

# ANALYSIS ABOUT THE INCREASE OF SEDIMENT AS A RESULT OF RAINFALL INTENSITY ON LUSI WATERSHED IN DISTRICT BANJAREJO BLORA

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**Abstract :** Lusi Watershed has an area of 103.6 km<sup>2</sup>, located in District Banjarejo, Blora, influenced by the tropical climate in the south-west monsoon which is characterized by a rainy season with an average rainfall of 112 mm/year, has an intensity of rainfall is about 40 mm/day to 82 mm/day. The intensity of the rainfall caused flooding runoff and concentrations of TSS resulted in increased of watershed. The purpose of this study is to describe the increase in concentration of sediment result of the high intensity of rainfall on the lusi watershed. The study was descriptive quantitatively using statistical analysis of correlation. The results showed that there is a correlation between the variables of rainfall intensity with variable of levels of sediment by 86%. When compared with the second class status of water quality, the water level in the Lusi watershed has exceeded its capacity. Recommendations from this study is necessary to control erosion due to the flow of runoff with preventing illegal logging activities in the forest in the upper reaches of the watershed.

**Keywords:** intensity of rainfall, river streams region, sedimentation.

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## I. INTRODUCTION

Lusi Watershed, located in District Banjarejo, Blora has an area of approximately 103.6 km<sup>2</sup>. According Blora in Number [1], most of the soil in Blora are medium textured soil, plants can still grow well, but must be specially treated to prevent erosion, because such soils more susceptible to erosion. The soil texture in Blora are classified into three, smooth texture (clayey loam to clay) of about 5%, medium texture (clay to dusty loam clay) of about 39% , and a coarse texture (sandy clay to gravel) of approximately 56 % . Soil texture will affect the fertility of the soil, ability to absorb and retain water as well as susceptibility to erosion. The influence of climate in Blora on the intensity of rainfall is closely related to discharge flood runoff that carries sediment grains, especially in the rainy season.

## II. RESEARCH METHOD

### 2.1. Location and Time of Research

The study was conducted in the District Banjarejo, Blora, Central Java. The research was conducted in six (6) months in 2004 and continued in 2015/2016.

### 2.2. Research Planning

This study has a type of quantitative research, which was conducted using a survey of the condition of the lusi watershed include measurement of rainfall intensity and rate of sedimentation. The two of variables are then analyzed using statistical methods of correlation, then calculates the material contamination in the water with one of its parameters is sediment. Sedimentation rate in these waters are then compared with the standard quality of Lusi river waters.

### 2.3. The Scope of This Research

The scope of this study is to describe the physical condition of the waters on Lusi watershed area located in District Banjarejo by measuring the intensity of rainfall that increase sediment concentration and then compared with the standard quality of Lusi river waters in accordance with water quality status.

#### **2.4. Population and Sample**

The population of this study is the condition of watersheds Lusi in Blora. The sample was taken by purposive sampling using Lusi watershed area located in District Banjarejo within area of 103.6 km<sup>2</sup>.

#### **2.5. Variable of Research**

The dependent variable of this research was the rate of sedimentation in the lusi watershed in District Banjarejo, Blora, while the independent variable of the study is the intensity of the rainfall.

#### **2.6. Data Pocessing**

Data processing starts from measurement and calculation of the intensity of rainfall and sediment levels in the lusi watershed located in District Banjarejo, then using statistical methods to analyze the correlation of these two variables.

### **III. RESULTS AND DISCUSSION**

#### **3.1. General Conditions of Research Area**

Blora Regency located between 111° 16' to 111° 338' East Longitude and 6°528' to 7° 248' south latitude. The total area of Blora are about 1820.59 km<sup>2</sup>, the lowest ground surface height 25 meter above sea level and 500 meter above sea level as the highest ground, flanked by mountain ranges North Kendeng and South Kendeng mountains. In the north: Kab. Apex and Kab. Pati, Central Java Province; east: Kab. Bojonegoro, East Java Province; south: Kab. Ngawi, East Java Province; and west: Kab. Grobogan, Central Java Province. Blora regency has an area of 182,058.797 hectar, divided into 16 districts, with a height of between 40 to 500 meter above sea level (MSL). each Districts have an area of about 5.69% or 103.5 km<sup>2</sup>. Blora regency total tropical climate with rainfall throughout the year 2014 are about 1,321 mm with an average rainfall of 112 mm/yr, where the highest rainfall occurs in January is 261 mm and the lowest in September, which is 10 mm. Average days of rain during the year 2014 recorded eight days with average the most rainy days in January is 20 days and the lowest in September where there is only one day of rain. Residents in the District Banjarejo 2015 around 58,157 inhabitants consisted of 28,775 inhabitants of the male and 29,382 female inhabitants were mostly livelihood as farmers.

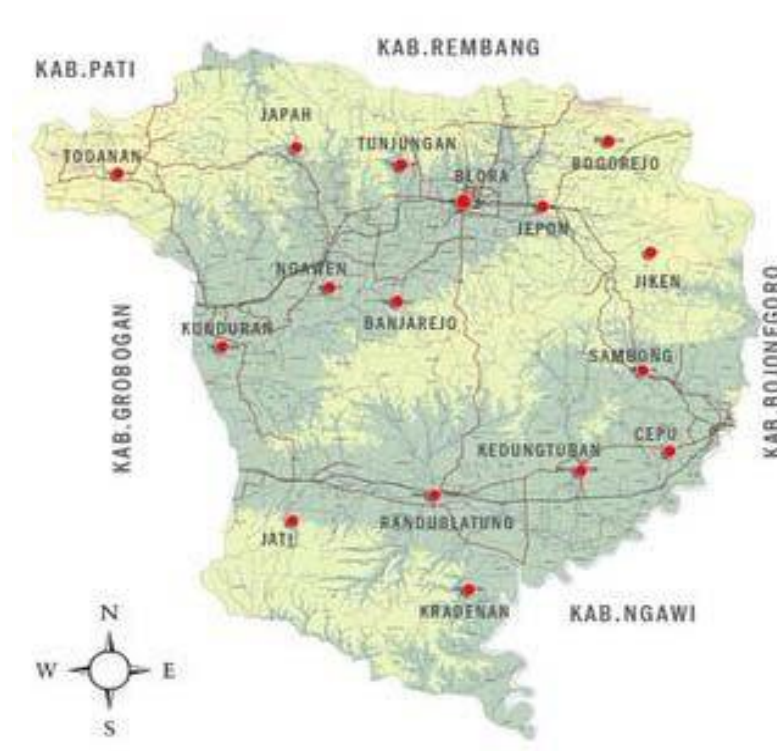


Figure 1. General Map of Blora Regency

### 3.2. Rainfall intensity

From the measurements that was taken during the rainy season from September 2015 to January 2016, the result of rainfall intensity are like in Figure 2 as follows :

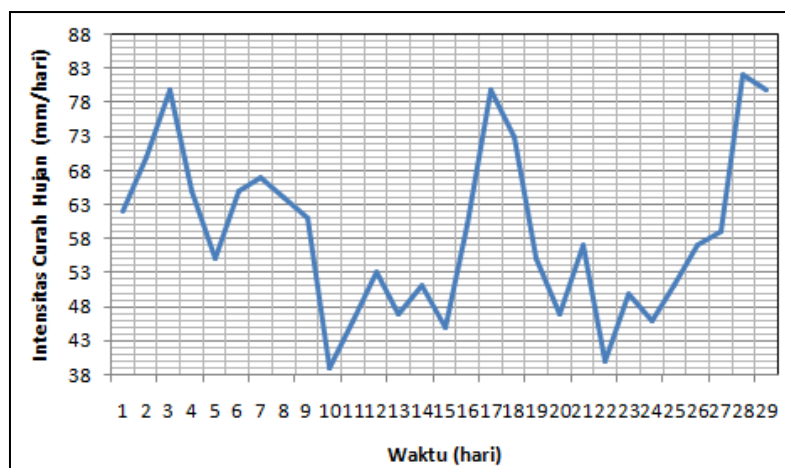


Figure 2. Graph of Rainfall Intensity (mm/day)

Figure 2 illustrates the measurement results throughout 2015 to 2016, intensity of highest rainfall are about 78 mm/day to 82 mm/day. While the intensity of the rainfall occurs about 40 mm/day to 42 mm/day. According USSCS in Dwiputri, M [2], Furuso [3], and Maat, W.H [4], one of the methods commonly used to estimate the peak flow rate (discharge planning) is rational method. Rational method was developed based on the assumption that the rainfall has uniform intensity and evenly throughout the drainage area for at least equal to the time of concentration (tc). Rational Method mathematical equation is as follows :

$$Q = 0,00278.C.I.A \dots\dots\dots(1)$$

Where :

Q = water discharge runoff (m<sup>3</sup>/sec)  
 0.00278 = constant for unit area in Ha  
 C = Flow Coefficient  
 I = Intensity of rainfall (mm/h)  
 A = area of watershed (Ha)

### 3.2. Sedimentation level

From the measurements taken during the rainy season on the field, intensity rainfall results obtained are like in Figure 3 as follows:

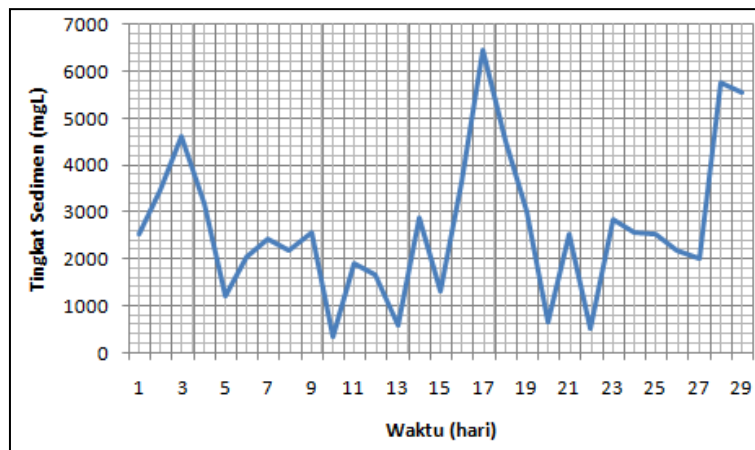


Figure 3. Graph of Rainfall Intensity (mm/day)

According to Government Regulation No.82 / 2001 [5], for the status of water quality class II, standard quality TSS parameter is less than or equal to 50 mg/L, so that the measurement results on the ground indicate that the carrying capacity of the Lusi river has been exceeded.

### 3.3. Corellation Between Rainfall intensity and Sedimentation Rate

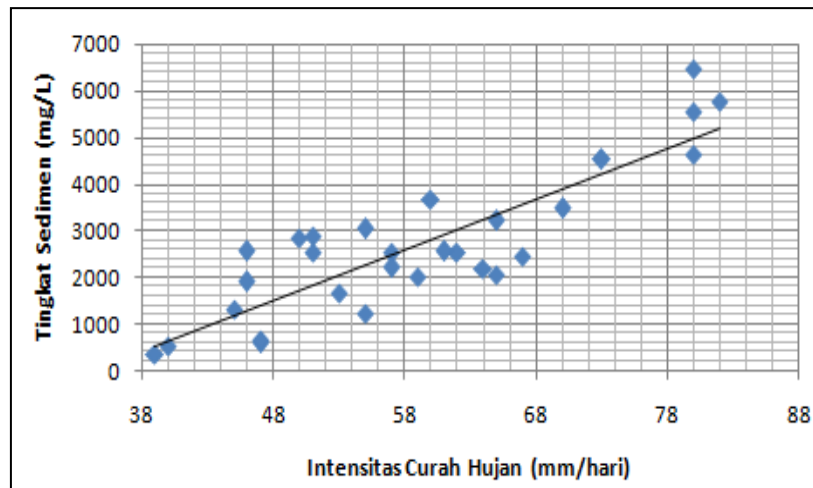
The relationship between the variables of rainfall intensity to the level of sediment concentrations have a correlation  $R = 0.86$  which indicates that the intensity of rainfall affect the value of TSS concentration or sediment level with the following equation :

$$Y = 108,9X - 3726 \dots\dots\dots(2)$$

Where :

Y = Level Sediments (mg/L)  
 X = Intensity Rainfall (mm/day).

Equation (2) applies if the initial value of minimal rainfall intensity of 40 mm/day and demonstrated a correlation between the intensity of rainfall with sediment concentration level as in Figure 4 below:



**Figure 4.** Correlation Graphs between Rainfall intensity with Level Sediments

#### IV. CONCLUSIONS

1. The intensity of rainfall in the lusi watershed about 40 mm/day to 82 mm/day, which act as a factor flood runoff.
2. The level of sediment in the lusi watershed exceeds 50 mg/L and have exceeded water quality standards with class II designation.
3. The correlation between the intensity of rainfall and sediment levels in the lusi watershed has a positive correlation rate of about 86 %.
4. Flood control runoff needs to be done for example by preventing illegal logging.

#### V. REFERENCES

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