THE CHANGE OF MANGROVE COVERAGE IN SEGARA ANAKAN LAGOON OF CILACAP – CENTRAL JAVA

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ABSTRACT

Mangrove ecosystem play san important role in coastal area. In several region mangrove coverage had decreased caused by various factors such as landuse change, erosion and sedimentation. Mangrove ecosystem in Segara Anakan Lagoon had decreased and damaged as well. The current work aimed to analyze the change of mangrove coverage in Segara Anakan Lagoon. A remote sensing analysis was conducted to deployeight yearsof satellite imagery data from 2002 to 2009. Analysis method included NDVI algorythm map processing which was associated with vegetation coverage in the area of interest. The results show that mangrove coverage in Segara Anakan Lagoon had decreased from 9,163.19 ha in 2002 to 8,433 ha in 2003, 7,764 ha in 2004, 7,252.72 ha in 2005 and 6,213.80 ha in 2006 respectvely. Further decrease occured in 2007 to 5,767.16 ha, 4,987 ha in 2008 and finally to 4,267.13 ha in 2009. Mangrove coverage is decreased approximately 677 ha each year. This decrease might be caused by several factors such as conversion of mangrove coverage to other utilization such as farming, housing and ponds, and high sedimentation rate from Citanduy river. These results suggest that management of mangrove area is needed to support coastal resources sustainability in Cilacap. Therefore, replantation and conservation of mangrove area could be applied for management purposes.

KEYWORDS: Mangrove, coverage, landsat, degradation, Segara Anakan-Cilacap

INTRODUCTION

Mangrove ecosystem is very important component for coastal ecosystem resources sustainability. According to Adi (2007), ecosystem mangrove damage and sedimentation in Segara Anakan Lagoon had caused to environmental degradation. Mangrove extent in Segara Anakan Lagoon seemed to be depleted, that be caused by high sedimentation rate along the lagoon. The sedimentation converted water environment to wetlands and caused to wetlands drying by limiting water supply to the mangrove environment.

Meanwhile mangrove ecosystem plays a role in the sustainability of most coastal organisms (Gunarto, 2004). Various aquatic organisms such as: fishes, shrimps and some others depend much on mangrove ecosystem conditions and stability. Furthermore, mangrove ecosystem stability itself depends much on coastal sediment dynamics that are mostly dominated by sedimentation processes (Bouillon *et al.*, 2007). Sediment supply to Segara Anakan Lagoonmostly come from Citanduy. This research aimed to analyze the change of mangrove coverage in Segara Anakan Lagoon.

MATERIALS AND METHODS

Analysis of mangrove coverage aimed to detect and calculate mangrove extent change in Segara Anakan Lagoon. The method used to analyze the mangrove coverage was a remote sensing. Data required to map mangrove coverage was Landsat Satellite Imagery. Mangrove coverage mapped in this study was including year by year mangrove coverage change for the last 8 years from satellite imagery taken in 2002 to 2009. Satellite imagery was collected from USGS official website (glovis.usgs.gov) to acquire Landsat satellite imagery for free download. Basic satellite processing was done using ERMapper software including band compilation, geometric correction (registration), radiometric correction and area cropping (Satyanarayana *et al.*, 2011). Digitation was done to create area of interest mangrove and used to crop mangrove coverage for further analysis. To analyze mangrove coverage, NDVI algorythm was used. Formulation of this algorythm is described as:

$$\mathrm{NDVI} = \frac{\mathrm{B4} - \mathrm{B3}}{\mathrm{B4} + \mathrm{B3}}$$

After NDVI analysis had beendone, mangrove coverage resulted from this analysis was then extracted using area of interest of mangrove digitized from previous process (Ismail *et al.*, 2008). Mangrove coverage extent was then calculated by a tool in ArcGIS.

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RESULTS

Analysis of mangrove coverage by satellite image mapping showed the change of mangrove coverage each year as shown in Fig 1.

Analysis on the change of mangrove coverage in Fig 1 showed the change of mangrove extent as well. Statistical information concerning the extent of mangrove of the respective year was then conducted. Change of mangrove extent from the analysis is shown in Fig 2.

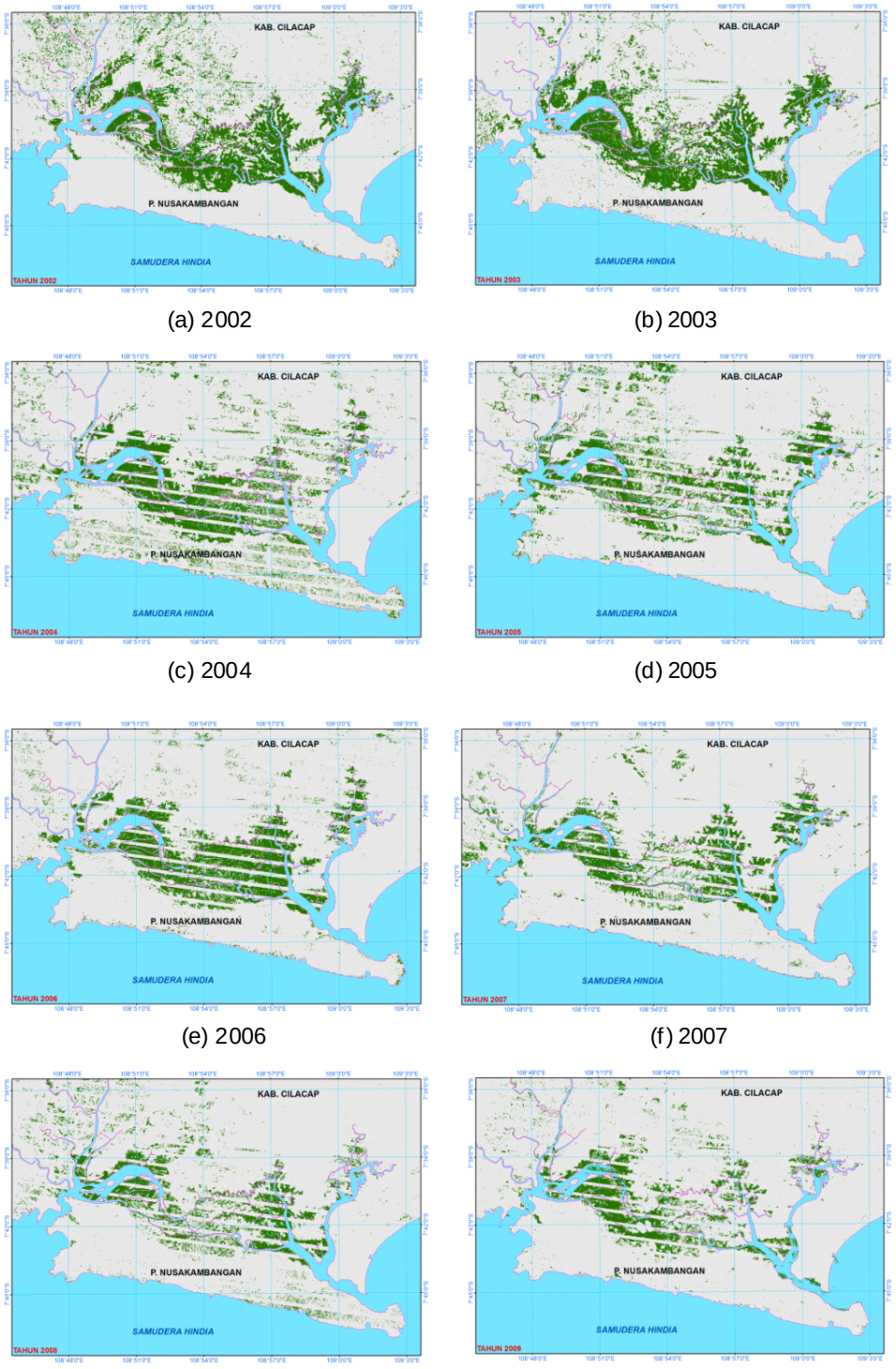

Figure 1. Change of mangrove coverage in Segara Anakan Lagoon area from 2002 to 2009.

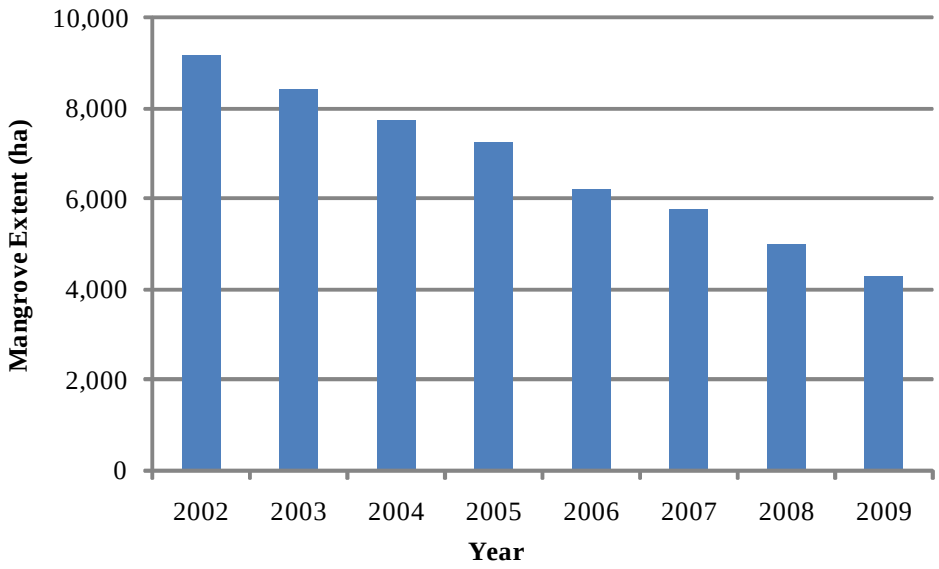

Figure 2. Change of mangrove extent in Segara Anakan Lagoon from 2002 to 2009.

Calculation of mangrove extent resulted in 2002 the mangrove extent in Segara Anakan Lagoon was 9.163,19 ha decreased respectively to 8.433 ha in 2003, 7.764 ha in 2004, 7.252,72 ha in 2005 and 6.213,80 ha in 2006. Further decrease occured in 2007 to 5.767,16 ha, 4.987 ha in 2008 and finally to 4.267,13 ha in 2009. Mangrove coverage in Segara Anakan Lagoon decreased approximately 677 ha each year. The decrease of mangrove coverage in Segara Anakan Lagoon was followed by the decreas of lagoon extent. According to Suryawati *et al*. (2011), the extent of Segara Anakan Lagoon in the year 2001 was 1,178 ha decreased to 800 ha in the year 2007, which means that average decrease rate was 63 ha/yr.

DISCUSSION

This decrease was caused by the high sedimentation rate and caused to the decrease of mangrove extent in Segara Anakan Lagoon (Dudley, 2000). Rohmat (2005) mentioned that sediment supply to Segara Anakan Lagoon was estimated about 6 million cubic meters per year where amillion cubic meter was settled down. The sediment accumulated in Segara Anakan Lagoon was then fill the lagoon area and soon would turn into land.

Conversion of mangrove coverage to another utilization were detected to be the most influencing factors to mangrove coverage losts. Another utilization of mangrove was also mentioned by Cornejo *et al*. (2005) such as woods harvesting for firewood, building material such as walls and fences.

All over the world, mangrove ecosystems are threatened with destruction through various forms of human pressure, in particular, extraction, pollution, and filling (Farnsworth & Ellison, 1997). Moreover, the species of mangroves in many geographical areas is decreasing as a result of mangrove forest destruction and exposure to various anthropogenic impacts (Hamilton & Snedaker, 1984), and the worldwide range of these forests is less than 50% of their original total cover (Saenger *et al*., 1983, Spalding *et al*., 1997). Overexploitation by traditional and commercial users and degradation as a consequence of development for other uses are also major problems of mangrove environments (Osuna, 2000).

Mangroves in Segara Anakan Lagoon are being losts because of vegetation clearing for agriculture, mariculture and urban such as many other country. Luna & Robles (2003) mentioned that several developing countries experienced the same problems such as in Mexico. Verdugo (1989) added that mangrovesare also used as hanging bars for the tobacco leavesin the drying galleries.

Mangrove has important roles in coastal ecosystem such as for coastal protection and to support coastal resources. To maintain this function, mangrove ecosystem should be protected from further degradation. Mangrove ecosystem sustainability depends alot to upland and coastal utilization. Mangrove management applied in some area including: replantation and conservation.

Mangrove decrease much affected fisheries resources. Baran and Hambrey (1999) noted that mangrove coverage related to secondary productivity of fish capture which means that mangrove habitat loss would impact to decrease or loss of fisheries productivity. Manson *et al*. (2005) mentioned that the function of mangrove ecosystem is to supply food, protection and primary productivity. Hence, mangrove ecosystem should be maintained to support fisheries resources sustainability.

CONCLUSION

Mangrove coverage in Segara Anakan Lagoon had decreased from 9.163,19 ha to 4.267,13 ha in 2009 with decrease rate of 677 ha each year. Mangrove coverage was decreased siginificantly, due to the high sediment comingfrom Citanduy river. Mangrove degradation also caused to decrease the potention offisheries resources in Cilacap coastal and marine area.

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