ANALYSIS OF RIVER FLOW PATTERN AND PUDDLE AREA CHANGES ALONG THE COASTAL AREA OF SURABAYA SIDOARJO USING REMOTE SENSING SATELLITE IMAGE

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ABSTRACT

Based on the geographical location, the coastal region of Surabaya-Sidoarjo is one of the low areas prone to inundation with a height that is almost parallel to the surface of the mean sea level. In addition to aspects of altitude regions, land cover changes in a catchment area will also greatly affect the hydrological aspects. Factors causing inundation and flooding are rainfall intensity is greater than the calculation in planning drainage and rainfall intensity in accordance with the planning but rainwater runoff is not able to be accommodated by the existing drainage system. In addition to events Lapindo mud that can damage the drainage system, also made possible the construction of bridges Suramadu can disrupt the flow pattern of the river along the coast of Surabaya-Sidoarjo. Analysis of spatial remote sensing satellite imagery and dynamic system models can be used to obtain predictions of inundation-prone areas.

The results of this study indicate that the northern coastal area of Surabaya to Sidoarjo is dominated by parallel flow pattern, while the coastal area of Sidoarjo more dominated by dendritic stream pattern. The pattern of stream flow from 2009 to 2013 are relatively fixed. Based on the risks assessment Sidoarjo Surabaya coastal area is dominated by very prone to inundation class. This happens because of the spread of high-intensity rainfall in the area. The high-intensity rainfall in the area are 1452 mm and more than 1740 mm. Thus indicating that in addition to land cover, rainfall is also quite affecting vulnerability inundation area.

In 2009 and 2013, there's a change in discharge water runoff that exceeds the existing discharge. Jomblong Sub watershed have an increased amount of runoff discharge 3.79 m³/second, so it can be estimated at about 230.80 hectares of land will be flooded in the vulnerable areas. It is directly proportional to the increase in area that very prone to inundation by processing satellite images of Landsat-7 ETM + in 2009 and Landsat 8 in 2013, amounting to 245.40 ha. Jomblong Sub watershed has a high runoff coefficient is 0.592, It’s because the addition of an extensive number of settlements in the study area during 2009-2013 amounted to 1755.92 hectares. If this condition remains the same, it can be predicted that widespread inundation area will be growing in the future.
As for the Greges sub watershed, has reduced value of the water run off discharge about 8.36 m$^3$/second or an area of 1506.7 hectares of inundation-prone areas is reduced in the 2009-2013 timeframe. Despite the decrease in flood areas, Greges Sub watershed remains the inundation-prone areas because it has a value of the discharge runoff that exceeds the existing with the runoff of coefficient about 0.579.

Based on the modeling of dynamic systems, Greges and Jomblong Sub-watershed has a puddle of high value in the wet months to 2 years forward. This is due to the high rainfall, low evaporation values, changes in land cover and low capacity of the channel/drainage system to accommodate storm water runoff. Based on a scenario made to reduce the value of inundation, each two sub watersheds need for capacity planning or adding a new dimension to the channel as well as the retention area to increase the ability to accommodate water runoff.

*Keyword*: Puddle area, river flow patterns, sub-watershed, the model dynamic systems, satellite remote sensing imagery