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Review

Handling of area impact of land exploitation in the Kendeng Mountain, Pati District, Central Java

Fathur Rozy[1], Mohamad Aliyudin[2], Sufi Mirna[3] and Risa Ayu[4]

[1] Department of Civil Engineering;; Institut Teknologi Adhi Tama Surabaya; rozysrhc@gmail.com
[2] Department of Civil Engineering;; Institut Teknologi Adhi Tama Surabaya
[3] Department of Civil Engineering;; Institut Teknologi Adhi Tama Surabaya; Sufim670@gmail.com
[4] Department of Civil Engineering;; Institut Teknologi Adhi Tama Surabaya; risaayua06@gmail.com
* Correspondence : alisumpil27@gmail.com

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Abstract
The Kendeng Mountains are the largest limestone producer on the island of Java, so mining or over-exploitation is often carried out in several locations. Pati Regency is a city affected by the exploitation of the Kendeng Mountains, in addition to Rembang Regency. The northern Kendeng area, which is in southern Pati, has experienced more than 60% deforestation. The impacts of this exploitation are floods, droughts, and landslides in the South Pati region. 2019 the southern Pati region has experienced quite large flash floods Since approximately 5 times. To deal with the impact of exploitation this research uses analysis and synthesis methods. The clearing of forest land use as an agricultural and mining area in this location continued to occur from 1996 to 2016, and the rainfall that experienced the La Nina phenomenon in 2020/2021 caused flooding in the Tambakromo, Kayen, Sukolilo and Winong areas. and drought in 30 villages, in the Pati region, Central Java. To maintain the impact of exploitation, reforestation must be carried out, construction of drainage canals, and construction of springs.
Keywords: exploitations; drought; floods; Kendeng Mountain; mining; reforestation

1. Introduction

Kendeng Mountains is one of the limestone mountains in Indonesia which is located on the island of Java. The location of the Kendeng mountains stretches in the northern part of Java Island across the Provinces of East Java and Central Java. The Kendeng Mountains are the largest limestone producer on the island of Java, so mining or over-exploitation is often carried out in several locations.

Pati Regency is a city that has been affected by the exploitation of the Kendeng Mountains, apart from the Rembang Regency. Exploitation activities in the Kendeng Mountains are in the form of opening limestone mining land and clearing forest land as corn fields. In the previous survey, it was stated that the northern Kendeng area in South Pati had experienced more than 60% of the land being cleared (Harja et al., 2022).

The impact of exploitation activities on the Kendeng Mountains is very dangerous. These include natural disasters such as flash floods and landslides during the rainy season and drought during the dry season. Since 2019 the southern Pati region has experienced quite large flash floods approximately 5 times, the affected areas include the Tambakromo, Gabus, and Winong sub-districts (Suwarno et al., 2022). This happens because the limestone

mountain which has been used as a source of clean water reserves has been mined excessively and also the forests on the mountain have been cut down in a large enough area.

In this study, research will be conducted on how to overcome or reduce the impact of disasters that occur. Both in terms of mitigating the impact of floods and landslides during the rainy season, as well as drought during the dry season.

2. Methods

The method used in this research is analysis and synthesis. Data collection techniques used include literature studies, site observations, field studies, and data analysis. Then the data obtained will be analyzed by grouping and identifying the existing problems. These data will then be discussed to look for their interrelationships so that a common thread is found for drafting a good and appropriate disaster management plan.

1. Literature Study
   Deepen and learn more about the literature review related to the title, either directly or indirectly related to the final result based on the discussion.
2. Observation
   In the data collection process, researchers made direct and indirect observations. Direct observation was carried out by coming directly to one of the locations, namely in Sinom Widodo Village, Tambakromo District, Pati. There the researchers made observations of the condition of the forest land which has now turned into a corn garden, and also observed the post-2022 flash flood locations which have not fully recovered.
   Meanwhile, for indirect observation, the researcher observed data obtained from various sources. The information used as a reference comes from previous research data and related news media.
3. Field Studies/Interviews
   In addition to field observations, the researchers also conducted interviews with several village communities affected by the disaster caused by the exploitation of the Kendeng mountains. Interviews were conducted with the aim to obtain information that was not written & was not found during observation.
4. Data Analysis
   In processing this data, analysis and synthesis methods will be used, namely by identifying all potential and physical and non-physical conditions, and will be linked to existing problems, so that later a conclusion will be obtained that can answer all problems and can be used in a design approach. to achieve the expected goals and objectives.

3. Results and Discussion

Factors that led to the disaster that occurred:

a. Land Use

In previous literature studies, mapping of Kendeng mountain forest land cover was carried out in 1996, 2000, 2006, 2011, and 2016 as shown in the figure:

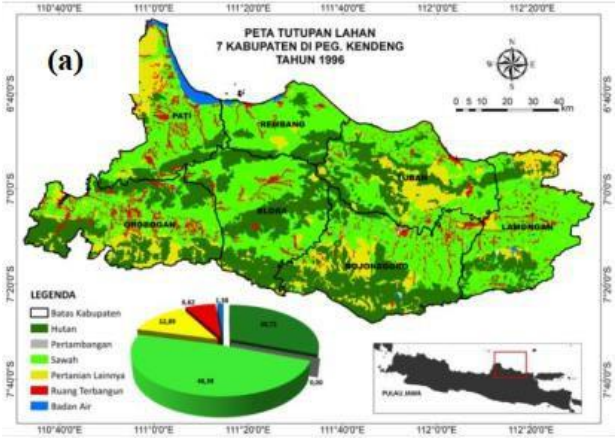

Figure 1. Kendeng Mountains land cover map in 1996

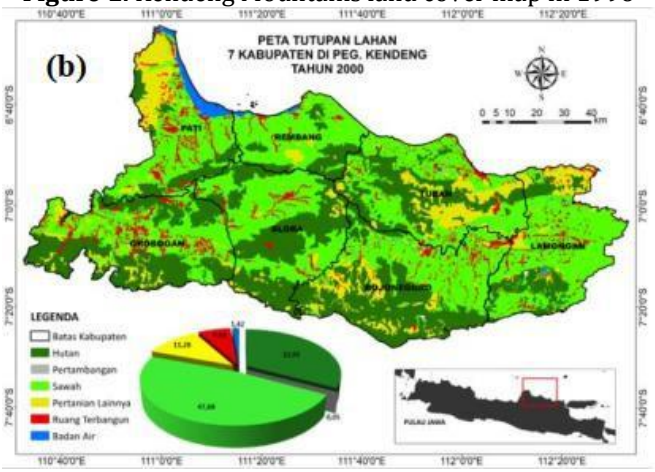

Figure 2. Kendeng Mountains land cover map in 2000

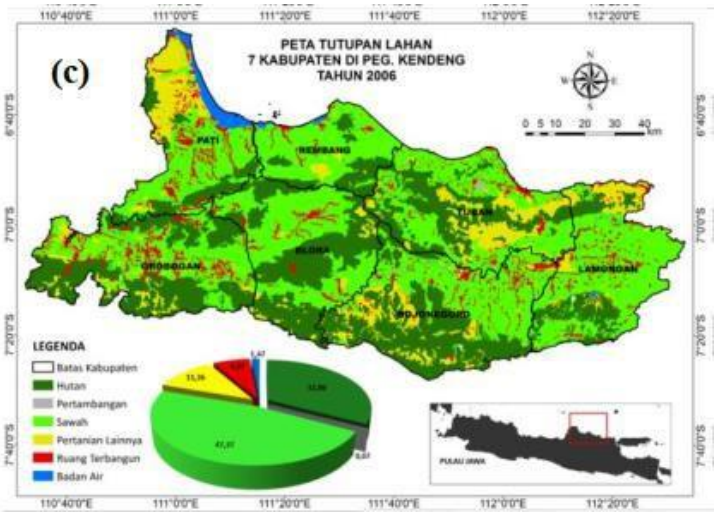

Figure 3. Kendeng Mountains land cover map in 2006

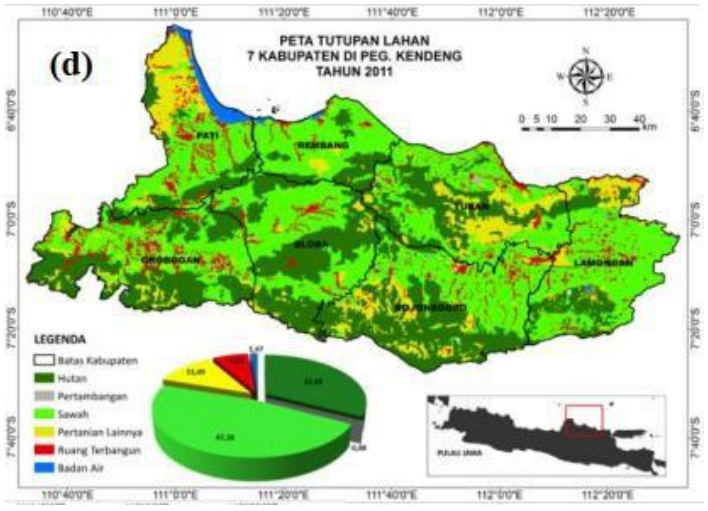

Figure 4. Kendeng Mountains land cover map in 2011

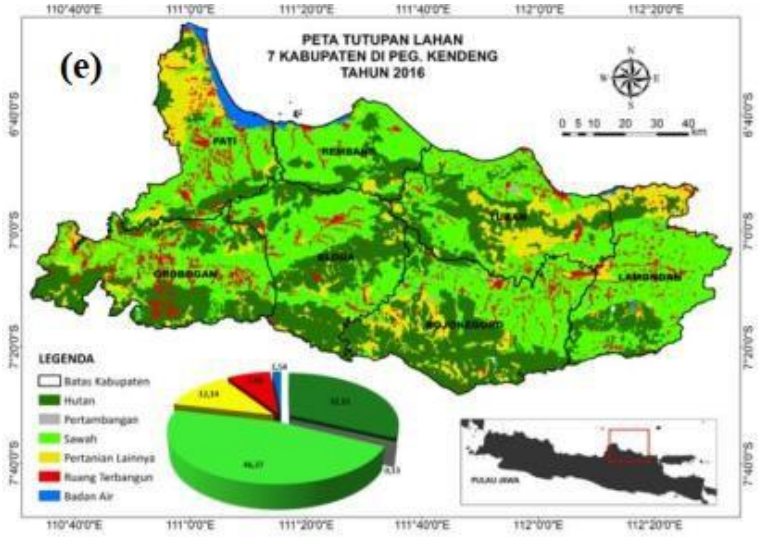

Figure 5. Kendeng Mountains land cover map in 2016

Table 1. Land Cover Data

No.	Land cover	Area (ha) in year of				
		1996	2000	2006	2011	2016
1	Forest	138187	141346	141306	141198	138532
2	Developed Area	8631	8821	8945	9085	9705
3	Ricefield	86622	84919	84919	84880	79417
4	Mining	3	414	680	748	1140
5	Water body	39	39	39	39	104
6	Agriculture, etc	42100	40042	36691	39631	46684
		275582	275581	272580	275581	275582

From these data, it can be seen that the clearing of forest land in the Kendeng mountains has increased every year. During the initial period of closure, the forest area changed its function as plantation land and teak plantation area, but in the following period, the area changed to function as a mining area. Thus the area of water storage is decreasing every year.

b. Rainfall

The peak of the rainy season is predicted to occur in January for most of Pati Regency. There is a difference in the slopes of the limestone mountains which are just entering the peak of the rainy season in February. The amount of rainfall for the 2021/2022 rainy season is predicted to increase compared to normal due to the La Nina phenomenon as well as the 2020/2021 rainy season.

Adequate rainfall is certainly a blessing for farmers and the community by increasing groundwater reserves and reservoirs. However, high rainfall also needs to be watched out for, especially for the limestone mountain region which experiences the rainy season earlier at the end of October and only reaches its peak in February. Communities around the limestone mountains are advised to be aware of the potential for heavy rains which can trigger landslides and flash floods.

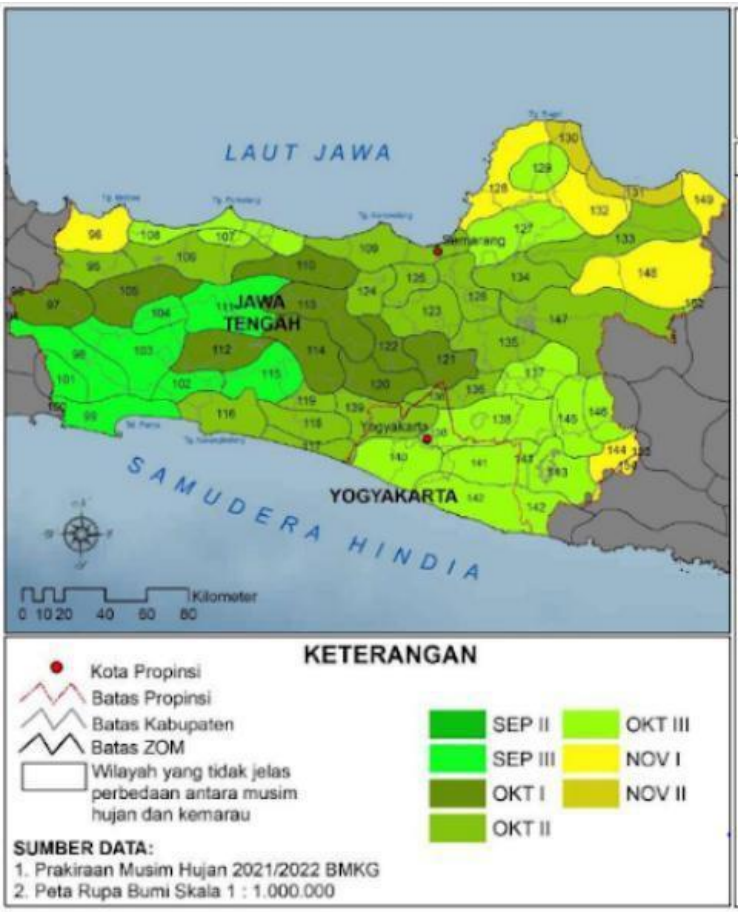

Figure 6. Central Java rainfall map

2. The impact of the disaster that occurred:

a. Flash Floods

The districts affected by flash floods in Pati Regency include the Tambakromo, Kayen, Sukolilo, and Winong areas. Several residents' properties and houses were damaged and washed away. And also in 2022, the flash flood disaster in Tambakromo District claimed 2 lives.

Figure 7. Conditions flash floods in Pati Regency

Figure 8. Conditions after flash floods in Pati Regency

b. Drought

30 villages in the Pati region, Central Java are experiencing drought and water crisis. The Pemali-Juwono River Basin Center made a drilled well to solve the problem. However, the result is that not all drilled wells produce water. Because conditions have dried up completely, many residents are looking for springs in the rice fields. Some residents also use the reservoir water for cooking and bathing.

Figure 9. Rice fields affected by Drought in Pati Regency

3. How to deal with disasters that occur:

First, there is reforestation, which means reforestation so that nature becomes green and is usually done in forests that have become denuded so that they can function as they should. There are many benefits of reforestation, namely preventing soil erosion which can be caused by wind and also successive rains, soil fertility that can be used as agricultural land, keeping the soil structure from being damaged, keeping the diversity of animals in order to remain sustainable, keeping the air clean. and healthy especially for living things on earth, keeps the soil firm so that the risk of landslides can be avoided, reduces the effects of air pollution and global warming, and saves the natural resources that are already in the forest and can be used to increase its productivity. The second is the construction of drainage channels which have a very important role in inhabited areas. A good drainage system helps prevent many problems, such as reducing the possibility of flooding, controlling groundwater levels, and soil erosion, and preventing damage to existing roads and buildings. The last is the construction of springs. Springs are the emergence of groundwater to the surface of the ground. The use of springs is very diverse, including use for drinking water, irrigation, fisheries, for tourism objects.

4. Conclusions

The results obtained from the studies that have been conducted can be concluded that the mapping results from 1996 to 2016, the biggest cause of flash floods and droughts was the closure of forest land to change other functions. Mitigating the risk of flash floods and drought can be done by replanting forest areas that have changed their function, making water reservoirs such as ponds and reservoirs, making drainage and normalizing watersheds, and making regulations related to land use and imposing strict sanctions on violators.

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