



ABSTRACT

The existence of upper watershed of Tondano in North Sulawesi Province is very crucial in which within this watershed there is a Lake Tondano where has very important role in providing clean water for Manado City, irrigation for agriculture, hydropower plant, fisheries as well as for tourism purposes. It has been issued that high erosion in the Lake Tondano catchment area (upper watershed of Tondano River) is the cause of many problems regarding with the reducing the capacity of the Lake Tondano. Since year 1999 the Tondano Watershed has been designated as high priority watersheds to be addressed. There had been many studies to address the issue including study of soil erosion in upper watershed by applying USLE formula to calculate soil lost. In this research, it will try to accommodate Hazarika and Honda method to map soil erosion rate by using Normalized Difference Vegetation Index (NDVI) calculation and Slope parameter. The objective of this research is to predict soil surface erosion in Lake Tondano Catchment Area by using remotely sensed data especially Landsat imagery and slope factor for monitoring and recognizing spatial distribution of soil surface erosion in the research area during the last 15 years. Also to give recommendation what kind of appropriate soil conservation management in the research area.

The applied methodology encompasses five major phases namely research preparation; image processing and calculation of erosion by using ENVI and ER Mapper software, field observation and secondary data acquisition; GIS analysis by using ILWIS software and mapping by using ArcGIS software and the last is writing thesis. The research preparation includes collecting literatures such as textbooks, journals, reports, and determining research boundary. Image processing consists of preparing data set of Landsat image; image correction and image classification, calculation of NDVI; Digital Elevation Model (DEM) analysis to result slope in degree and after all to calculate annual soil erosion rate. The third phase was field observation to verify the tentative land cover map, as well as to recognize erosion appearance in the field relating to landform and land use. Observation includes the type of erosion, type vegetation, land-cover, slope, management practice as well as interview with farmers who are responsible in managing the land. The fourth was to conduct GIS analysis to get information about distribution of annual erosion rate in each landcover type and landform units. The last is writing thesis consists of complete research process to make conclusion and recommendations.

The outcome of this research, among others, is that land cover from 1991 to 2007 was changed, especially the existence of forest tended to decrease from 3.89% in year 1991 to 2.2 % in year 2007, while dry land farming had tendency to increase from 16.35 % (1991) to become 26.02 % (2007). This causes to the increase of quantity in annual soil erosion rate. In general, the study area has been dominated by very low level of annual erosion rate to low level. In the steep slope area both in the hill and in mountain the erosion from moderate level to very high level become available and tend to increase significantly from 1991 to 2002 and after that decline gradually from 2002 to 2007. The biggest area, where moderate level to very high level of erosion happen taking place in dry land farming and in clove plantation. The biggest percentage area where moderate level to very high level of erosion happen taking place in the landform of upper slope of mountain (D1), The second largest of landform with moderate to very high rate of erosion is in the upper slope of Mount Manimporok (V41). The third rank of medium-eroded landforms occurs in the landform of Lower Slope of Mount Tampusu. All moderate to very high level of erosion were happen in steep to very steep slope where dry land farming and in poorly treated of clove plantation exist. In accordance with management and conservation practice, most the study area has no conservation practice if any only in traditional way. Thus, in the landform with steep slope occupied by dry land farming and clove must be conserved immediately with contour terraces to prevent the further worsen in the future.

Key word: Remote Sensing, GIS, NDVI, Landuse Change, Landforms and Annual Soil Erosion Rate.