

Disaster and Relevant Management Problems along the Pujon – Ngantang Road in Konto Hulu Watershed, Indonesia

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I. INTRODUCTION

The Pujon - Ngantang Road is a segment of the East Java Province Road that linking Malang City to Kediri City and Jombang City. This road is located in the Malang Regency on a hilly terrain approximately 1,100 meters above sea level and approximately 11 kilometers adjacent to the Konto Hulu River as shown in **Figure 1**.

Table 1 shows the number of incidents of landslide and slope erosion along the Pujon-Ngantang Road, especially seven spots of slope erosion and fourteen spots of landslide that occurred on this road during January 29–31, 2014 due to flooding of the Konto Hulu River. The flood also damaged two bridges, several houses, a stall, and farmland and caused the death of three people as shown in **Figure 2** and **Figure 3**. Figure 4 shows the river channel change from 2011 to 2014.

The objective of this study is to investigate the disaster that occurred on the Pujon-Ngantang Road and relevant management problems in the Konto Hulu Watershed.

II. DISASTER AND RELEVANT PROBLEM

The Highway Public Works Department of East Java Province has the authority to deal with all problems on the Pujon-Ngantang Road, including disaster countermeasures. When a landslide occurs, emergency treatment is undertaken to clean the landslide material that buried the road to make the road passable by vehicle traffic. For slope erosion, emergency measures are carried out to prevent the slope erosion caused by the river flow from getting bigger and causing more damage to the road. Some slope erosion is severe causing 2/3 of the road damaged and making the roads are impassable for traffic in 2014.

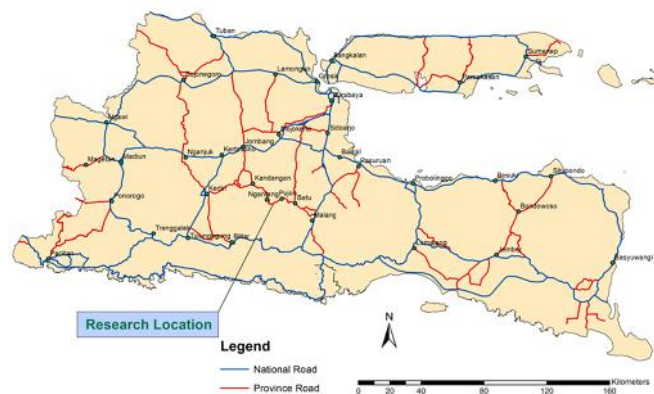


Figure 1. Research location on the Pujon-Ngantang Road¹⁾

Table 1. Number of disasters on the Pujon-Ngantang Road²⁾

Disaster Type	2010	2011	2012	2013	2014	2015	2016
Landslide	2	3	1	4	18	2	2
Slope Erosion	1	0	2	2	10	1	0



Figure 2. Landslide and slope erosion in the Pujon-Ngantang Road



Figure 3. Bridge collapse and damage by flood in the Konto Hulu River

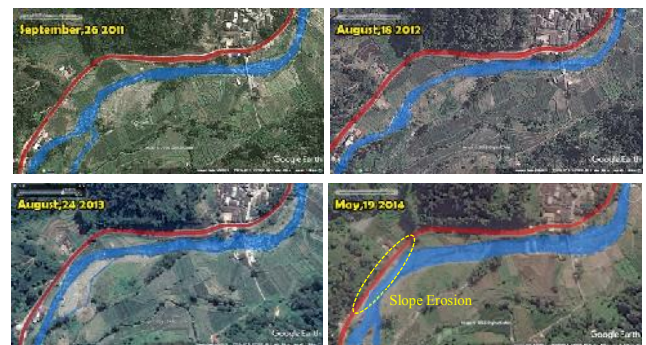


Figure 4. River channel change causes slope erosion on the Pujon-Ngantang Road, KM. P.Jon 8+800

Countermeasures are also achieved by regulating the traffic to unravel congestion. Traffic is diverted to a southern route through Malang City - Blitar - Kediri City and to a northern route through Malang City - Pandaan - Mojokerto - Jombang City, where the damage was severe. Access by both of these routes requires takes nearly two times longer than access from the Pujon-Ngantang Road.

One problem with the countermeasures is the budget in dealing with damaged roads. With regard to disasters, the budget is allocated from the emergency fund of the East Java Province, as considerable time is needed to obtain the budget and to select the company in the procurement process. Consequently, some permanent countermeasures require a long time to be implemented, during which some of the damage gets worse for lack of adequate treatments.

Land cover changes will effect the hydrological characteristics of a watershed and flood discharge. **Table 2** shows that the forest is the largest area covering 4,135 hectares (31.42%) in 2007 and 4,126 hectares (31.35%) in 2015. In general, the land cover area decreased from 2007 to 2015 except for the Scrub/Grass, the area of which increased about 9.89%.

Table 2. Land cover proportion in Konto Hulu Watershed³⁾

Land Cover Type	2007		2015	
	Hectares	%	Hectares	%
Forest	4,135	31.42	4,126	31.35
Mix Plantation	3,598	27.34	2,803	21.30
Paddy Field	3,582	27.22	3,1145	23.67
Scrub/Grass	1,233	9.37	2,534	19.26
Settlement	592	4.50	567	4.31
Unclassified	20	0.15	16	0.12
Total	13,160	100.00	13,160	100.00

Figure 5 shows the cultivation and garbage thrown by inhabitants into the river. Some cultivation methods in the Konto Hulu Watershed that ignore the conservation principles also contribute to creating critical land. This is caused by a lack of capital, low technology and also lower agricultural yields. In the forest area, some seasonal crops are planted under the forest trees with bad conservation⁴⁾. Moreover, planting seasonal crops on a steep slope results in high runoff and erosion. The inhabitants throw garbage in the river, which damages the environment and contribute to flooding.

**Figure 5.** Cultivation methods and garbage at the river

III. INSTITUTIONAL MANAGEMENT ASPECTS

Integrated watershed management is a series of attempts to formulate objectives, a synchronization program, and the implementation and control of cross-agency management activities based on specific characteristics to achieve the objectives⁵⁾. **Table 3** shows the duties and responsibilities of agencies in the Konto Hulu Watershed. Many agencies

involved in watershed management often causes a frequent lack of interest between agencies. Some agencies have a fundamental duty and function similar to planning and carrying out the same activities. Meanwhile, other management activities are not carried out by any of the agencies. These are some of the conflicts and management issues/problems in the Konto Hulu Watershed.

Watershed management approaches that differ according to the sectoral interests of each institution and the lack of coordination between institutions become a serious problem in watershed management. In this case, the Highway Public Works Department of East Java Province has the only authority to handle the Pujon – Ngantang Road. But, it does not have the authority to resolve the main cause of slope erosion and the landslide disaster on the Pujon-Ngantang Road.

IV. SUMMARY

The change of land use in the watershed may impact the hydrological characteristic that led to a flood and a landslide. Conservation of the watershed is needed to mitigate the conditions along the Pujon-Ngantang Road by cooperation by relevant governments and agencies.

REFERENCES

- 1) Highway Public Works Department of East Java Province, 2016.
- 2) Regional Disaster Management Agency of Malang Regency, 2016.
- 3) Regional Development Planning Agency of Malang Regency, 2016.
- 4) Management Agency of Brantas Watershed: *Monitoring and Evaluation Report of Brantas Watershed*, 2015.
- 5) Suprayogi, S., et al: *Pengelolaan Daerah Aliran Sungai (Watershed Management)*, 2015.

Table 3. Duties, responsibilities and management issues/problems of agencies in Konto Hulu Watershed

No	Agency	Status	Duties, Responsibilities and Management Issues/Problems
1	Brantas River Basin Organization	Regional	Prepare patterns and water resource management plan in the river area. Plan and implement protected area management of water resources in the basin. Implement water resources management, which includes the conservation of water resources, water resources development, utilization of water resources and control of water damage in the river area.
2	Jasa Tirta I (State Owned Enterprises)	National	Organize general use of water and water resources quality and sufficiency for the fulfillment of the lives of many people; covers the protection, development and use of the river and/or sources of water, including providing information, recommendations and guidance counseling. This agency has the same duties as the Brantas River Basin Organization in Water Resources Development, but this agency is more involved in operation and maintenance.
3	Regional Development Planning Agency of Malang Regency	Municipal	Responsible for the detailed planning of land use in the Malang Regency. The Brantas River Basin Organization is more involved in planning the watershed area.
4	Perum Perhutani (State Owned Enterprise)	National	Responsible to manage and control the economic, social and environmental aspects of forest resources.
5	Brantas Watershed Management Agency	Regional	Responsible for soil conservation and rehabilitation of areas of natural forest and production forest areas in the watershed. Problems and issues arising out of land conservation and forest land rehabilitation shall be resolved by this agency and Perum Perhutani.
6	East Java Province Watershed Irrigation (IRJAT)	Province	Responsible for the development of irrigation in East Java Province.
7	Water Resources Agency of Malang Regency	Municipal	Implementation, monitoring, control and evaluation of water resources in the Malang Regency. This agency has the same duties in irrigation development as the East Java Province Watershed Irrigation.
8	Environment Agency of Malang Regency	National	Responsible for promulgating and implementing regulations in environmental control.
9	Agriculture and Plantation Department of Malang Regency	Municipal	Stabilize and increase food production to strengthen food security. Increase the supply of raw material to support the agricultural industry and increase the incomes of farmers through increased production, productivity, quality of results and added value. Establish and realize of food crops, horticulture and plantation. There are issues about agricultural waste and the distribution of irrigation water.
10	Energy and Mineral Resources Agency	National	Approve permits for groundwater exploitation and the control of the water use. There are issues about water use.
11	Animal Husbandry Agency of Malang Regency	Municipal	Develop and implement the livestock and animal health. There are issues about livestock waste and crops for livestock feed.
12	Public Works & Spatial Agency of Malang Regency	Municipal	Implement public work and spatial planning. Give permits to utilize space. Organize waste and sanitation management. Develop the water, domestic waste and drainage. There are issues about waste and sanitation problems.
13	Highway Public Works Department of East Java Province	Province	Organize, develop and maintain the roads and bridges of East Java Province. Slope erosion and landslide are some problems that must be resolved on land located adjacent to other agency land authority (for instance, Perum Perhutani)