Yogyakarta Tahun 2009-2029*

[2] Fitria T . 2016 Dampak Pertumbuhan Hotel Terhadap Perubahan Karakteristik Perwilayahan Kota Yogyakarta *Simposium Nasional Teknologi Terapan (SNTT)*

[3] Murti C C and Rofi A 2017 Dampak Sosial Ekonomi dan Lingkungan Fisik Masyarakat Akibat Pengembangan Hotel di Kota Yogyakarta *J. Pembang. Wil. KOTA* **13** 165–74

[4] Tasha K 2012 *Pemodelan perubahan penggunaan lahan dengan pendekatan Artificial Neural Network (Studi Kasus: Kabupaten Bengkalis, Provinsi Riau)* (Bogor)

[5] Alsaaideh B, Al-hanbali A and Tateishi R 2011 Assessment of Land Use / Cover Change and Urban Expansion of the Central Part of Jordan Using Remote Sensing and GIS *Asian J. Geoinformatics* **11** 1–9

[6] Weng Q 2002 Land use change analysis in the Zhujiang Delta of China using satellite remote sensing, GIS and stochastic modelling *J. Environ. Manage.* **64** 273–84

[7] Suroso D S A and Firman T 2018 The role of spatial planning in reducing exposure towards impacts of global sea level rise case study: Northern coast of Java, Indonesia *Ocean Coast. Manag.* **153** 84–97

Influence Assessment of Built-Up Area Development to The Physical Environment, Social and Economic Aspects in Yogyakarta City Using Spatial-Statistical Analysis

7 www.coursehero.com
   Internet
   19 words — 1%

8 Tosan Okoro, Polina Mironova, Thrmiga
   Sathiyamoorthy, Jermey Hall et al. "Correlation of
   Residents' Performance in Competency-Based Exams and
   Orthopaedic In- Training Examinations (OITE)", Research Square
   Platform LLC, 2021
   Crossref Posted Content
   14 words — 1%

9 A R Rakhmatulloh, D I K Dewi. "Mapping of Road
   Network, Land Use, and Pedestrian Ways in CBD of
   Semarang", IOP Conference Series: Earth and Environmental
   Science, 2019
   Crossref
   12 words — 1%

10 1library.net
   Internet
   11 words — 1%

11 eprints.uthm.edu.my
   Internet
   11 words — 1%

12 elib.uni-stuttgart.de
   Internet
   10 words — < 1%

13 repository.lppm.unila.ac.id
   Internet
   10 words — < 1%

14 Kathleen A. Farley. "Grasslands to Tree
   Plantations: Forest Transition in the Andes of
   Ecuador", Annals of the Association of American Geographers,
   2007
   Crossref
   8 words — < 1%

15 iopscience.iop.org
   Internet
   8 words — < 1%

16	pertambangan.fst.uinjkt.ac.id Internet	8 words — < 1%
17	www.mitrariset.com Internet	8 words — < 1%
18	Vanchai Laemlaksaku, Sittichai Kaewkuekool. "Chapter 2 A Study of Comparative Design Satisfaction Between Culture and Modern Bamboo Chair", Springer Science and Business Media LLC, 2008 Crossref	6 words — < 1%
19	www.ncbi.nlm.nih.gov Internet	6 words — < 1%

EXCLUDE QUOTES   ON
EXCLUDE BIBLIOGRAPHY ON

EXCLUDE MATCHES   OFF