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ANALYSIS OF FLOOD SUSCEPTIBILITY IN ADIMULYO DISTRICT, KEBUMEN REGENCY YEAR 2021

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ABSTRACT: Flood is a disaster is a large amount of puddle of water, occurs due to natural factors and human factors. Adimulyo district is one of the districts in Kebumen Regency which exposed to floods several times every year. This study aims is to analyse flood vulnerability in Adimulyo District, Kebumen Regency. This research is a quantitative descriptive research, data collection techniques in the form of field observations and secondary data analysis. Flood susceptibility analysis was carried out by overlaying maps of rainfall, soil type, elevation, slope, and distance from the area to the river. The unit of analysis uses land units. To determine the level of flood susceptibility in Adimulyo Regency, the scoring method is used. The results showed that the level of flood susceptibility in Adimulyo District was divided into 3 classes, namely 7 land units of moderate vulnerability, 54 land units of high vulnerability, and very vulnerable 13 land units.

Keywords: Flood, Vulnerability, Overlay

1. INTRODUCTION

Floods is the most frequent hydrometeorological disasters in the world and have caused great environmental and socio-economic losses in affected floodplains [1]. Flooding is water that overflows from a channel and inundates the surrounding land, can cause damage to agricultural land, residential land, urban land and can even cause fatalities [2,3]. Every year, floods disaster cause social losses and disruptions worldwide, with significant consequences including: loss of human and animal life, b) destruction of infrastructure, communication networks, and buildings, c) loss of crops and land, d) transportation sediments, loads and pollutants [4].

There is a trend of increasing flood risk in many countries, especially in Southeast Asia and Africa. There are several types of floods, including river overflow floods, flash floods, tidal floods on the coastal area, urban flooding and sewer overflow floods [5]. Managing floods for the welfare and safety of the community is the duty and responsibility of the Government in flood-prone areas. The approach that can be taken is to reduce susceptibilityand increase community capacity in dealing with flood disasters. One important step is mapping disaster-prone areas Takemoto [6] to find out which areas require greater attention and to identify vulnerable elements to help save lives and properties [7]

Flood disaster management requires an effective integrated flood management strategy involving all stakeholders and various related sectors [8]. In order for flood management to be more effective, local governments must identify flood-prone areas and prevent urbanization along riverbanks to prevent and mitigate flood impacts [9]. To carry out such measures, vulnerable areas must be detected first, through appropriate scientific methods. In addition, the lack of inventory maps, lack of proper flood analysis, and difficulty of interpretation are the main limitations in the planning [10].

The flood susceptibility map is a comprehensive resource for forecasting and preventing floods worldwide, particularly where floods occur on a regular basis [11]. This study aims to analyze the level of flood vulnerability in Adimulyo District, Kebumen Regency, Central Java Province.

2. RESEARCH METHODS

The research was conducted in Adimulyo District, Kebumen Regency, Central Java with an area of 43.43 km2. The reason for choosing the location is because this area often experiences floods every year, especially during the rainy season.

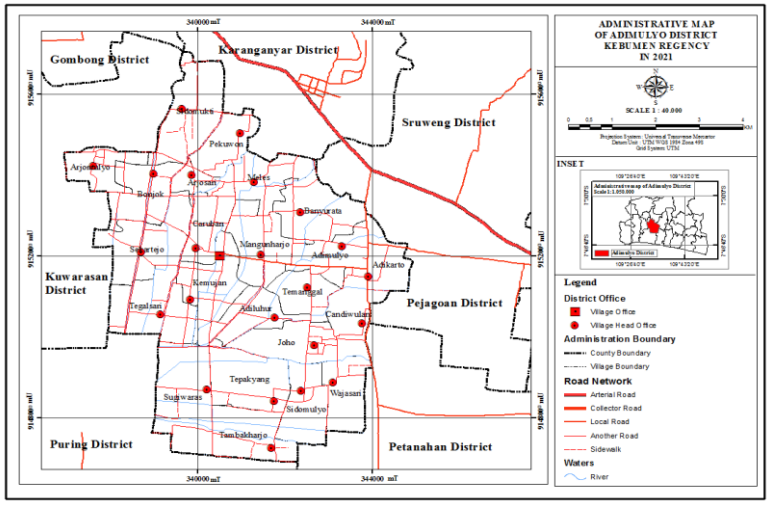

Fig 1. Map of Adimulyo District (Research sites)

Secondary data was obtained from various agencies in the form of data on soil types, slopes, altitude, rainfall, land use, and the distance of the area to the river. Primary data obtained by field observations, used to check the validity of secondary data and check the land use of the research area.

The population for determining the level of flood susceptibilityis all land units. The research sample used a saturated sample, which means that all land units were taken as research samples. Land units are obtained through overlays from soil type maps, slope maps, area elevation maps, area distance maps to rivers, land use maps, and geological maps.

Determination of the level of flood susceptibility is carried out by overlapping the parameters used [12]. The scoring method is used to obtain results or scores as a determinant of the level of flood vulnerability. The higher the score obtained, the higher the level of flood susceptibilityinthe study area. The results of this study are in the form of a Flood Susceptibility Map in Adimulyo District in 2021. The flood susceptibility level parameter uses the following parameters [13]:

Table 1. Rainfall Parameters

No.	Rainfall	Criteria	Score
1.	< 1000	Very low	1
2.	1000-1500	Low	2
3.	1501-2000	Medium	3

Source: [13]

Table 2. Slope Parameters

No.	Slope	Criteria	Score
1.	0 – 8	flat	5
2.	8 – 15	sloping	4
3.	15 – 25	slightly steep	3
4.	25 – 45	steep	2
5.	>45	very steep	1

Source: [13]

Table 3. Parameters of Soil Type

No.	Types of Soil	Criteria	Score
1.	Regosol	Coarse	1
2.	Andosol	Slightly rough	2
3.	Aluvial, Mediteran	Medium	3
4.	Glei	Slightly fine	4
5.	Grumusol	Smooth	5

Source: [14]

Table 4. Land Use Parameters

No.	Land Use	Criteria	Score
1.	Plantation	Very Good	1
2.	Scrub	Good	2
3.	Moor	Medium	3
4.	Settlement	Poor	4
5.	Rice Field	Not Good	5

Source: [13]

Table 5. Distance from the river Parameters

No.	Distance from the river	Criteria	Score
1.	0 – 25 m	Very High	5
2.	>25 – 50 m	Height	4
3.	>50 – 75 m	Medium	3
4.	>75 – 100 m	Low	2
5.	>100 m	Very Low	1

Source: [13]

Table 6. Altitude Parameters

No.	Altitude	Criteria	Score
1.	9 – 10,6	Very High	5
2.	10,7 – 12,2	Heigh	4
3.	12,3 – 13,4	Medium	3
4.	13,5 – 15	Low	2
5.	15,1 – 17	Very Low	1

Source: [15]

Based on the total score of all flood susceptibility parameters, then carried out the classification to determine the level of vulnerability. Classification of flood susceptibility levels can be seen in the following table:

Table 7. Classification of Flood SusceptibilityLevels

No.	Class	Score	Classification
1.	I	6 – 11	Not vulnerable
2.	II	12 – 16	Low vulnerability
3.	III	17 – 21	Moderate vulnerability
4.	IV	22 – 26	High Vulnerability
5.	V	27 – 30	Very vulnerable

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3. RESULTS AND DISCUSSION

Flood susceptibility is a condition in which the area is easily affected by floods based on the causative factors such as rainfall, soil type, altitude, and slope and other factors [15]. The level of flood susceptibility is determined through an overlay of six parameters in the form of rainfall, slope, altitude, soil type, land use, and distance from the area to the river. Determination of the level of flood susceptibility is carried out on all land units in Adimulyo District as many as 74 land units The land unit map of Adimulyo District is presented in Figure 2:

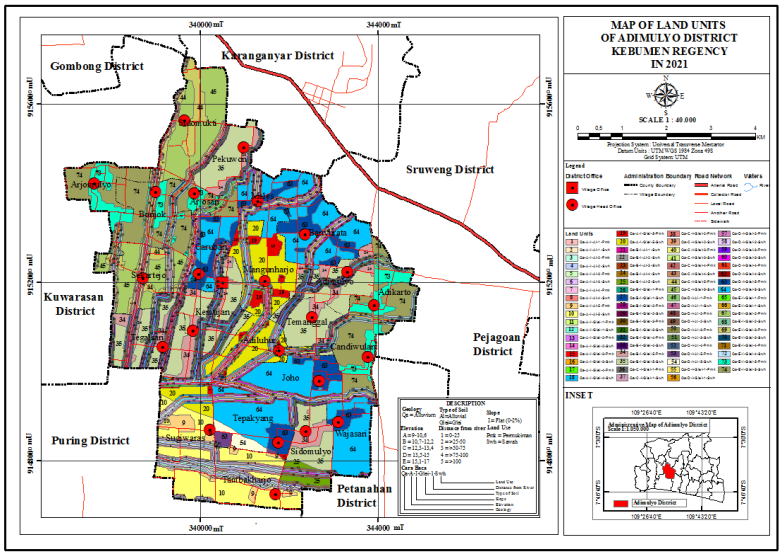

Fig 2. Map of Adimulyo Subdistrict Land Unit

The description of each parameter of flood susceptibilityin Adimulyo District are:

3.1. Rainfall

Rainfall is one of the triggering factors for flooding in Adimulyo District. Rainfall data was obtained from the Central Bureau of Statistics of Kebumen Regency for 10 years. The average amount of rainfall in Adimulyo District is 2882.4 mm/year for all land units. Based on the scoring results, the amount of rainfall in all land units is included in the very high category and is in class V with a score of 5.

3.2. Slope

The slope of the slope affects the direction, rate, and runoff of water, so the flatter an area, the greater the potential for inundation. The entire area of Adimulyo District is an area with a slope of 0-2%, so it is categorized as a flat area (class I) with a score of 5. The slope is one of the causes of frequent flooding in Adimulyo District

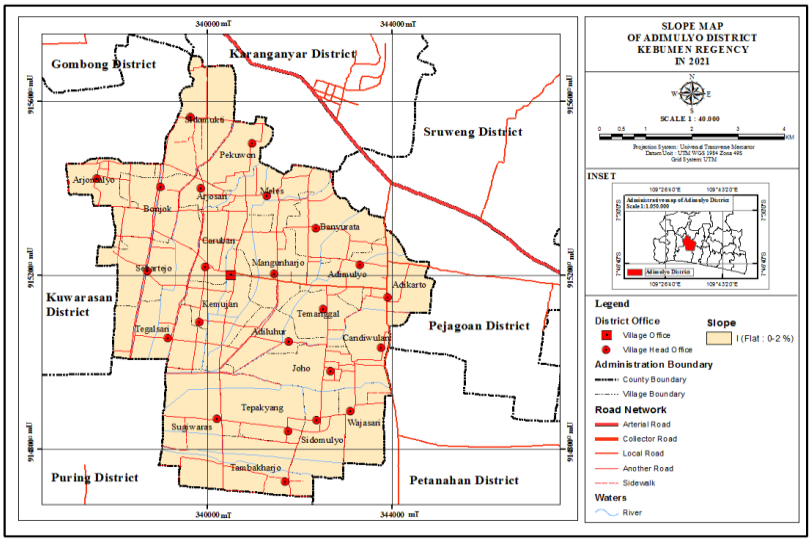

Fig 3. Slope Map of Adimulyo Subdistrict

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3.3. Altitude

The altitude of the area affects the occurrence of floods because water will flow from a high place to a lower place. Adimulyo District is located at an altitude of 9-17 meters above sea level. Based on the results of scoring on land units in Adimulyo District, it can be seen that the height of the area is divided into 5 classes. Very high class consists of 20 land units, high class is 15 land units, medium class is 10 land units, low class is 19 land units, and very low class is 10 land units.

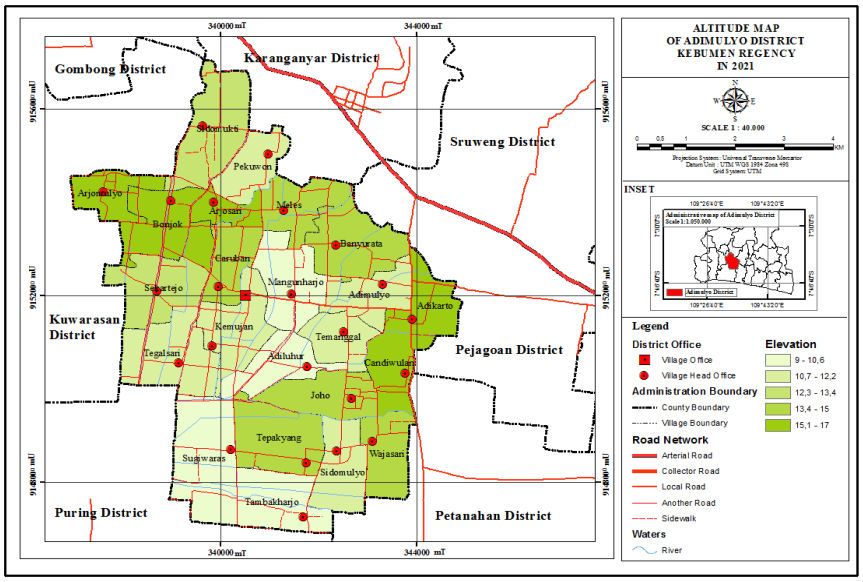

Fig 4. distribution of altitude in Adimulyo District

3.4. Land Use

Land use is related to the results of human activities on land use. Based on the image interpretation, it is known that the land use in Adimulyo District consists of settlements and rice fields. Land use in the form of settlements consists of 35 land units, while the use of paddy fields is 39 land units.

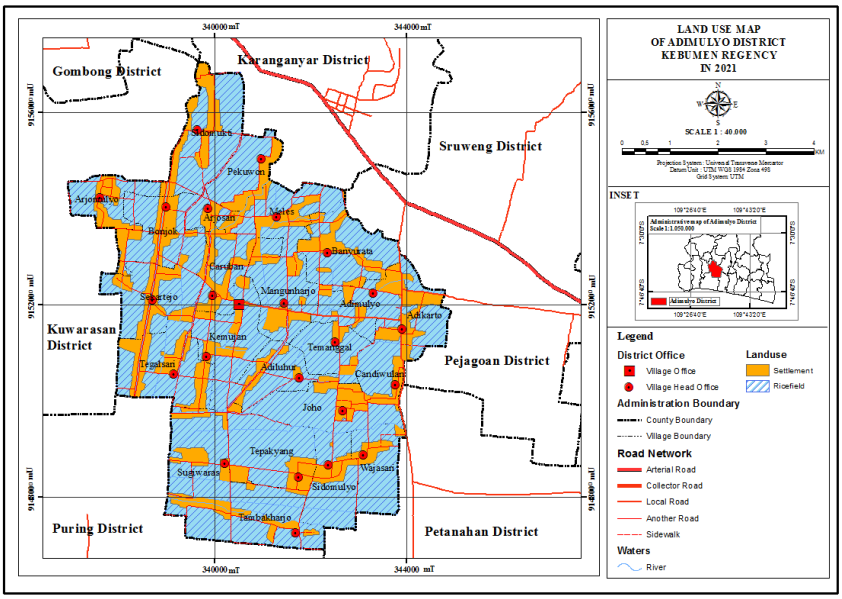

Fig 5. Land Use Map of Adimulyo District

3.5. Type of Soil

The soil type affects the potential for flooding in an area. On fine soil texture, water will be more difficult to seep into the ground, allowing for puddles either by rain or overflow from water bodies. Soil in the study area is divided into two types, namely alluvial soil and glei soil. Alluvial soil is found in 24 land units which are included

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in the medium category with a score of 3, while the glei soil consists of 50 land units with a high category and a score of 4. The distribution of soil types in Adimulyo District can be seen in the following figure.

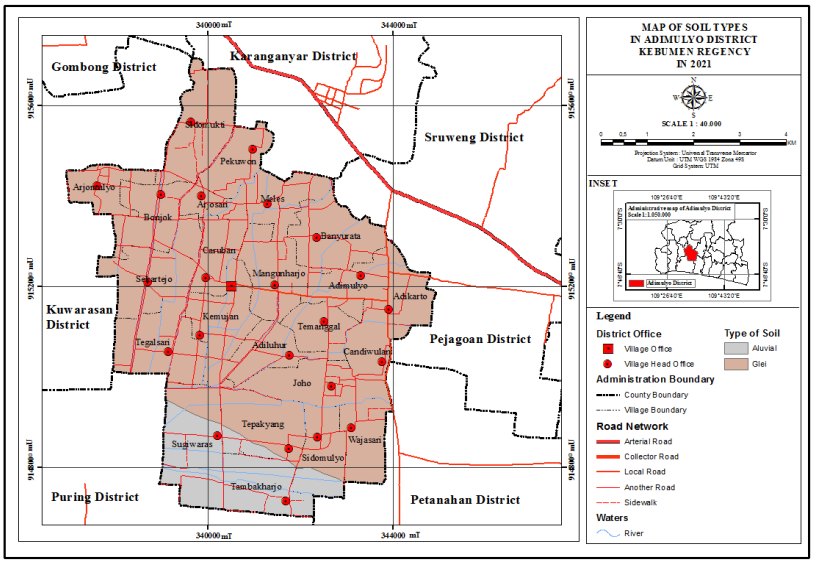

Fig 6. Distribution of soil type in Adimulyo District

3.6. Distance to River

Floods usually come from overflowing river water, therefore the closer a place is to the river, the greater the potential for flood disasters. Based on the results of the scoring, it can be seen that the distance between the area and the river in the study area is divided into 5 classes. Class I with very high criteria is found in 15 land units, class II with high criteria is found in 15 land units, class III with moderate criteria is found in 15 land units, class IV with low criteria is found in 14 land units, and class V with criteria very low is found in 15 land units.

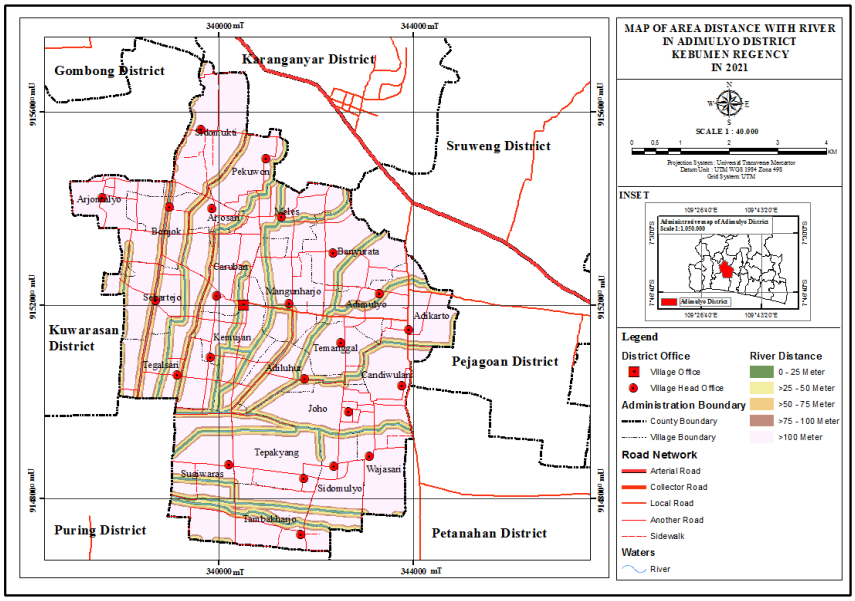

Fig 7. Distribution of the distance of place to the river in Adimulyo District

3.7. Analysis of flood vulnerability

The level of flood susceptibility in Adimulyo District is obtained through overlays of flood susceptibility parameters. All parameters were scored and the results were classified based on the classification table for the level of flood suceptibility. For more details, the classification of flood susceptibility can be seen in the following table and figure.

Tabel 8. Levels of Flood Susceptibility in Adimulyo District

No.	level of flood vulnerability	number of land units	Class	Area (km^2)	%
1.	Moderate	7	III	9,15	20
2.	High	54	IV	32,79	72
3.	Very High	13	V	3,46	8

Source: primary data analysis

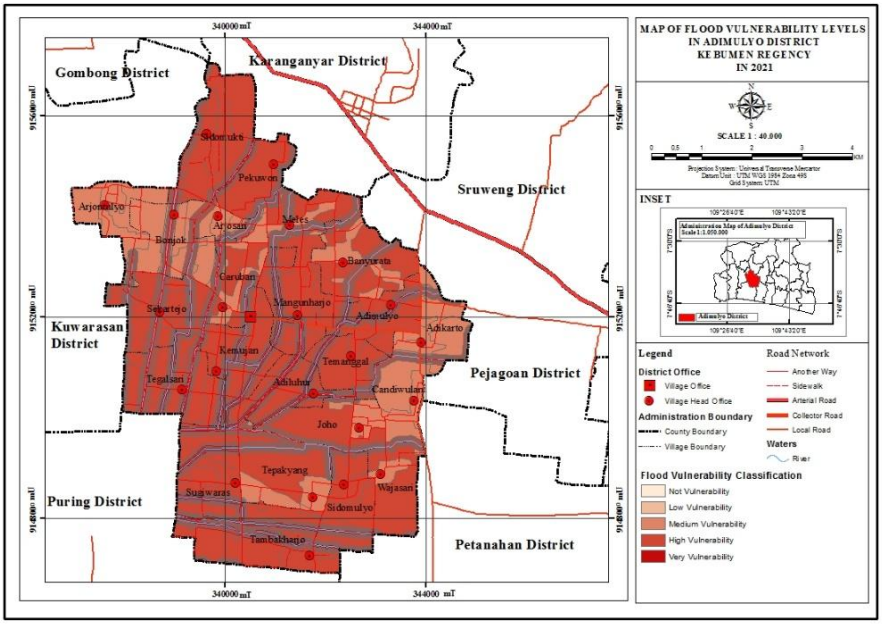

Fig 8. Map of level susceptibilitydistribution in Adimulyo District

Based on the analysis in table 8 and figure 8, it can be seen that most areas (80%) in Adimulyo District have a high and very high level of vulnerability. From the distribution maps of flood susceptibility above, it can be seen the distribution areas that have a high and very high level of vulnerability. The results of this susceptibility analysis can be used for the policy direction of the Kebumen Regency Government in flood disasters management. Steps that can be taken include increasing the preparedness of the government, communities and families against the next flood disaster, carrying out flood mitigation both structurally and non-structurally to reduce the impact of the next flood, socialization and rehearsals for communities located at high and very high levels of vulnerability.

4. CONCLUSION

Based on the results of scoring and classification, it can be seen that the level of flood susceptibility in Adimulyo District is divided into three classes, there are the medium susceptibility level of 9.15 km^2, high susceptibility with an area of 32.79 km^2, and the very high level of 3.46 km^2. Areas that are classified as very high susceptibility have a fairly close distance to the river and a fairly low altitude. The results showed that the level of susceptibility in Adimulyo District was dominated by a high level of susceptibility. The results of the study can be used as a basis for disaster management in the research area.

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