

Monitoring Of Land Cover Changes In Mine Environment

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Abstract— Land cover detection change is significant for planning and managing an area. The condition of an area should be analyzed to observe human activities that influence environment and thus it is important to simulate land cover changes. Land cover can be effectively monitored by remote sensing technique and GIS using multi-temporal satellite images. Multi-temporal satellite images analysis will be helpful to conceive the sequence patterns of land cover change and to detect the trend of changes. Supervised classification is applied to classify land cover type and calculate the changes of coverage area. Mining is one of human activity which its process causes land cover change. This study is intended to analyze the land cover change in Bangka Tengah due to mining activities. Landsat time series are used in this research during 18 years period (Landsat acquisitions are 1997, 2000 and 2015). Site area of this research is in Batu Belubang, Tanah Merah, Kedimpel and Tanjung Gunung. Field study shows change of land cover from vegetation cover into tin mining area and its post tin mining activity such as tailing area and an artificial lake known as kolong.

Keywords— *Land Coverage Changes, Tin Mining, GIS, Remote Sensing*

I. INTRODUCTION

Land use and land cover are dynamic and is a critical part in understanding the associations of the human exercises with the earth and in this way it is important to reproduce ecological changes [1]. Observing of land use/land cover changes which would design advancement exercises, for example, significant plans and their territory prerequisites land use and land spread change has turned into a focal part in current systems for overseeing normal assets and checking natural change. The quick improvement of the idea of vegetation mapping has lead to expanded investigations of land use and land cover change around the world. In spite of the fact that the terms 'Land Use' and 'Land Cover' are regularly utilized conversely, their genuine implications are very particular [2]. Land cover alludes to the physical attributes of earth's surface, caught in the appropriation of vegetation, water, soil and other physical highlights of the land, including those made exclusively by human exercises e.g., settlements. While land-use alludes to the manner by which land has been utilized by people and their living space, for the most part with highlight on the utilitarian job of land for financial exercises. This data likewise helps with checking the elements of land use coming about out of changing requests of expanding populace [3]. Basically,

identifying changes in land surface is noteworthy for comprehension and surveying human effects on nature [4].

Land cover can be cost-viably mapped and observed by remote sensors on airplane and satellites [5]. Data from satellite remote detecting can assume a valuable job in understanding the idea of changes in land cover/use, where they are happening, and anticipating conceivable or likely future changes. Such Satellite data is basic to making arrangements for improvement and safeguarding our characteristic assets and condition, and is required by urban organizers and subjects. Satellite remote sensing approaches give a financially savvy proceeding with work incorporates including satellite elective when more data is required, yet spending plans are declining [6]. Remote sensing innovation and satellite information are useful for the identification of changes in land use/land cover [2]. Remote sensing system is an appropriate instrument used to screen and survey land use over a wide scope of land over an extensive stretch. Land use designs change after some time in light of monetary, social and ecological variables. Understanding the idea of progress in the utilization of land assets is basic learning to encourage legitimate arranging, the executives and control of the utilization of land assets [7]. Remote sensing information and strategies, in blend with GIS and scene measurements, are crucial to break down and describe land spread and its changes. Specifically, by methods for the reconciliation of remote sensing and GIS strategies, it is conceivable to break down and to order the changing example of land cover amid quite a while period and according to comprehend the progressions inside the region of interest [8].

Mining is a standout amongst the most unique procedures with immediate just as circuitous effect on the earth. Thus, mine region gives perfect circumstance to assessing the ordered changes in land use designs [1]. Bangka Belitung Province is a potential area of tin mineral, one of its regency which has land cover/land use changes is Bangka Tengah. Monitoring of land cover changes in Bangka Tengah is intended to analyze the changes pattern due to mining activities. Monitoring process is using remote sensing and GIS technique through multi temporal satellite images.

II. MATERIALS AND METHODS

A. Study area

Study area is located in Bangka Tengah. Bangka Tengah is a regency of Bangka Belitung Province, located in 105°

48° BT - 106° 51° BT and 02° 11° LS - 02° 46°LS. Bangka Tengah regency is bordered by Pangkalpinang city, Bangka regency and Bangka Selatan regency. Field study locations are used to ground check the condition of selecting training area. Map location of field survey is shown in Fig. 1.

B. Data source and methods

GIS and remote detecting strategy were utilized in this examination to recover the land cover change information. Landsat images utilized in this examination were acquired from USGS and as of now geo-referenced, at the Universal

Transverse Mercator projection system (zone: 48S, datum: WGS-84). However, all images were compared with topographic map of BIG. Multi temporal Landsat images used for analyzing land cover change are acquired on 1997, 2002 and 2015. These satellite images were imported and analyzed in ER Mapper version 6.4 and also processed using ArcGIS version 10. Each Landsat image has been classified through supervised Maximum Likelihood Classification into 4 classes (Vegetation, Non Vegetation, Kolong and Tin Mining Area). The grouping pictures were trailed by the field confirmation and exactness appraisal.

III. RESULTS AND DISCUSSION

Land is turning into a rare common asset because of the prospering populace development and urbanization. Basically, identifying changes in land surface is noteworthy for comprehension and evaluating human effects on the earth [4]. Coordinating GIS and remote sensing gave significant data on the idea of land spread changes particularly the zone and spatial appropriation of various land spread changes [9]. Data of human effects to nature can be examined through land spread change utilizing multi transient satellite pictures. In this study, Landsat images used for processing have three different times (1997, 2002 and 2015). Each data is classified into 4 main classes; Vegetation, Non Vegetation, Kolong and

Tin Mining Area. Vegetation is all of vegetation cover such as mangrove forest, swamp forest, agriculture land, etc. Non Vegetation consist of urban area, abandonment of the agricultural region and bare soil. Kolong is a hole caused by mining and filled with water. Tin mining area is including active tin mining area and post tin mining area (tailing). Field study in around Bangka Tengah (Batu Belubang, Tanah Merah, Kedimpel, Tanjung Gunung, Kayu Besi, etc.), identified an active tin mining activity and temporary shelter for the miners near the mining site. Besides, there are some reclamations area, managed by tin company in Bangka Belitung province as their CSR. Fig. 2 show the field study conditions.

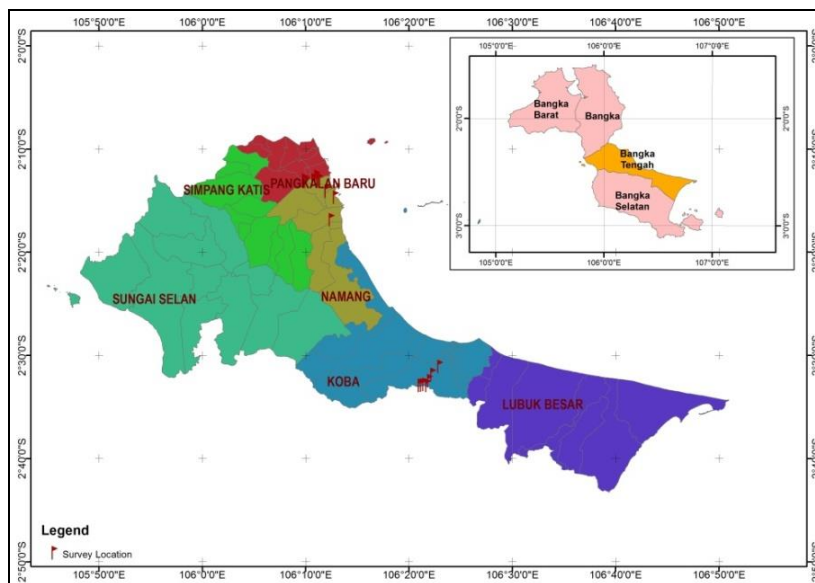


Fig. 1. Map Location



Fig. 2. Field Study Conditions

Supervised maximum likelihood classification is used in this study. The overall classification accuracies of land cover maps of 1997, 2000 and 2015 were 100%, 100% and 86.49% with Kappa statistic of 1, 1 and 0,817. Satellite images classification show change of land cover during 18 years (1997-2015), it is identified by the increasing of one class and the decrease of the other class. However, there are vegetation growth on the bare land. Coverage area in hectare can be seen in Table 1. Land cover map of year 1997, 2000 and 2015 are shown in Fig. 3, Fig.4 and Fig.5.

TABLE 1 COVERAGE AREA OF LAND COVER

Classes	Coverage area (Ha)		
	1997	2000	2015
Vegetation	141,599.91	122,375.17	143,727.48
Tin Mining Area	4,635.82	10,118.24	9,400.77
Non Vegetation	77,739.95	92,179.57	71,975.88
Kolong	3,934.74	3,237.45	2,806.29
	227,910.42	227,910.42	227,910.42

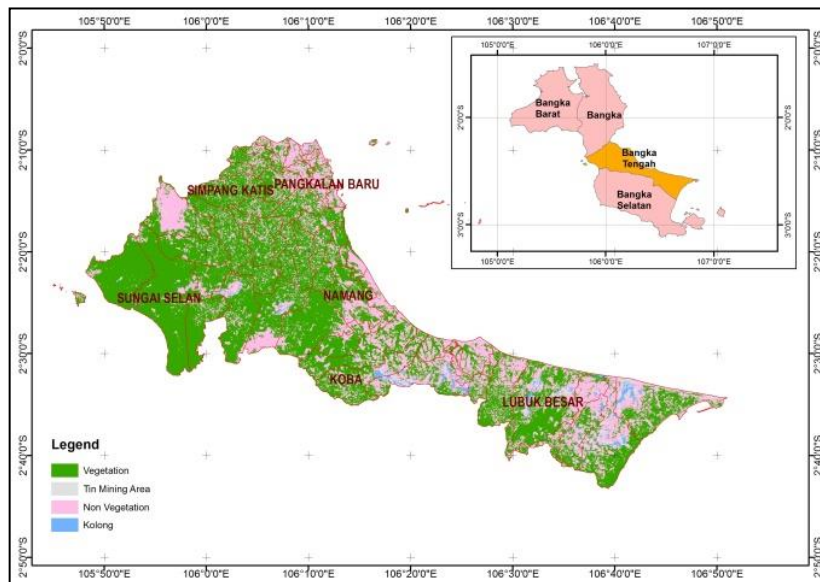


Fig. 3. Land Cover Map on 1997

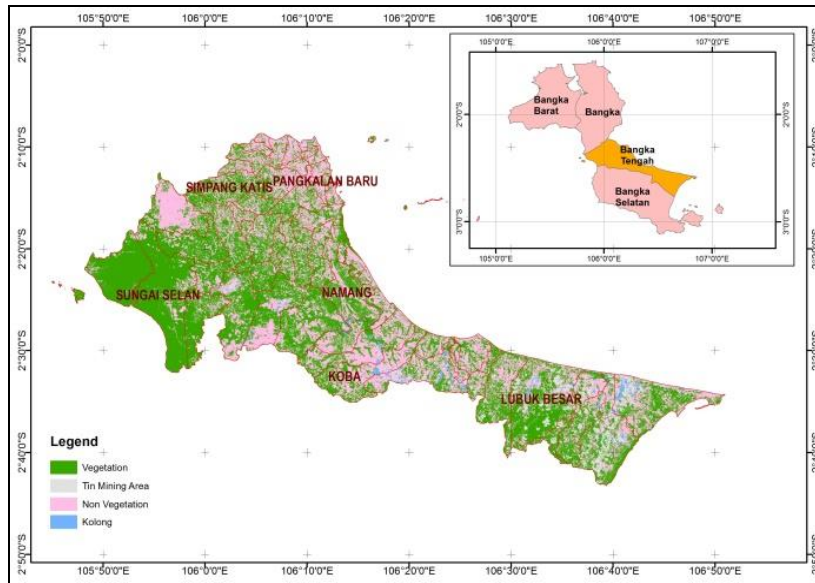


Fig. 4. Land Cover Map on 2000

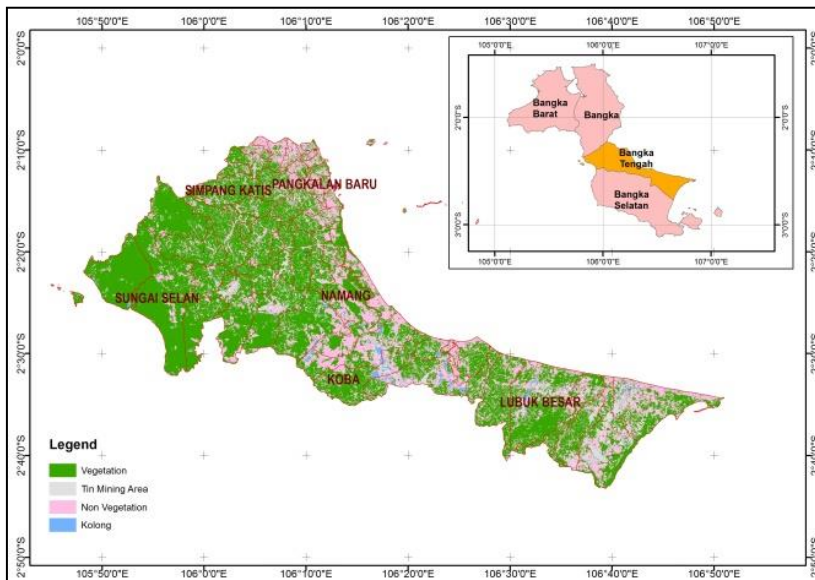


Fig. 5. Land Cover Map 2015

IV. CONCLUSIONS

Examining satellite information utilizing remote sensing and GIS is exceptionally useful for land cover change location between 1997-2015, maximum likelihood classification provided the classification of land cover change. The result shows that increasing of non-vegetation area is caused by mining activity and population growth, which is correlated to the expanse of urban area. However, future study with more satellite images, higher resolution and ground check may improve the accuracy of land cover change maps.

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