Analysis of the Dynamics of a Built-Up Area in the Region in the context of Regional Proliferation (Regional Split) Implication in Indonesia: A case study of Southeast Sulawesi Province

I. INTRODUCTION

The decentralization policy applied in Indonesia since 1999 brought about some changes in the governmental system. One of the most influential policies related to decentralization in Indonesia is the regional split/regional proliferation policy at the local government level (province and city/regency).

Regional split/regional proliferation refers to creating a new autonomous region/city by splitting one core region into two or more regions (see Figure 1). This policy has affected the region, and many studies have analyzed the implications of this policy. However, these studies mostly analyzed the implications from economic, social, and political perspectives. Hence, this study aims to contribute from a different point of view—namely, land use analysis, specifically for the built-up area, as part of the environmental perspective that is still rarely investigated when analyzing the implication of this regional split policy.



Figure 1. Illustration of the Process Regional Proliferation/ Regional Split

Mapping the built-up areas in the region is important because the existence of these types of land can be used as an indicator of environmental quality and urban/regional development. Many scholars have agreed that land use types can serve as a proxy for valuing ecosystem services because natural ecosystems use land as a carrier and land use change can greatly change the ecosystem¹).

II. ANALYSIS METHOD

The analysis consists of a data analysis and literature explanation, as follows:

1. The initial step is analyzing time series data from satellite images (Landsat). The Landsat data will be differentiated as (1) new regions and (2) core regions and will focus on the capital/center of the region, known as the center business district (CBD). The aim of this step is to identify built-up areas in the region before and after the policy was applied.

The classification method uses the index-based built-up index (IBI), which is a method that combines several Landsat bands' data to enhance the visualization of the image for built-up areas. The IBI results will facilitate the identification of built-up areas using a supervised University of Miyazaki, Student Member, O GAZALI University of Miyazaki, Professor, Minoru KUMANO

 $\begin{array}{l} \text{classification method. The IBI formula is as follows}^{2\text{}2\text{}\text{Band5}} \\ \text{IBI} = \frac{\frac{2\text{Band5}}{\text{Band5} + \text{Band4}} - \left[\frac{\text{Band4}}{\text{Band4} + \text{Band2}} + \frac{\text{Band2}}{\text{Band2} + \text{Band2}}\right]}{\frac{2\text{Band5}}{\text{Band5} + \text{Band4}} + \left[\frac{\text{Band4}}{\text{Band4} + \text{Band2}} + \frac{\text{Band2}}{\text{Band2} + \text{Band2}}\right]} \end{array}$

- The dynamics of the built-up areas will be defined by quantifying the area generated from the first analysis. Matrix comparison methods will be used to identify the changes and rate of changes of the built-up areas in the region.
- 3. The pattern of the changes will be descriptively analyzed to identify the possibility of correlation between the implementation of the regional split policy and built-up areas expansion.

III. RESULTS AND DISCUSSION

a. Regional Proliferation/Regional Split Policy

Regional proliferation appears to be a trend in the Indonesian governance system. Based on the data from the Indonesian Statistical Bureau (2016), since this policy has been applied, the number of regencies/municipalities has increased rapidly, from 326 to 514, in the last 15 years (see Figure 2).



Figure 2. Number of Provinces and Regencies/municipalities in Indonesia, 2000–2015

Southeast Sulawesi is one Indonesian province experiencing an increase in the number of regions because of the regional split/regional proliferation policy in the decentralization era. It consisted of only 6 regions in 2001; today this number has increased to 17 regions.

Table 1. Top 5 Province in Indonesia in term of Regional Split

No	Province	Number of Local Regions		Increase
110	110,11100	2001	2015	morouse
1	North Sumatera	20	33	13
2	West Papua	0	13	13
3	South East Sulawesi	6	17	11
4	North Sulawesi	6	15	9
5	East Nusa Tenggara	15	22	7



Figure 3. Illustration of Regional Split in Southeast Sulawesi Province, 2001 and 2014

This study analyzed three selected areas of the region in this province. Two areas are the capital from the new autonomous region, Lasusua(a) and Bombana(b), which was split in 2003-2004, and one area is the capital of one of the core region, Kolaka(c) (see Figure 3).

b. The Dynamics of Built-up Areas

Remote-sensing data are a popular dataset for analyzing the dynamics of land use changes, including build-up/urban area analysis. This study use time series Landsat images to analyze the built-up area before and after the regional split. It uses Landsat 5 TM for analyzing data from the years 1994 and 2004 and Landsat 8 OLI for analyzing data from the year 2014. All images were first processed using the IBI method and then generated using supervised classification and digitation. The results are shown in Table 2.

 Table 2. Built-Up Areas in Selected Study Area (Ha)



Figure 4. Comparison of Increasing Rate of Built-up Areas Before and After Regional Split

The results shows an obvious difference between the growth rate of the built-up areas before and after the implementation of the regional split/proliferation. The growth rate after the policy was applied (2004–2014) increased rapidly compared to the growth rate before (1994–2004).



Built-up Areas

Figure 5. Illustration Map of the Built-Up Areas Distribution in Each Study Area a. 10 year before split (1994); b. when it was started to split (2004); c. 10 years after split (2014)

IV. CONCLUSIONS AND FUTURE STUDY

a. Conclusions

- 1. Naturally built-up areas in the region must grow over time, but the results of this study indicate that a regional split/regional proliferation policy could accelerate the growth rate of built-up areas.
- 2. A difference exists between the growth rate of the builtup areas in the core region and the new regions. The new regions (Bombana and Lasusua) grew faster than the core region (Kolaka).

b. Future Study

The implication of a regional split/region proliferation policy should be more deeply analyzed not only on built-up areas, but also on more land use classifications (e.g., forest, agriculture, bare land) and should use the ecosystem service value (ESV) as a proxy for measuring quantitative implications.

V. REFERENCES

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