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DETERMINATION THE OCCURANCE OF MERCURY IN SOIL IN THE MINING AREA OF ROMANG ISLAND

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Info Artikel

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Abstract

The occurance of mercury in the environment whether on land, water and air can occur because of human activities or naturally existed. In gold mining activities, the source of mercury occurrence can be from the mining activity or being naturally exist in the land and water. Romang Island is one of the islands in the Maluku Islands. In the Romang Island, currently being done the process of exploring the potential of mining materials. Metallic minerals to be explore on Romang Island included Gold (Au) and associated metal minerals such as Silver (Ag), Copper (Cu), Zinc (Zn), Lead (Pb) and Manganese mineral (Mn). This study aims to determine the occurrence of mercury in the soil in Romang Island. This research is very important to understand whether the mercury in Romang Island is natural existed or available due to the mining activities. In order to determine the mercury in the soil, laboratory test was conducted. Soil samples were taken using non-probability sampling method: accidental sampling and purposive sampling. Selection of this sampling method is done with consideration of limited road accessibility on Romang island and security. From the results of laboratory tests, we found that mercury in Romang Island is naturally existed. The value range from 0.223 to 1.627 ppm. The natural existence of mercury in the Romang Island is quite possible given the geological conditions on this area.

Abstrak

Kata kunci: Merkuri, tanah, tambang emas, Pulau Romang

Keberadaan merkuri di lingkungan baik di darat, air dan udara bisa terjadi karena dibawa oleh manusia atau terdapat secara alami. Pada kegiatan pertambangan emas, merkuri dapat berasal dari proses pengolahan apabila proses yang digunakan adalah adalah proses amalgamasi. Keberadaan merkuri pada pertambangan juga dapat dikarenakan merkuri terdapat secara alami sebagai mineral ikutan pada komoditas tambang yang ditambang. Pulau Romang merupakan salah satu pulau yang berada di Kepulauan Maluku. Saat ini, di wilayah Pulau Romang sedang dilakukan proses eksplorasi potensi bahan tambang. Mineral logam yang akan di tambang di Pulau Romang antara lain mineral logam Emas (Au) dan mineral-mineral logam ikutannya seperti Perak (Ag), Tembaga (Cu), Seng (Zn), Timah Hitam (Pb) dan logam mineral Mangan (Mn). Studi ini bertujuan untuk melakukan uji keberadaan merkuri pada tanah di Pulau Romang. Penelitian ini sangat penting untuk mengetahui apakah keberadaan mercury di Pulau Romang bersifat alami atau bersumber dari kegiatan penambangan. Untuk mengetahui kandungan merkuri dalam tanah perlu adanya uji laboratorium. Sampel tanah diambil menggunakan metode *non-probability sampling* yaitu *accidental sampling* dan *purposive sampling*. Dari hasil uji laboratorium, mercury di Pulau Romang dijumpai secara alami dengan kisaran 0,223 – 1,627 ppm. Keberadaan mercury secara alami sangat mungkin mengingat kondisi geologi di Pulau Romang.

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1. INTRODUCTION

Indonesia has a large quantity of mining commodities such as nickel, tin, bauxite, copper, gold and so on. Indonesia's nickel reserves accounted for 6% of the world's nickel reserves (Devi and Prayogo, 2013). As for other minerals, about 17% of the world's total tin reserves are in Indonesia, while Indonesia has about 4% of the world's total copper and bauxite reserves and 5% of the world's total gold reserves (Investment Business Global, 2015).

Mining activities usually located in remote areas. With this activities, many people expected mining become an economic driving force in the area. Mining activities cover many aspect ranging from hard labour to soft labour. It involved economic, social study, enginering etc. Significant impact both for local government and local communities therefore expected. (Fleming and Measham, 2014; Xing et al., 2017). Therefore, the improvement of the regional economy derived by mining activities is unavoidable. Environmental and socio-cultural changes is one of the examples (Reis et al., 2016; Robles et al., 2014). Land degradation can be one of the major example the effect of mining activity toward evironment. Proper mining plan accompanied by the application of good mining practices can minimize the impacts of environmental and socio-cultural changes that may occur as a result of mining activities (Peluso, 2017).

Mining Companies activity in Romang Island has entered the exploring phase and planning to produce Gold Metals (Au), Silver (Ag), Copper (Cu), Zinc (Zn), Lead (Pb) and Manganese (Mn).

The purpose of this paper is to verify the mercury occurance in soil of the Romang Island. Since the mining activity is not yet entered the explotation phase, we can justify wheter the mercury in the Romang Island is naturaly avalible or not. If so, than what is the value? Figure 1 shows the natural occurance of mercury in the soil, water and in the air.

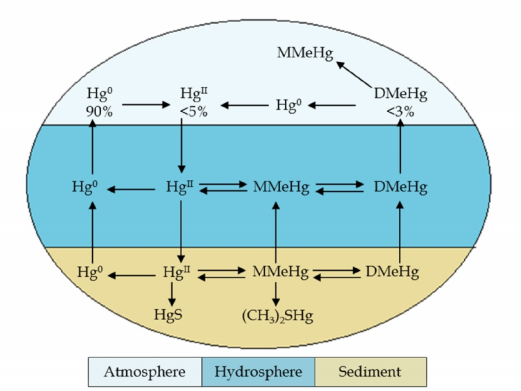

Figure 1. Distribution of mercury species in atmosphere, hydrosphere and sediment (Leopold et al, 2010).

With this research, we can give recomendation to the mining company or the government to ensure the presence of mercury. Therfore they can localize and minimize the mercury at mining sites in general and make a strategic plan to minimize the efect of the mercury to the environment. Thus, the protection of water resources and land around the mining site can be implemented.

1.1 Study Area

The study area is located between 7° 29′ 47″ to 7° 18′ 12″ N latitude and 127° 18′ 55″ to 127° 30′ 15″ E longitude. This research is conducted in the Romang Island, Sub-district, Southwest Maluku District, Maluku Province. Figure 2 shows the location of the Romang Island. This area dominated with hilly to mountainous terrain. The higest mointain is 747 msl. Land cover of the area is dominated by primary forest, secondary forest, shrub land, mix garden, agriculture land and settlement. The climate of Romang Island is majorly controlled by Banda Sea. Due to this condition, Romang Island has two peak of wet season within a year. It occurred during December/January and March/April.

Geology of Romang Island controlled by tectonics processes. During early Pliosen, the tectonic activity has create folded ridge and several fault-line in this area. This processes creates sulfide residues such as Au, Ag, Cu, Pb, Zn, Mn.

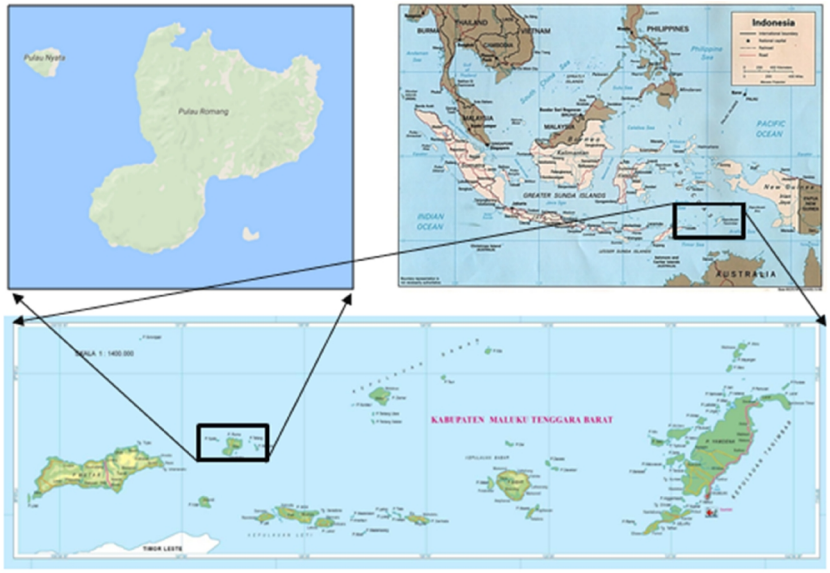

Figure 2. Study Area: Romang Island

2. METHODS

2.1 Sampling Desain

The soil sampling scheme was carried out by applying non-probabilistic sampling. Due to limited road accessibility and security, in this research we use accidental sampling and purposive sampling. 6 soil samples were collected. All the sample were excavated from the soil surface till 50-100 cm below soil surface. Figure 3 shows the soil sampling activities.

Figure 3. Soil Sampling

2.2 Soil Analysis

The soil collected from the field survey than analized by Geoservices Laboratory. This is an accredited laboratory by National Accreditation Committee.

In order to determine the occurance of the mercury in soil, laboratory analisys were conducted. Cold vapor atomic Absorption Spectrofotometer (CV AAS) was used to determine the mercury in the soil samples.

In order to avoid subjectivity, the soil samples were collected by independent team accompanied by the representatives of Indonesian Goverment, Provincial Governments and representatives from the academic team as well as the representative of the mining companies. The result of investigation is to verify the occurance of mercury at mining area in Romang Island. By understanding the sources of potential major polluters, an effective and efficient management can be implemented.

3. RESULTS AND DISCUSSION

From the results of field investigation, we found that several mining companies has not start their mining activity. When the field work was conducted, the mining company is in the state of explration, construction preparation, plants around the drilling site grow well. No exploitation has ben conducted. From the result of the laboratory test, we found that the mercury in the soil of the Romang Island as follow:

Table 1. Results of Soil Sampling Analysis at Mining Area In Romang Island

No	Location	Hg Value (ppm)
1	LWD 062	0,335
2	LWD 084	0,226
3	LWD 173	0,228
4	LWD 645	1,136
5	LWD 728	0,223
6	LWD 735	1,627

The results of CV AAS test shows mercury content in the soil samples ranging from 0,223 ppm to 1,627 ppm. Since in Indonesia ther is no standard for the mercury threshold in soil, therefore we use the standard from United States Environmental Protecy Agency (USEPA) to compare our result. According to USEPA, the residential soil screening level (SSL) is 2.3 ppm (Gray et al., 2014). Therefore, all the samples were bellow SSL.

The natural occurance of mercury in soil of Romang Island can be caused by its geological seting. Geologically, Romang Island is consist of volcanic rocks composed trachyandesitic from around Misoen to Plio-Plistosen Era. The stratigraphy on the island is thought to have something in common with Wetar Island, a gold trap occurring in eroded plutonic rock environments, when the ultimate phases of magmatism carry a hydrothermal and groundwater solution. This process is known as the epithermal process, as it occurs in shallow and low temperatures (Zhu et al., 2011). The concept of epitermal gold deposits is a novelty that gives a significant change in the potential of Indonesian gold. Seawater that enters the body of the earth role to bring mineral solution to the surface. Mercury is naturally present with gold. Mercury is a gold associated mineral followed by a collection of high epithermal sulphide alterations in the context of the Banda arc indicating the presence of sulphide-related deposits. This high epitermal sulphide produces Au (gold) metal, as well as one of Hg (Mercury).

4. CONCLUSIONS

Analysis of soil mercury content at the mining area in Romang Island shows that the value ranging from 0.223 ppm up to 1.627 ppm. Compared to standard from USEPA that threshold for mercury in soil is 2.3 ppm, we found that all the samples show a good value.

Mercury is naturally existed in Romang Island due to its geological setting. The occurance of Gold in this area were formed by hydrothermal epithermal processes. This processes can be the source of the natural mercury.

Mining Companies in Romang Island are still conducting pre-construction activities and continuing exploration activities. Therefore, no exploitation activities has been done. Although it is very small, mercury content in soil need to be monitored and managed especially when exploitation activities will be done. Therefore, environmental issues can be minimized.

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