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Forecast Study of Surface Flow and Area of Water Catchment Area in Six Districts in Samarinda City Using Shuttle Radar Topography Mission (SRTM) Satellite Image

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Abtract:- Floods are disasters that often occur in several parts of Indonesia. Almost every area that has a low altitude must have experienced flooding, one of which is Samarinda City. Flooding in Samarinda City is common and frequent. The use of SRTM images as material for analyzing natural resources and natural disasters, where data collection does not require direct contact with the objects studied is very effective and efficient in terms of time, cost and human labor.

The purpose of this study was to create a surface flow map in Samarinda City with Shuttle Radar Topography Mission (SRTM) satellite image. Knowing terrain of catchment area in Samarinda City.

The research method used is analysis of Surface Flow Forecast using Shuttle Radar Topography Mission (SRTM) Satellite image and carrying out the process of making surface flow forecasts for Samarinda City using Arc GIS 10.3 software. Data processing is carried out using Arc ToolBox as a tool in Arc GIS 10.3 software by creating water flow and catchment area with downloaded SRTM satellite image.

The results of study can provide information about the waterway and the area of the accompanying catchment area in Samarinda City as a consideration of Samarinda City government's policy in flood management. The results showed that most of Samarinda area is in the Karang Mumus sub-watershed so that catchment area shown through data processing on application used gives very broad results, which is as wide as 46,699.44 Ha. Areas outside of Karang Mumus sub-watershed area gave the result that, the area of water catchment in Samarinda Utara district is 6,258.73 Ha, Samarinda Ulu 24.55 Ha, Sambutan 4,046.87 Ha, Sungai Kunjang 438.76 Ha, Loa Janan Hilir 61.35 Ha, Palaran 10,536.40 Ha.

Six sub-districts, namely Sungai Pinang, Samarinda Seberang, Samarinda Kota and Samarinda Ilir are sub-districts located entirely in the Karang Mumus sub-watershed area.

Keywords:- *Shuttle Radar Topography Mission (SRTM), water flow estimation, remote sensing.*

I. INTRODUCTION

Shuttle Radar Topography Mission (SRTM) satellite image, is a type of satellite image that has a use in elevation model analysis. SRTM uses SAR (Synhentic Apeture Radar) technology. SRTM has same data structure as grid format, which consists of cells that each cell has a height value. The elevation values in SRTM and DEM30 are altitude values from WGS84 datum and 30m DEM image analysis used to determine accumulation of surface flow patterns, both river flow patterns, straightness flow patterns and rock formations. The Shuttle Radar Topography Mission (SRTM) obtained most complete near-global elevation data to produce a high-resolution database ofearth's digital topography. SRTM consisted of a specially modified radar system that flew on the Space Shuttle Endevour for 11 days in February in 2000 (Anwari & Makruf, 2019).

Over time, development of remote sensing has enormous benefits for development of natural resources and human resources, especially in fields of mapping, planning, analyzing natural resources on surface and inside earth, and analyzing potential natural disasters. Related to use of satellite image in analysis of natural disasters such as floods (Wahid, 2016).

According to Sutanto (1986), a flood is a stream of river water that flows beyond capacity of a river, and thus, flow of river water will pass through river cliffs and inundate surrounding area. Almost every area that has a low altitude must have experienced flooding, one of which is Samarinda City. Flooding in Samarinda City is a common thing, what needs to be thought about is how to overcome these frequent problems.

The objectives of this research activity are to:

- Make a forecast map of water flow in Samarinda City
- Knowing terrain of catchment area in Samarinda City, East Kalimantan Province.

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II. METHOD

The method used in this study was data collection by preparing all data to be processed from Shuttle Radar Topography Mission (SRTM) images, such as determining the recording year and administrative boundaries of the research area. Samarinda City area data from available SRTM satellite image is 2000 recording data.

Data processing is carried out through several stages, including: Making Water Flow Forecasts by knowing marbles in city of Samarinda, from these marbles then known the pattern of water flow, river order, drainage basin lines which are then made into polygon shapes.

The creation of a Catchment Area is carried out by calculating area that has been known to be forecasted for water flow. Furthermore, layout of the regional map is carried out.

III. RESULTS AND DISCUSSION

A. Prakiraan Daerah Potensi Mengalami Aliran Permukaan:

Process of analyzing surface flow forecasts that produce area of each sub-district is presented in Table 1 below.

No.	District	Number of Surface Watersheds	Wide Range (Ha)
1.	Samarinda Utara	46	7,76 – 1.387,8
2.	Samarinda Ulu	1	24,55
3.	Sambutan	18	1,30 – 1.751,46
4.	Sungai Kunjang	9	0 – 139,94
5.	Loa Janan Hilir	6	0,09 – 22,67
6.	Palaran	44	10,02 – 5.084,02

Table 1: Number and Area of Surface Watersheds

Based on data on surface water flow, of 6 (six) sub-districts observed, there are areas that have a lot of surface water flow, namely Samarinda Utara District which has 46 watersheds and those with little water flow, namely Samarinda Ulu District area which amounts to 1 watershed. A total of 4 (four) sub-districts, namely Sambutan District, Sungai Kunjang, Loa Janan Hilir and Palaran are included in scope of a larger stream, namely Karang Mumus sub-watershed.

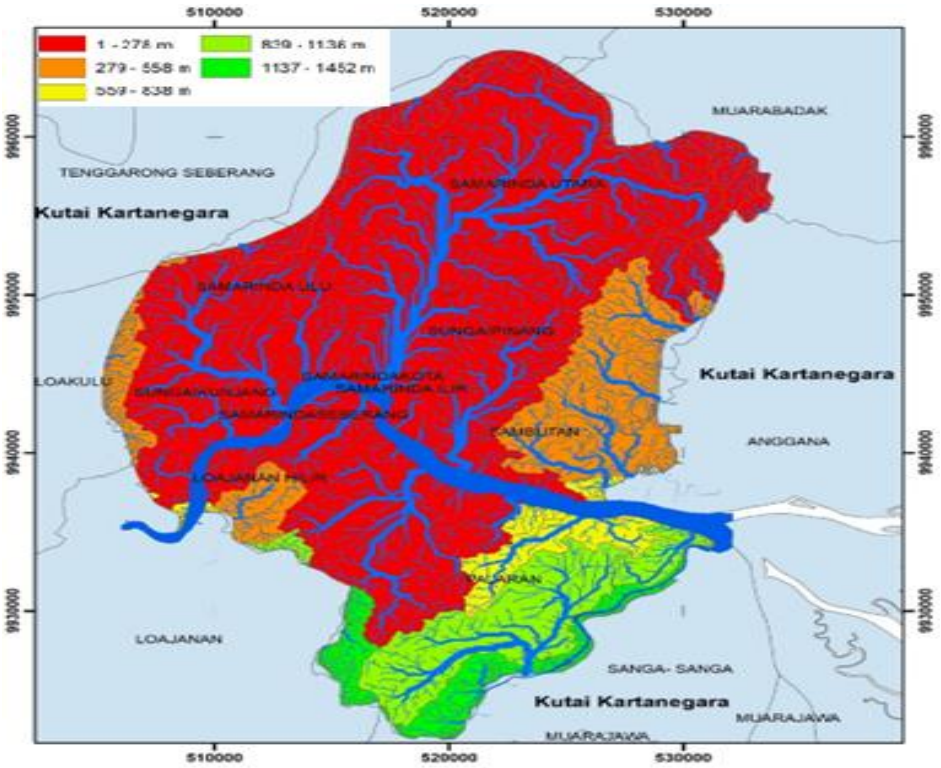

Fig. 1: Samarinda City Surface Flow By Watershed

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B. Catchment Area:

The area of watersheds that have been studied based on SRTM satellite image in six sub-districts in Samarinda city is summarized below.

No	District	Area of subdistrict (ha)	Terrain of catchment area (ha)
1	Samarinda Utara	22.952	6.258,73
2	Samarinda Ulu	2.212	24,55
3	Sambutan	10.095	4.046,87
4	Sungai Kunjang	4.304	483,76
5	Loa Janan Hilir	2.613	61,35
6	Palaran	22.129	10.536,40

Table 2: Total Area of Catchment Area

Based on area of catchment area in each sub-district observed subsequently compared with data on flood events in Samarinda city in three different years.

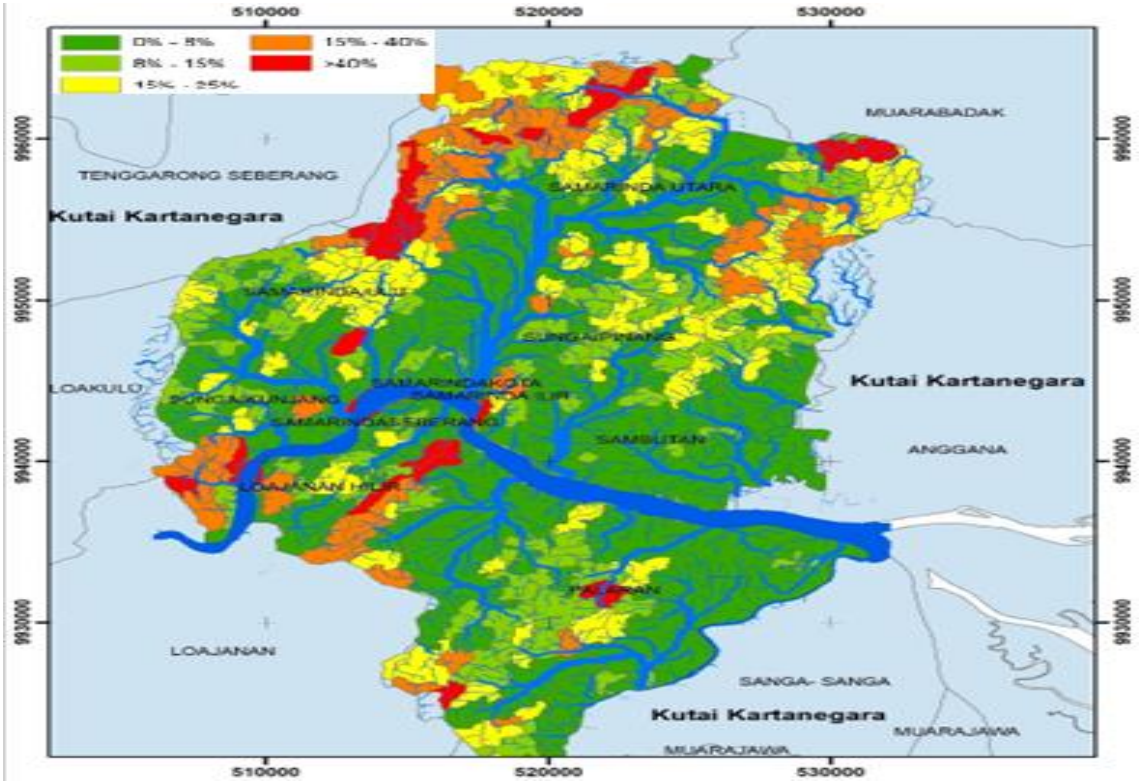

Fig. 2: Samarinda City Surface Flow By Slope

No	District	Slope (%)	Data kejadian banjir		
			2011	2014	2018
1.	Palaran	15-25 (rather steep)	0	0	0
2.	Samarinda Ilir	0-8 (sloping)	5	5	2
3.	Samarinda Kota	0-8 (sloping)	0	0	0
4.	Sambutan	0-8 (sloping)	0	0	2
5.	Samarinda Seberang	0-8 (sloping)	2	2	1
6.	Loa janan Hilir	15-25 (rather steep)	1	1	0
7.	Sungai Kunjang	15-25 (rather steep)	0	0	0
8.	Samarinda Ulu	15-25 (rather steep)	7	7	1
9.	Samarinda Utara	0-8 (sloping)	5	5	7
10.	Sungai Pinang	0-8 (sloping)	4	4	5

Table 3: Kejadian Banjir Setiap Kecamatan di Kota Samarinda

Information about flooding in each of these sub-districts is an area that is always flooded and equipped with its notability. Flood events from six sub-districts observed, in three sub-districts experienced an increase in number of floods, namely Samarinda Ulu, Sambutan and Samarinda Utara while terrain of catchment area was two sub-districts including area, except Samarinda Ulu. This is likely because catchment area has changed its function to housing or other designations.

IV. CONCLUSION

Terrain of catchment areas in six sub-districts in Samarinda City is as follows, Samarinda Utara district 6.258,73 Ha, Samarinda Ulu 24,55 Ha, Sambutan 4.046,87 Ha, Kunjang River 483,76 Ha, Loa Janan Hilir 61,35 Ha, Palaran 10.536,40 Ha.

One of the reasons for flooding in several areas in Samarinda City is change in function of catchment area to another designation. Water Flow Forecast Maps in six sub-districts in Samarinda City can be generated from Shuttle Radar Topography Mission (SRTM) satellite image using softwareArc GIS.

REFERENCES

[1.] Aini, A. 2007. Geographic Information Systems Definition and Application. Accessed from Http://Stmik. Amikom. Air conditioning. id/[accessed 24 March 2013].

[2.] Anwari, A., & Makruf, M. 2019. Mapping of Flood Hazard Prone Areas in Pamekasan Regency Based on Geographic Information System (GIS). Network Engineering Research Operation, 4(2), 117–123. https://doi.org/10.21107/nero.v4i2.127

[3.] Asen, Christian Nuel. 2016. Mapping the Distribution of Samarinda City Fire Stations. Samarinda State Agricultural Polytechnic, Samarinda.

[4.] Indarto. 2013a. Geographic Information Systems. First edition. Graha science, Yogyakarta.

[5.] Oriza Steva Andra, 2014a., "SRTM Satellite image". Geography Information Systems Practicum. https://www.slideshare.net/886428468/citra-srtm. (Downloaded June 29, 2017) Vol 14, No 3 – 8.

[6.] Robert j. Kodoatie and Roestam Syarif., 2010b. Water Spatial Planning. 1st edition. CV ANDI OFFSET , Jl. Beo 38-40, Yogyakarta 55281.

[7.] Sutanto, P. D. (1986). "Remote Sensing Volume 1.2". Gadjahmada University Press. 8(2).