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EFFECT OF CORRELATION BETWEEN ROCK PROPERTIES WITH WATER DISCHARGE BY RAINFALL TO LEVEL OF LANDSLIDE IN THE CITARUM WATERSHED 20 – 0 KILOMETER, WEST JAVA, INDONESIA

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Abstract

Citarum River is one of the longest rivers in West Java, Indonesia, with coordinate 7°4'31"S 107°44'53"E. Citarum river has an upstream which located in the region of Neglawangi, Kertasari, and has a downstream in the northern coast of Bekasi. A lot of people domiciled on the watershed of Citarum. Natural disaster such as landslide has become a common thing for people who live around the watershed of Citarum. Study of rock properties located in Citarum

River may explain why landslides often occur in areas of Citarum River. The rock sample was conducted at three different stations with each station has a different rock properties. High rainfall causes water flow in the river rises. With the high discharge of water by high rainfall, certain rock properties that have a low resistance to water will be easily eroded and causes the soil above the rock properties vulnerable to landslides.

Keywords

Citarum, Landslide, Rock Properties, Rainfall, Water Discharge

1. Introduction

Citarum River stretches from Situ Cisanti which located on West Java to northern coast of Bekasi, with a length of 297 km it is the longest river in West Java. Citarum River has a very important historical value. In addition to historical factors, Citarum river has a high value in economical and social aspect, this is because about 25 million people exploits variety of things from Citarum river as a source of energy (hydropower) and as a source of water for their daily needs.

The topography of Citarum watershed, on the upstream area, where we conducted our research, looked like a giant basin and it called Bandung basin. This area has an elevation of 625 – 2.600 meters above sea level. The Citarum watershed formed by tectonic and volcanic activities, continued by erosion and sedimentation processes.

From the data we received from (fill it) that the erosion in the Citarum watershed has risen up to 14%. The erosion in the upstream area of Citarum has sent 490 tons/hectare/year and could be categorized as a very high index of erosion.

Citarum river area has a lots of rock outcrops, this is because the water is one of the media to transport rock particles that have already eroded. The rock particles sedimented at one place and lithified, forming a sedimentary rock. By observing the outcrops on the Citarum River, we can predict various things, such as the landform when the rocks formed, soil resistance against landslides, etc.

The condition on Citarum river, especially at 20-0 kilometer, there are many landslides often occur when the water discharge escalate. Along the side of the river at 20-0 kilometer, conglomerate rocks were found, as well as clay that could be seen in the outcrop around the Citarum River.

2. Methodology

The study was conducted by doing the research directly to the field, by 20-0 kilometer along the Citarum River. The study was conducted on 15th -17th August 2016 in conjunction with ITB (Bandung Institute of Technology) Meteorological team. Throughout the research of 20 kilometer, there are several outcrops that we could see clearly even though some outcrops had shown weathering effects. The research on rock outcrops conducted at three different stations, which is at the coordinate 7°3'15"S 107°45'39"E, 7°3'44"S 107°45'35"E, 7°4'48"S 107°44'44"E and processed the data at the campsite. The literature review conducted to validate the data that have been obtained from the field. Secondary data used in this study to obtain data on rainfall and water discharge on the river.

3. Results & Discussions

Rock properties that have been obtained from the field varies, depending on the sampling stations;

1. Station 1

- a. Coordinates : 7°3'15"S 107°45'39"E
- b. Lithology : Conglomerates - Fine sand

2. Station 2

- a. Coordinates : 7°3'44"S 107°45'35"E
- b. Lithology : Conglomerates - Clay

3. Station 3

a. Coordinates : 7°4'48"S 107°44'44"E

b. Lithology : Crosses layer of soil – Fine sand

In the coordinates 7°3'44"S 107°45'35"E there were many landslides, the hypothesis taken is that the area of Citarum river which has a rock properties of clay has as higher landslide potential than the area which has a stronger rock properties. Clay has low resistance to the force exerted by the flow of water in the river. When we observed on the geochemistry side, clay particles have a negative electrical charge so it attracts positive charged ions contained in the water to balance the load, that is the reason why it is very easy for clay to mix and dissolve with the water. The rainfall in the 20-0 kilometer area during the rainy season is ± 314 mm per day. The high rainfall causing Citarum river water discharge increased to ± 578 m³ / sec. Most of the structure on the research area is contained of hard rocks on the top area and soft rocks on the bottom area. Clay and fine sand are categorized as soft rocks and the conglomerates are categorized as hard rocks. When the water eroded the soft rocks on the bottom area, it causes the hard rocks on the top area has no foundation, it causes the structure vulnerable to landslide.

4. Conclusions

The rock properties on Citarum river area, especially the areas with clay lithology underneath the soil, has a high potential of landslides especially during the rainy season. The high rainfall causes the water flow increases, causing the clay underneath the soil easily be mixed with the water. This reaction will weaken the soil resistance and lead the soil vulnerable to landslide.

The research that has been done is expected to increase the public awareness about landslide, especially for the people who live in the area of Citarum river. Development of urban area needs to be more careful and selective, areas with low resistance to any disaster should not be used as a settlement. Information about the rock properties that have obtained from the outcrops is expected to be useful for further research.

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