

RINGKASAN EKSEKUTIF



IMPACT ANALYSIS OF LAND-USE CHANGES ON WATERSHED UPSTREAM AREA TO THE COASTAL AREA IN KARAWANG REGENCY USING GIS

Introduction

The growth of human needs provokes people to perform development in all fields, including the construction on critical areas such as watershed area. The development on watershed area will affect the coastal areas which are located far away. Conflicts arise in Karawang Regency regarding utilization of the areas such as mangrove area, agricultural area, fishponds, settlement areas, and tourism areas as well as international port development and railway construction planning. A lot of information is needed in Integrated Coastal Area and River Basin Management (ICARM) planning process to achieve a sustainable development.

Sustainable development can only be achieved if comprehensive management over development is well performed. A comprehensive management of both river basin and coastal area is described in the ICARM guidelines. The guidelines give the planning process to facilitate multi-sectorals approach in minimizing negative effects of development especially on river basin and coastal area. This thesis research gives the earliest stage of planning process on the integrated coastal area and river basin management as it provides information on existing condition of Karawang Regency especially erosion-sedimentation issues and identifies some conflicts that might be arisen from the former and later development to design the basic management of goals and objectives in long-term perspective to achieve sustainable development before the strategies are formulated and implemented in the planning process.

Keyword: watershed, river basin, erosion-sedimentation, spatial plan, Integrated Coastal Area and River Basin Management

METHODOLOGY

Primary data is obtained by field observation to see real phenomenon occurs. Secondary data is obtained by online literature and institutional survey. Geographic Information System is used as a tool to process landsat satellites used in analysis in 1994, 2000, 2005 and 2010. Those Landsat data then processed using ENVI 4.8 and ArcGIS 9.3.

Data Analysis Methods

There are three main methods to reach the objective of the study. Firstly, a land-cover changes analysis that is developed to see the development of built areas, non-built areas and water bodies in Karawang Regency. Secondly, coast line changes analysis which is done to estimate erosion sedimentation process on the area over several years. Lastly, a land-use planning analysis by overlaying spatial plan map and erosion sedimentation map is conducted to analyze the condition of observation area and its land use in the future.

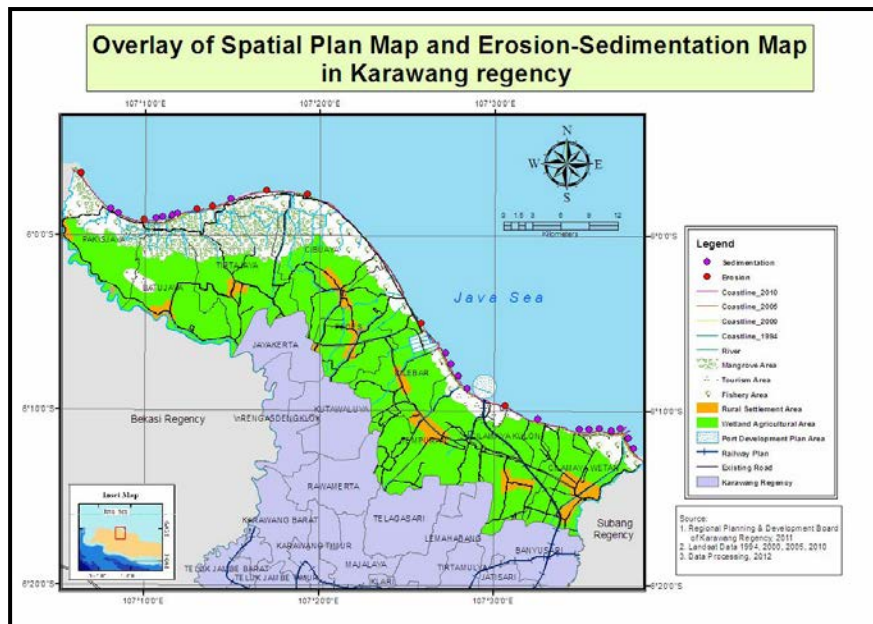
Result

Existing condition of Karawang Regency shows that mostly of area are covered by agricultural area. The growth of population is in line with the area development such as settlements and industry area. The number of built-areas and water bodies in Karawang Regency increase from 1994 to 2010. On the contrary, non-built areas decrease during the period. Built-up area increases from 72.298 sq. km in 1994 to 270.371 sq. km in 2010. The decrease of non-built area is about 249.805 sq. km, whereas water bodies have been swollen from 9.506 sq. km to 76.007 sq. km. This is ironic, as the conversion of non-built areas into built-up areas occurs in industry area which is near the watershed area. Population expansion caused by both natural growth and immigration was a result of development on settlements, workplace and public space. Land-use changes along river basin area may cause problem to coastal area which is located far from the sources. River basin management is needed to minimize negative impact of physical development to environmental degradation.

Study on the development of coastal area shows that most parts of coastal areas in Karawang Regency encounter sedimentation process. Some parts have to deal with erosion and the other parts have no significant effect to the coastline. Cilamaya Wetan District is the most critical areas of sedimentation process (sediment rate is 0.126 km²/year). This might be a result of river runoff from Cilamaya River which is a big river separating Karawang Regency and Subang Regency. Definite cause of sedimentation on the area needs a further research to find the best solution to protect the area. On the other hand, the most critical areas of erosion process occurs in Cibuaya District (erosion rate about 0.044 km²/year) followed by Pakisjaya District (erosion rate nearly 0.017 km²/year). Priority actions in protecting coastal area from environmental degradation are needed.

Agricultural wetland, mangrove forests, fishponds, settlements and tourism are five major activities planned by local government for future development in coastal-districts. Integrated coastal zone management will be essential to be applied if many activities occur in one area since many conflicts may arise. Good management on coastal area will preserve ecosystem, create high resilience from destructive factors and achieve the goal of sustainable development.

Other conflict that emerges in infrastructure development is the harbor development in Tempuran-Cilamaya Kulon District. The development of harbor may affect the coastal process such as changes on current and wave conditions that lead to the changes of sediment behavior. In long-term effect, it may change the coastline and water quality on the area. Another construction plans to be developed in the future is railway from coastal Tempuran District into the city across Cilamaya Kulon District and Cilamaya Wetan District. Both physical constructions may cause effect to the environment. Environmental impact assessment is needed to measure the loss and profit of the development, using the information gained from the assessment then local government may decide the best action to perform the development



Overlay of Spatial Plan Map and Erosion-Sedimentation Map in Karawang Regency's Coastal-districts

Sub-district	Year (km2)				Changes of Area (km2)	Rate (km2/year)
	1994	2000	2005	2010		
Pakisjaya	69.350	69.138	69.010	69.072	-0.278	-0.017
Batujaya	75.695	75.622	75.629	76.121	0.426	0.027
Tirtajaya	106.945	106.896	106.705	107.229	0.283	0.018
Cibuaya	114.776	113.988	113.921	114.068	-0.708	-0.044
Pedes	70.534	70.411	70.598	70.605	0.071	0.004
Cilebar	72.166	71.853	72.163	72.470	0.304	0.019
Tempuran	95.277	95.095	95.504	96.079	0.801	0.050
Cilamaya Kulon	68.145	68.033	68.075	68.284	0.139	0.009
Cilamaya Wetan	75.908	75.984	76.853	77.928	2.020	0.126

Source: data processing, 2012

Recommendation

Maintaining the mangrove and performing beach nourishment are two possible activities that can be taken into consideration by local government to protect coastal area. Those methods can be applied to Cilamaya Wetan District, Cibuaya District and Pakisjaya District which have highest erosion-sedimentation rates. Besides, zoning area based on land suitability analysis on coastal area should be done to support integrated coastal zone management.

In doing the rehabilitation actions, local government may involve individuals, communities (Non-Governmental Organization), cooperate with upper level of government and do the projects with other countries. Policies establishment and law enforcement regarding pollution, land-use changes around critical areas and other activities that result to the environmental degradation are also needed. These are to control the development, minimize the side effect of development itself and achieve the sustainable development.

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