Analysis And Identification Of Landuse On The East Coast Of South Sumatera Using GIS

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Analysis And Identification Of Landuse On The East Coast Of South Sumatera Using GIS

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Abstract- **Analysis and identification of land use in coastal areas to study the coastal environment Sembilang National Park in South Sumatra using remote sensing system (Geoinformation System) has been conducted from June until November 2014. The objective to study the changes that occur in the coastal environment as well as to identify and estimate the area use change existing mangrove areas in Region I of the Section of Sembilang National Park Management, South Sumatra. Methods for the analysis and identification based on Landsat image data 8 in 2013 using ENVI 4.3 and Arc GIS 9.3 software as well as the conversion of ground check. The results showed the use of land in the mangrove areas in the region I of the Section of Sembilang National Park Management classified into 5 classes, namely mangrove, water area, mangrove shrubs, mainland mud, and ponds areas. The area of each class were observed in sequence as follows 8921.19 ha (41.69%) is a mangrove area; 3934.3 ha (23.28%) is water areas; 3.608,52ha (17.41%) is an area of mangrove shrubs; 1.649,11ha (9.05%) is mainland mud and settlement area; and 1.561,04ha (8.57%) is the ponds areas. The percentage of the class obtained as a result of the conversion of ground check is based on the land use map data with the total area observed.**

Keywords: analysis and identification of land use, coastal environments, Sembilang National Park

I. INTRODUCTION

Banyuasin coast is part of the Bangka Strait and become strategic in the development of the coastal Baregion of South Sumatra. Sembilang National Park is located in the coastal areas of South Sumatra and is one of the world's wetland sites with the largest mangrove ecosystem in western Indonesia (± 205.750ha) [1]. This area is designated as a national park by the Minister of Forestry of the Republic of Indonesia No. 95 / Kpts-II / 2003 dated March 19, 2003 with an area of ± 202.896,31ha. The administration includes the District Banyuasin II, Banyuasin, South Sumatra Province [2]. Sembilang National Park is divided into three sections management areas, namely Regions 1 SPTN Sungsang, Region 2 SPTN Sembilang and Region 3 SPTN Tanah Pilih. Region 1 SPTN Sembilang National Park covers an area of Solok Buntu and Lalan. The average salinity of the water is 10-20 ‰, pH 6 to 7 and humidity (Rh) ranges from 10-30% [3].

Natural disasters and human activities such as clearing of the pond causing mangrove areas experiencing various pressures and degraded gradually but continuously. The increasing utilization of coastal areas has disrupted the balance of coastal ecosystems, mainly due to sedimentation [5]. Data in 1993 showed Banyuasin has extensive coastal mangrove forests around 856.134ha, but the mangrove forest area decreased to only about 260.001ha in 2003. Image analysis and conversion of ground check on the condition of mangrove forests in the coastal Banyuasin published by [6]

shows approximately 70% of mangrove forest in the coastal region Banyuasin lost due to natural disturbances which about 18% of this land is lost due to forest fires that occurred in 2003. Data Japan International Cooperation Agency or JICA [7] shows that during the period 2001-2009, there was a reduction land in this coastal region to reach 3.552ha. As described by [3] degradation of mangrove forests in the coastal region of Banyuasin especially in areas Sungai Barong Kecil, Sungai Barong Besar, and the Sembilang National Park caused by the conversion of mangrove areas into a pondss area and the local community settlement or immigrants. Land conversion causing ecological functions of the mangrove areas declined.
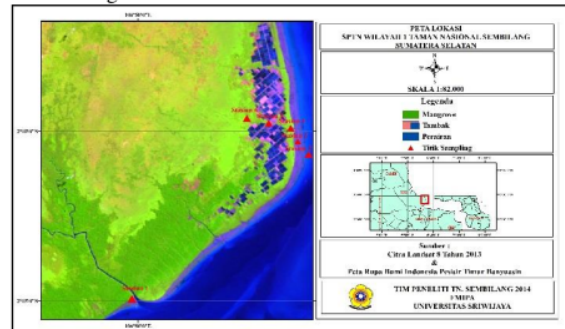

Fig. 1. Banyuasin coast area a South Sumatera and ordinate of research location

Factors tidal and stable high water causes intense coastal erosion and increase the amount of silt carried up to the the ocean [8]. Natural phenomena that occur repeatedly. transverse, and tend seasonal cycle as a beach (beach cycle) has resulted in the decline of or alteration of shoreline coastal areas. Wave motion perpendicular to the shoreline and continued for a relatively long period of time causes the erosion of the beach. The position of the shoreline in coastal Banyuasin observed by Landsat imagery in 2013 more extensive than the previous 5 years. High sedimentation rate and tidal influence in the region suspected to alter the position of the shoreline [9].

II. METODOLOGY

Research was conducted during March until November 2014 at Region 1 of the Sembilang National Park Management Section, South Sumatra with ordinate as in Table 1. Identification process using Landsat 8 in 2013 and ENVI 4.3 and Arc GIS 9.3 Software.
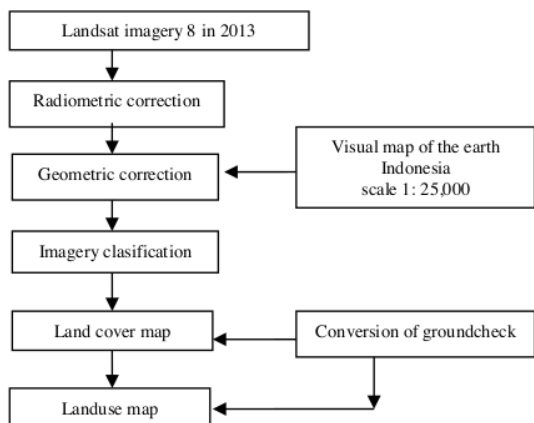
Landsat imagery 8 in 2013

↓

Radiometric correction

↓

Geometric correction ← Visual map of the earth Indonesia scale 1: 25,000

↓

Imagery clasification

↓

Land cover map ← Conversion of groundcheck

↓

Landuse map ←

Fig 2. Flowchart of the process of identification of land use

III. RESULT AND DISCUSSION

Identification of Mangrove Land Use

The results of the classification of Landsat 8 in 2013 with a band combination 654 using RGB (Reed, Green, Blue) format for a supervised classification is known classes of land use in the Region 1 in SPTN has a class suitability of land use after conversion graound check. According to [10] observations in the field is considered complete if every class or color differences in interpretation has been observed, in check, and believed to be true so that no land use classes that do not observed. Identification of land use in the mangrove areas (see Table 1) is determined based on the color display that appears on the temporary land use map and used as a reference for the identification of the type of land use actual. Determination of land use classes in mangrove areas based on visual appearance of color and spectral reflectance characteristics or value of the digital number [11].

Imagery data and groundcheck conversion of mangrove areas in region I SPTN indicates that there are 5 classes of land use : 1) mangrove area, 2) shrubs of mangroves, 3) ponds of pond, 4) land of mud, and 5) waters area. Settlement area is part of the mainland mud. This suggests the residential areas in the mangrove area is only as a small part of mangrove area so it is not represented as a class of its own.

Classification of land use in coastal areas of Banyuasin especially in region I of SPTN in Sembilang National Park is described as follows:
1. Mangrove area. This area is located along the coast, and the growth of mangrove very influenced by the physical environment and tidal conditions.
2. The area of mangrove shrubs. This area is occupied and dominated by shrub vegetation identified as mangrove shrubs
3. Ponds areas. This area is located in the mangrove area and into an open area used for fish or shrimp. Results of monitoring and ground check showed mostly open land has been restored and others still remain as wastelands. Commonly pondss area are found in region of Resort Solok Buntu

4. Mainland mud. This land is formed as a result of coastal erosion, the presence of high sedimentation, the influence of the tides, as well as the destruction of mangrove forests. The formation of sludge land affect the natural revegetation process of mangrove. Which tends to cause the solid ground of this area is preferred by the community to build settlements so that more settlements identified in this region.
5. Waters area. This area is the most extensive area identified in the image and the conversion of ground check showed almost the entire region tidally influenced.

Tabel 1. Ordinate of monitoring and characteristic of research area

Location	Ordinate	Lokation characteristic by	
		Satelite	Ground check
1	02°09'50,1" LS 104°54'17,3" BT	Mangrove	Mangrove
2	02°09'50,1" LS 104°54'16,6" BT	Mangrove	Mangrove
3	02°09'49" LS 104o54'02,2" BT	Mangrove	mangrove
4	02°087',6" LS 104°54'02,2" BT	mangrove	Mangrove
5	02°08,2" LS 104°54'20,6" BT	Mangrove	Mangrove
6	02°08'07,9" LS 104°54'1,3" BT	Mangrove	Mangrove
7	02°09'46,4" LS 104°53'38,8" BT	Pondss	Ponds areas
8	02°10'18,8" LS 104°53'3,4" BT	Ponds areas	Ponds areas
9	02°10'39,5" LS 104°54'35,9" BT	Ponds areas	Ponds areas
10	02°10'9,7" LS 104°53'1,9" BT	Mangrove shrubs	Mangrove shrubs
11	02°09'50,1" LS 104°54'16,6" BT	setlement	setlement
12	02°14,9'13" LS 104°49,9'58" BT	mud	mud
13	02°09'57,7" LS 104°54'41,34" BT	Water areas	Water areas

The green color on the geometric correction map (see Fig. 2) shows the mangrove forest. The mangrove forest is the largest area and dominate the coastal areas of Banyuasin. Identification of green color as the vegetation region amplified by several studies [11] [12] [13] and [14] who states the color green to dark green on the imagery data is prove the existence of the vegetation on convertion ground check.

The results showed an area of green in the image is the reflectance of vegetation. Reflectance is clearly visible in the images in the infrared channel. Areas of light green color in the map view of land use in the mangrove areas indicate the presence of mangrove shrubs. Conversion ground check showed that 42.69% of the region 1 of SPTN is mangrove areas and 17,41% is a mangrove shrubs. Types of mangrove shrubs dominate the region and identified is *Acrostichum speciosum*, *Acrostichum aureum* and *Derris trifoliata*.

Acrostichum sp is a shrubs that grows only in mangrove areas are disturbed. The mangrove shrubs have relatively fast growth and can grow up to 4 m. These bushes can interfere with the growth of mangroves. *Derris trifoliata* mangrove shrub types that grow in mangrove succesion areas, so that this type are found in mangrove area that has been burnt [15].
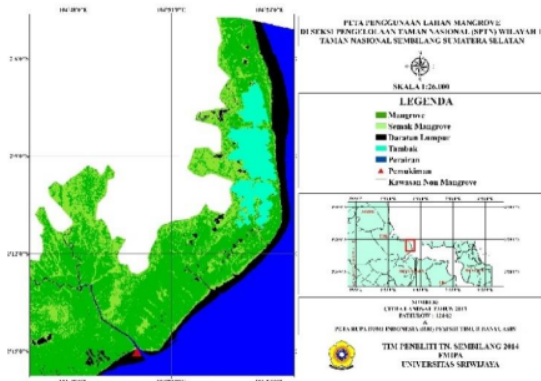
Figure 2. Map of mangrove land use in Region 1 of the National Park Management Section (SPTN) in Sembilang National Park, South Sumatra

Dark blue color on a geometric map is indicated as the area of marine waters, while the light blue area is the area of the pond. The results of image enhancement has shown that the bund and checkered with black to dark blue identified as a water region or pondss and ponds or open land [12] [16] [17].

Black spots on a map depicting land use area of the former farm that has been abandoned and has not been restored. Black areas along the coast of the mainland mud formed by the influence of the tides, sedimentation and erosion in coastal areas. Tidal and abrasion effect on the rate of increase of sludge land along the coast and caused the shifting shoreline. Described by [18] shift of the shoreline is strongly influenced by the rate of coastal erosion and accretion (sedimentation) [18]. Abrasion is the process of erosion of the coastline due to high tides and strong ocean currents, while accretion (sedimentation) is the process to the presence or addition of land area for sediments carried by sea water [19].

Sedimentation and abrasion that occurs in mangrove areas disrupt local ecosystems. Excessive sedimentation cause a rise in the ground and reduce the influence of the tide. In addition, high sedimentation resulted in the closing of the mangrove roots and interfere with the growth of mangroves [20].

Orange triangle symbol shown on maps depicting land use for settlement areas and identified in the waters of the Muara of Bungin river. The settlement occupied fishermen or also just a stopover for fishermen who come from outside the region. The results of the conversion of ground check for classification on land use maps of mangrove areas in Region 1 TNS SPTN shows the area of mangrove class is 7.595,11ha (42.69%), mangrove shrub is 3171.83 ha (17.41%), ponds areas is 1.561,04ha (8:57%), waters area is 4.240,77ha (23.28%), and mainland of mud is 1.649,11ha (9.05%). Percentage of area obtained as a result of the conversion of the total area observed in the study.
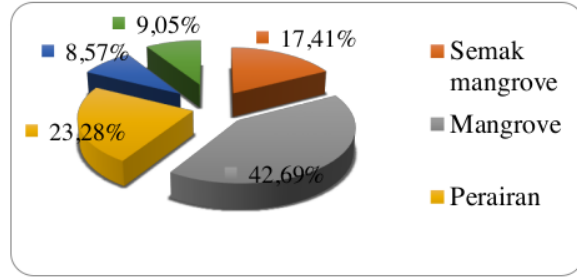
Lost and increase of agricultural land is directly proportional to the decline of fish, shrimp and crab. It is associated with reduced function of the mangrove forest as a refuge and breeding ground for several species of fish, shrimp and crabs [17]. Reduction of mangrove forest land due to anthropogenic activities such as land conversion into settelement area, agricultural areas, industrial causes increased levels of pollution in water [21]. Socio-economic impacts, loss of mangrove forests reduce the income of coastal communities. Information Department of Forestry 2008 [22], cause damage to the economy and well-being of coastal communities is the loss of mangrove forests or coastal ecosystems.

Condition of ground check results in the study area is shown in the following pictures:

Fig. 3.. Condition of Banyuasin coastal areas in South Sumatra (a) Mangrove, (b) mangrove shrub, (c) Pond, (d) Waters area, (e) Mainland of mud and settlement area.

IV. CONCLUSION

The results of the analysis dan identification of landuse in the mangrove areas in the National Park Management Section Region 1 in Sembilang National Park at South Sumatera classify mangrove areas into five classes, namely class mangrove, waters area, mangrove shrubs, mainland of mud, and ponds areas. The area of mangrove class is 7.595,11ha (42.69%), mangrove shrub is 3171.83 ha (17.41%), ponds areas is 1.561,04ha (8:57%), waters area is 4.240,77ha (23.28%), and mainland of mud is 1.649,11ha (9.05%). Percentage of area obtained as a result of the conversion of the total area observed in the study.

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