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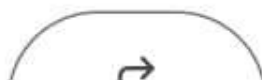
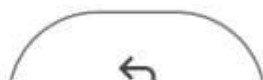
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# Mercury contamination in groundwater from artisanal and small scale gold mining activities (case study in Southern Lombok Coast, West Nusa Tenggara Province)

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**Abstract.** Artisanal and small scale gold mining (ASGM) activities usually use the amalgamation process with mercury to extract the gold. The waste of amalgamation is accommodated in a pond or in the exhaust into the river directly. The most tailing pond which is located close to the well because of the only water source for an amalgamation process is called groundwater. It can be caused by the pollution of mercury itself into the groundwater. This research is aimed to determine the mercury content in groundwater in Southern Lombok Coast. The method used are observation and laboratory testing for mercury content. Observation is done in West Sekotong village, Pelangan, and Batu Putih village to know the process of amalgamation and disposal of its tailings directly. Ten wells water from amalgamation process location were taken as samples for mercury laboratory testing. The result of this study is compared with government regulation no. 82/2001 about water quality management and water pollution control. The result showed that mercury content from nine samples below 0.06 µg/l, only one sample (sample code P2) has mercury content >0.06 µg/l. According to government regulation no. 82/2001 the groundwater quality in Southern Lombok Coast is included in quality water grade 4:0,0005 mg/L.

## 1. Introduction

Gold mining activities in the coastal areas of South West Lombok have long been an attraction. The community takes and digs rocks in the hills. The process of rock processing is done in various locations by amalgamation using mercury to extract gold. This amalgamation activity is carried out traditionally. The rest of the amalgamation is disposed of in the holding ponds or dumped directly into the river. The location of the reservoir is very close to the source of clean water (wells). This can cause mercury pollutants to be absorbed into groundwater. While the source of water used for people's daily needs is dug well water and river water. Based on the results of previous studies showed that in one amalgamation process requires 7.5 kg of rock, ± 20 liters of water (for processing and washing), and 0.5-1 kg of mercury, which is processed for ± 3-4 hours. The mercury content wasted in tailings varies depending on the accuracy of the rollers in the washing, but on average, it has a high level of up to thousands of ppm (Rahmawati, 2011). In the handling of amalgamation waste, there are several ways by which the community is done: 1) the community makes a reservoir (a cement pond without cement), to collect the waste; 2) the community builds a container with cement, and 3) the community

dumps waste directly into the yard and yard or flows directly into the river. Careless disposal of tailings and waste collection that is not safe for the environment; it is considered that groundwater and the waters around the location will be polluted with mercury. This is what makes it essential to conduct research to test the mercury content in surface groundwater. Until now, mining activities are still carried out by the community and are very difficult to stop because they are their main livelihood. On the other hand, if mining activities continue to be carried out, the amount of mercury that is wasted into the environment will increase. Therefore, the research is carried out in-depth research so that it can be classified and mapped the distribution of mercury. The purpose of this research is to determine the mercury content in surface groundwater in the coastal areas of the southern part of West Lombok

## 2. Methods

The method used in this study is observation and laboratory testing. Tools and materials used in this study can be seen in full in Table 1. as follows.

Table 1. Tools and Materials Used in Research.

No.	Tools and materials	Purpose
1	Sample bottle	for storing samples
2	HNO 3	preservation of water samples
3	Coolbox	For storing water samples
4	GPS	To determine the coordinates of the research location
5	Camera	documentation
6	Water sampler	taking water samples
7	water quality tester	testing the quality of the physical parameters of water
8	The meter	measures the depth of the groundwater level and distance
9	Landsat ETM 7+ images	know the location of the settlement

Data collection is done in the field and the laboratory. The method of taking test samples and analyzing groundwater carried out according to the Indonesian National Standard (SNI). When taking groundwater surface, the depth of groundwater level, excellent condition, depth of well, distance from amalgamation location, and surrounding environment are considered. Water sampling is carried out according to the Indonesian National Standards (SNI). Water samples are taken merely using a water sampler and then given HNO 3 to pH 2 - 3. Then cooled at  $\pm 4$  o C. The number of surface groundwater samples taken was 10 samples. A sampling of surface groundwater is carried out at the location of dug wells in the vicinity of the amalgamation process. Analysis of mercury content in water by using mercury analyser (AAS). For the quality standard for mercury content in well water used is the water quality standard according to Government Regulation No. 82 of 2001

## 3. Result and discussion

### A. Sampling location

The location of this study can be seen in Figure 1 below

PETA

### B. Mining Activities

Mining activities carried out by the Sekotong community in their homes use the amalgamation method. The water requirement for an amalgamation process requires 7.5-10 liters of water obtained from a well. Waste amalgamation process (tailings). In the form of a mixture of water, rock powder, and mercury which is wasted with the tailings. The stages of the amalgamation process can be seen in the following picture:

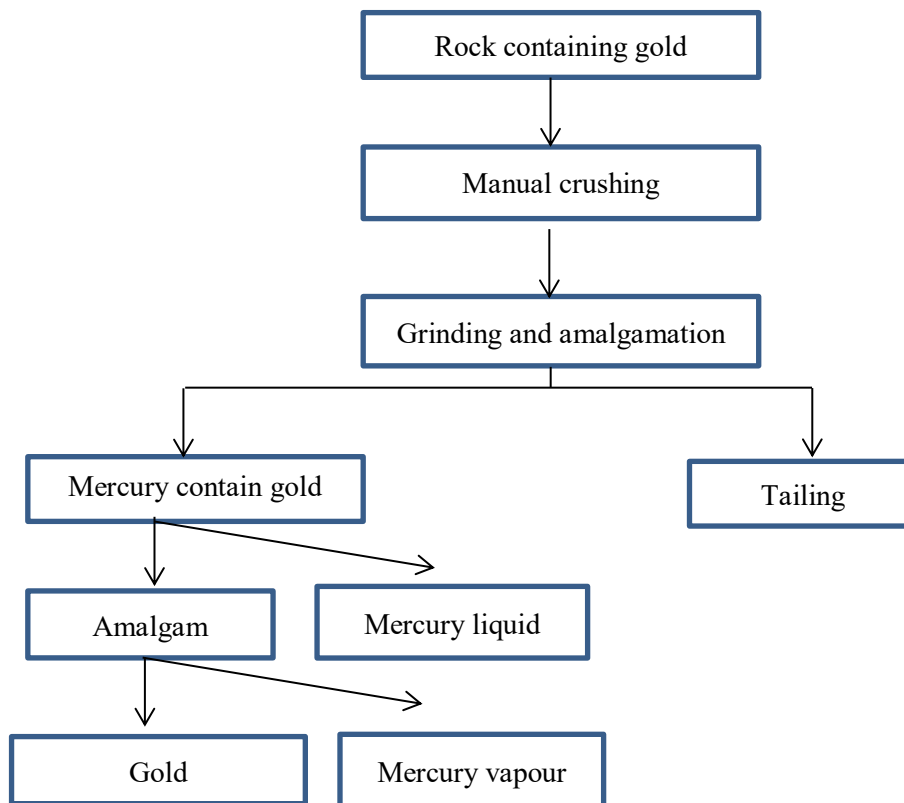


Fig. 2. Stages of Amalgamation Process

Mercury Content in Surface Water From the results of the analysis of mercury content in well water in three Sampling Villages, namely Desa Sekotong Barat, Pelangan Village, and Desa Batu Putih it is known that the mercury content at the sampling location has the value of 0.06 g / L - 0.085  $\mu$ g / L. Based on Government Regulation No. 82 of 2001 showing that, surface groundwater quality in the Southern West Lombok area is classified in class 1, with a mercury content of less than 0001 mg / l.

#### 4. Conclusion

Mercury content in well water in the three study villages, namely Desa Sekotong Barat, Desa Pelangan and Desa Batu Putih, values ranged from 0.06  $\mu$ g / L - 0.085  $\mu$ g / L. Based on government regulation number 82 of 2001 concerning water quality management and regulation of water pollution and KEP-02 / MENKLH / I / 1988, shows that the quality of surface groundwater in the coastal areas of the South West Lombok is classified in class 1 and is still below the threshold pollution.



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