

## ENVIRONMENTAL POLLUTION KNOWLEDGE OF SMALL SCALE MINERS IN BOMBANA REGENCY, INDONESIA

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### ABSTRACT

Mining in Bombana Regency is a very promising source of new income for the community. Not only local people but also all Indonesian individuals who know the existence of mining activities. The purpose of this study is to describe the demographic conditions of gender, age, education and previous work and the influence of variables. Questionnaires used as primary data gathering tools. Random samples used as sampling methods in the population. Of the existing population, 252 used as research specimens. In this research, qualitative descriptive analysis and Pearson correlation with SPSS program used. The results showed that the miner's knowledge of gold processing derived from experience and interaction in the mining area. The lack of local government's role after anticipating small-scale gold miners who do not understand the impact of their activities.

**KEY WORDS:** Demographics, Knowledge, Gold Miners

### INTRODUCTION

Traditional gold miners use mercury to capture and separate gold grains from rock grains. This Hg precipitate is filtered using a cloth to get the rest of the gold. The filtered sediment then squeezed by hand. Water remains of minerals containing Hg are allowed to flow into the river and irrigated for agricultural land. Also, mercury components are also widely spread in corals, soil, air, water, and living organisms through complex physical, chemical, and biological processes.

Development in this area enhances the real sector and to achieve a steady economic development of the nation but on the other hand, causes environmental conditions to decline due to the negative impact of the elaboration of the sector (La Ode Muhammad Yasir Haya, 2014).

Mining activities use a lot of water, although some are the result of recirculation. Sulfide-containing minerals, due to their contact with air through mining, form sulfide acids in combination with the trace element. This condition as a whole has a negative impact both on surface water and on groundwater. Water contamination can also come

from landfill tailings and rock waste, not to mention the explosion process that can increase water salinity.

Identification and control of the environment that will cause environmental conditions and society to be bad. Important aspects of the implementation process include the closure of small-scale mines and non-compliant factories regarding environmental pollution (Siddiqui *et al.*, 2012).

Bombana Regency was formed in 2003 as a result of the expansion of Buton Regency and is one of the Regency located in Southeast Sulawesi Province, Indonesia. At the beginning of September 2008, some people found a lump of gold in the river tahi ite and from where the start of mining activities. Since that time people began to speculate to become gold miners. The high interest of becoming a miner has also been known to the public in various parts of Indonesia and then came to Bombana to become a miner (Hadi, 2009).

In regulation (Departemen Kesehatan Republik Indonesia 2016). (a) Mercury is one of the persistent and bioaccumulative chemicals in ecosystems that negatively impact human health and the environment; (b) Indonesia is currently identified in

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mercury use in the industrial field, especially small industries that contribute to high mercury contamination, so it is necessary to reduce and eliminate mercury in Indonesia. Reduce and eliminate mercury in Indonesia; it is a need to follow up the implementation of Practices in the Sound Management of Chemicals in 2020.

Among the passages in mining operations, when amalgam smelter mercury will vaporize with high exposure. In mining areas especially in the surrounding mining villages that are not exposed, from mining activities have adverse effects on public health, especially children (Drasch *et al.*, 2001). Small-scale gold mining activities will contribute enormously to the release of mercury to the whole world and especially to the local, regional environment by using mercuric water to extract gold from the ore (De Lacerda and Salomons, 2012).

The social and environmental production of suffering is a process shaped by the reciprocal interactions among several social and environmental factors. It is well-known worldwide that the aggregates and accumulated negative social and environmental impacts of gold mining activities leave more suffering to the local communities than to the gold traders and consumers. Nevertheless, the forms of human suffering can be at the same time collective and individual; the modes of experience in pain and trauma can be both local and global (Kleinman *et al.*, 1997). The extractive and mining industry is an important sector and well-known for its associated socio-economic negative impact (Moody 1991). A massive open-pit gold mine generates an average of 76 tons of wastes per ounce of gold (Earthworks, 2007). A long list of cultural and human right violations, pollution from cyanide spills, and endless debates over Submarine Tailing Disposal associated with large-scale mining (Moody 2003) (Earthworks, 2007). This study illustrates the knowledge of small-scale mining minerals pollution influenced by related factors.

#### MATERIALS AND METHODS

Research location in Bombana Regency Southeast Sulawesi Province, Indonesia. Bombana Regency is geographically located south of the equator, extending from north to south between 4°30' – 6°25' South latitude and extending from west to east between 120°82' – 122°20' east longitude. Bombana Regency is adjacent to Kolaka and Konawe districts in the north, sea flores in the south, Bone Bay in the

west and Muna Regency and Buton Regency in the east (Statistik, Badan Pusat, 2016).

Primary data collected in the form of respondents conducted on the location of small-scale mining precisely in the Village District Wumbubangka North Rorowatu and Rau-Rau Village Rorowatu.

The type of research used is survey research, where the research collects information from a sample by asking through questionnaires or interviews by using questionnaires to generate a picture of various aspects of the population (Fraenkel *et al.*, 1993).

This study uses questionnaires as a means of collecting primary data provided by the respondents as a sample of the existing population. Random sampling used as a method of sampling in the population then the respondent is a small-scale miner active in mining by using mercury material in mining activities. The people of small miners at the time of this study conducted by 1000 - 1300 workers. Of the population used 252 as a sample of the study. Descriptive research typically uses larger samples; it sometimes suggested that one should select 10-20 percent of the accessible population for the sample (Singh, 2006). In this research, descriptive qualitative analysis done by giving a description, condition and level of knowledge of small-scale mining community that uses mercury material as part of mining activity and frequency and percentage data employed in the discussion. Pearson correlation analysis with SPSS program is used to find out how weak or strong relationship between variables age, education and previous work to the level of miners' knowledge.

#### RESULTS AND DISCUSSION

The major advantage of descriptive statistics is that it permits a lot of information to describe the fact that the median (more about these in a moment). When such indices calculated for a sample drawn from a population, they are called statistics; When they derived from the rest of the population, they are called parameters. We present the most commonly used techniques for summarizing such data. Some form of a summary is essential to interpret data collected on any variable a long list of scores, or certain representations are just unmanageable (Fraenkel *et al.*, 1993). Demographic profiles of respondents in this study can see in Fig. 1 to 4.

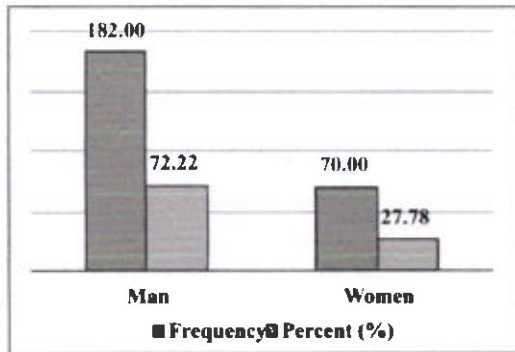


Fig. 1. Gender Respondents

Fig. 1 show sex distribution of respondents with the frequency of men amounted to 182 people with a percentage of 72.22%, and the rate of women amounted to 70 individuals with a percentage of 27.78%. These results can conclude that the majority of small-scale gold miners are male, while female sex is the majority of wives of male miners. Another observation point is that some miners bring their families, i.e., wife and children, either helping or just accompanying male miners.

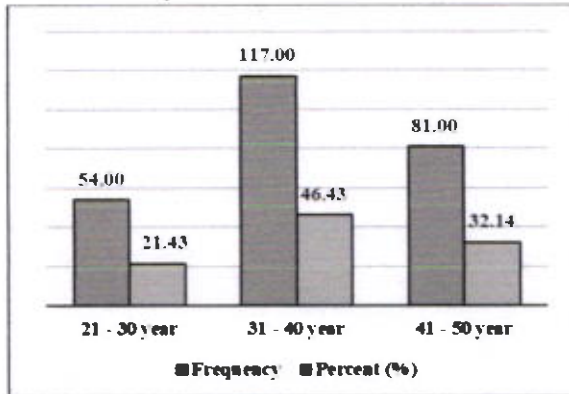


Fig. 2. Age of Respondents

Fig. 2 shows the distribution of respondent age with age frequency of respondents ranged from 21 - 30 years old 54 people with a percentage of 21.43%. The incidence of respondent age ranged from 31 - 40 years 117 individuals with percentage 46.43% and frequency of respondent age ranged between 41-50 years of 81 people with a percentage of 32.14%. These results show that the majority of miners ranged from 31 to 40 age.

The demographic condition of a region greatly influences one's decision to make a migration or

residence. Younger age factors are a primary consideration for a person in immigration. In this study, the majority of individuals have been married and have children more easily take the decision to immigration by looking at the demographic conditions of the area that will be habitable.

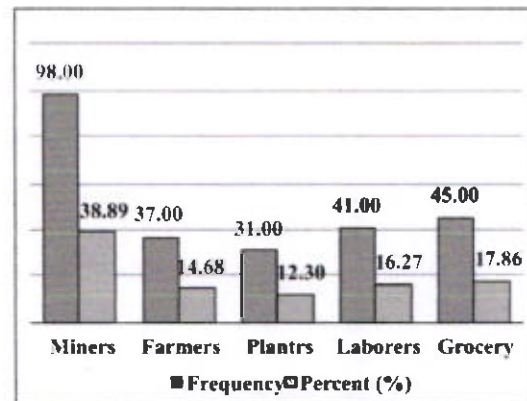


Fig. 3. Previous Respondents Job

Fig. 3 shows frequency distribution of respondents with the previous job miners amounted to 98 people with percentage 38.89%, kind of work farmers amounted to 37 people with percentage 14.68%, type of plants work amounted to 31 people with percentage 12.30%. Kind of work laborers amounted to 41 individuals with a rate of 16.27% and with the type of work grocery amounted to 45 people with a percentage of 17.86%. The result concluded that the majority of respondents' work before becoming small-scale miners works as miners. The work of miners is done to move from one place to another where the location. The majority of miners come from outside the region and deliberately come to the area just to become miners

In the condition of local farmers, the general public and agricultural sector in the research area experience social, economic and environmental impacts of gold mining activities. Caused by a shift in the work of farmers into gold miners. Drought, damage to agricultural land, land and water disguises and land ownership from farmland to mining property. The mine has also given birth to a more complex new social structure, consisting of landowners in mining areas, large mining companies, large capital traders (gold buyers), government officials, basic needs traders, inns to prostitution. Large companies cause social interaction between communities, cooperation between mining corporations and government and

competition among mining companies. Although there is an agreement between mining companies and local communities, there is also a tendency for conflict between communities (Meisanti *et al.*, 2012). Conditions at the time of the study are still in a situation where people are still searching for new mining areas, and local governments are beginning to collect data on small-scale loggers in and are directed to cooperate with large mining companies.

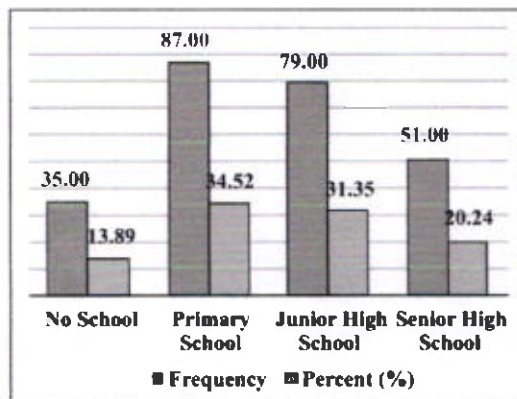


Fig. 4. Respondents Education Level

Figure 4 shows non-schooling of 35 people with a percentage of 13.89%; primary school education is 87 people with a rate of 34.52%, junior high school education level is 79 people with a rate of 31.35% and high school education level amounted to 51 people with a rate of 20.24%. These results indicate that the majority of primary school education levels.

To gain knowledge about a person or the social life of a community or group, the approach taken must be more humane. One of them is by trying to get closer to people or social objects that will be studied. The data obtained through various surveys, questionnaires, personal tests and standardized instruments (Burrell and Morgan, 1979).

Criteria level knowledge of one can be known by interpreted with a scale that is qualitative (Suharsimi, 2006) as follows:

- High-Scale Knowledge: Percentage yields ranged from 76% - 100%.
- Medium-scale Knowledge: Percentage yields ranged from 56% - 75%.
- Less-scaled knowledge: Percentage yield below 56%.

The level of knowledge of small-scale miners is generally at a small degree of knowledge, as can be seen from Fig. 5. which shows that the frequency with the knowledge level is less than 106 people

with the percentage 42.06% and the incidence of knowledge level is 80 individuals with the rate 31.75% and the frequency of experience level is 66 individuals with the percentage 26.19%.

According to (Notoatmodjo 2010), there are two ways to gain knowledge, namely: (1) Trial and error:

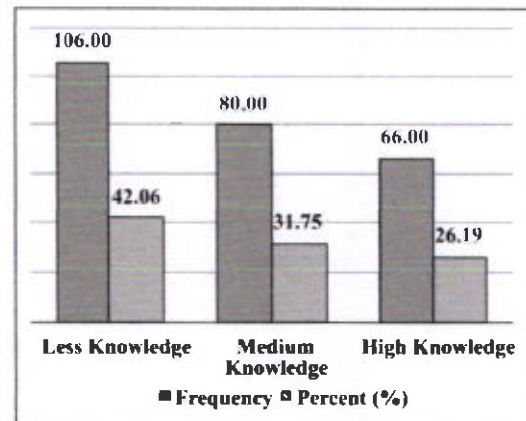


Fig. 5. Knowledge Level of Respondents

This method has been used before culture and even before civilization. At that time someone when faced with problems or problems, the solution is done by trial and error alone. Even today even this method is still often used, especially by those who have not or do not know a certain way to solving problems encountered; (2) The mode of power or authority: Authorities, both government leaders, religious leaders and scholars in principle have the same mechanisms in the discovery of knowledge. This principle is that others accept the opinions expressed by persons having authority, without first examining or validating them either based on empirical facts or by their reasoning. Is because the person receiving the opinion assumes that what he or she has found is correct.; (3) Based on personal experience: This done by repeating the experience gained in solving problems encountered in the past.; (4) Through the mind: In line with the development of humanity's culture, the way people's minds develop. From this man has been able to use his reasoning in obtaining his knowledge. In other words, in acquiring the truths of human experience have used his way of thinking; (5) Modern or Scientific Ways: The new or modern way of gaining knowledge today is more systematic, logical and scientific. This method is called the method of scientific research.

Other studies have shown that environmental contamination from mercury use from small-scale gold mining activities has significantly increased and has accumulated to acute high. Then the use of mercury for gold processing plants concerning fluctuations in mercury levels in water and river sediments has provided insight into the mercury disperse path from the gold processing plant throughout the river system. Increased levels of mercury will provide a strong indication that the contamination in this area (Limbong *et al.*, 2003).

The lack of local government funding for community training poses a significant challenge in implementation in the application of international guidelines on alternative methods and to produce local capacity for fabrication of clean technologies in priority gold ore incorporation. In this case, the stakeholders widely shared the view that mining officials have a vital role in developing community technical monitoring programs (Spiegel & Veiga, 2007) (Siddiqui *et al.*, 2012). What happens in other parts of the world is almost the same in Bombana Regency regarding increasing environmental knowledge, the lack of funds to carry out these activities becomes the most important factor. These conditions make small-scale miners increasingly engaged in mining operations by not taking into account the impact that will cause both environmental and health impacts.

For the correlation between variables, i.e., whether the existing sample data provides sufficient evidence that there is a link between the variables in the sample's origin population. And if there is a relationship, how strong the relationship between variables will use Pearson correlation analysis whose results can see in Table 1.

To facilitate the correlation rate obtained shows a high correlation level or weak bias shown through numbers above 0.5 indicates a strong correlation while below 0.5 indicates a weak correlation (Santoso, Singgih, 2014)

**Table 1.** Pearson Correlation of Demographic Variables on Knowledge Level (N = 252)

Variable	Correlation Coefficient	Sig.	Explanation
Age	.265	.003	Very Weak Correlation
Education	.712	.010	Medium Correlation
Previous Job	.487	.006	Weak Correlation

Table 1 reveals that the age factor of respondents obtained correlation coefficient value of 0.265 with probability value (sig.) 0.003 which means there is a significant relationship between age and education with feeble association level. The presence of age differences does not significantly affect the standard of knowledge related to mining impacts. The older a person, the more experience he gets. Knowledge based on experience Experienced is the knowledge in question.

Further education respondents showed correlation coefficient value obtained by 0.712 with probability value (sig.) of 0.010 which means there is a significant relationship between education respondents in this case gold miners education to the level of knowledge gained from the education. From these results can be concluded the higher the level of teaching the higher the knowledge will be obtained.

According (Notoatmodjo, 2003) which states that a highly educated person has better knowledge compared with individuals with low and middle school education. Education has a significant role in determining the quality of human beings, with personal education considered to gain knowledge and information, and the higher a person's education, the better quality of life.

However, it seems that in this study that economic factors are very influential in changing the condition of someone to be no longer using their knowledge, they know that the activity they do is wrong but because of the economic and social situation and see everyone doing the mining operations is known Will damage the environment.

Community-run gold mining provides better employment opportunities as well as being a significant livelihood and capable of meeting all economic and savings needs. The traditional mining sector also has a positive impact on the fulfillment of social needs, when the income portion of the segment is used to meet the need for access to children's education, health and other social needs (Harianja and Sukmana, 2014).

Then the work factor of previous respondents shows the value of correlation coefficient obtained by 0.487 with a probability value (sig.) Of 0.006 which means there is a significant relationship between the previous respondent's work to knowledge related to gold mining. Can be concluded from the results terms but that the higher or better the work of interviewees the higher the level of education.

Indeed, long work contributes to influence the standard of knowledge of a person; this is because the work is closely related to social and cultural interaction factors, while social and cultural interactions closely related to the process of information exchange. And this will certainly affect the level of one's knowledge. In small-scale mining, not all miners in the location have jobs or experience in gold mining. Most miners who came before worked as farmers or fishers therefore not all miners have knowledge about how to mine traditionally.

The need for integration between planning and application of the field to generate awareness regarding how to maintain the environment. The role of government by conducting socialization and training on small-scale gold miners on environmentally friendly color processing methods and how to mine a bend with materials and tools that have tested friendly to the environment. It should also convey regarding the impact of gold mining on the environment, health, and safety.

The social system that originally built was a crocodile system of farmers' and fishermen's communities, which differed from the culture of mining activities undertaken by the community. The culture of farmers or fishers in carrying out their activities in need of process and persistence. Meanwhile, mining operations tend to be instant, because if today get the results, then the day can also earn money in much greater amount when compared with the results as a farmer or fisherman and construction workers. As a result, as it continues and people are accustomed to such a pattern, they will experience a cultural change from process culture to instant culture that will be very harmful in the long run.

Social change of society can no longer regard as an acceptable effect, but a severe impact. Variations in the social system of society will affect the life pattern of a community in a region and will be able to influence nationally (Pudjiastuti, Tri Nuke, 2009).

### CONCLUSION

From the results we have discussed it can conclude that all aspects of the demographic profile of small-scale miners to the miners' knowledge are in real gold processing. The knowledge gained is still based on the experience they have made and succeeded even though the procedures and impacts that will arise will be much greater than the results obtained. The lack of information received by small-scale

miners related to environmentally friendly gold processing methods led to knowledge gained from experience and interaction among miners at the mine site. Therefore, the government should be more responsive to the impact that will happen to the environment, safety and health, especially the more complex socio-economic impacts will occur.

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