ENVIRONMENTAL AWARENESS AND HEALTH ASSESSMENT IN ARTISANAL AND SMALL-SCALE GOLD MINING OF SIBUTAD, ZAMBAONGA DEL NORTE

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Abstract

Mining is considered a complex, energy intensive industry, as seen by the global insurance market. The complexity of the industry from the insurers’ perspective is based on the broad scope of loss potential, or health risk. In this study the researchers wanted to determine the environmental awareness and health assessment in artisanal and small-scale gold mining in Libay, Sibutad, Zamboanga del Norte. The result revealed, majority of the miners and ball mill operators were not totally aware on their health risks due to prolonged mercury exposure. It seems that most of the methods used by ball mill operators appeared to be hazardous both to the worker and the environment. Thus, there is a need to regulating the small-scale mining activities which may include licensing/registration and strict compliance of safety measure to small-scale mining. Lastly, miners and ball mill operators should be encouraged to submit themselves for blood sampling for mercury analysis.

Keywords: Environmental Awareness, Health Assessment, Artisanal & Small-scale mining.
Introduction

Mining is considered a complex, energy intensive industry, as seen by the global insurance market. The complexity of the industry from the insurers’ perspective is based on the broad scope of loss potential, or risk. The International Labour Organization (ILO, 1999) report an estimated number of artisanal miners was around 11 to 13 million in 55 mainly developing countries. From these results, it was extrapolated that 80 to 100 million people worldwide were directly and indirectly reliant on this activity (Hinton, J.J., 2005). Risk is present in many different aspects of mining, including environmental, employee’s health and safety, and etc. (Koponen, et.al.). Furthermore, environmental effects have included extensive land disturbances, loss of forest cover and habitat, contamination of rivers used for drinking water and food supplies, and increasing social conflict over access to mineral resources.

Priester et. al., (1993), explain the vicious circle of artisanal and small scale mining as basically caused by lack of training, finance and equipment which in turn generate other negative processes like low efficiency, low production, low wages, poor working conditions and even health risk to heavy metal. In terms of their health conditions, miners were exposed to heavy metals which are present in the substance used to separate gold from the ore. In terms of environmental conditions, McMahon, et.al.,(2000), pointed out that artisanal and small scale mining contributed environmental problems such as in land, air and water. In land, occurs soil erosion, loss of top soil, while for water, mercury pollution, sedimentation and siltation. Other problems may occur like mercury vapors, deforestation and loss of biodiversity. The Philippine Journal (1997), as cited by Israel, D. & Asisrot, J. (2000) presented a report that DENR is closely monitoring the provinces of Zamboanga del Norte, Cagayan de Oro, Davao del Norte and Negros regarding the extent of mercury pollution in their particular waterways.

Accordingly, Zamboanga del Norte is one of the mineral depositories in the Philippines (Goodland, R. & Wicks, C. (2008). This mineral includes chromite, gold, bentonite, marble, limestone, quartz, manganese, pebbles and gravel. Gold is the dominant product in Sibutad one of the Municipalities in Zamboanga del Norte wherein an estimated of about 17.6 million metric tons of ore containing an estimated 0.84 grams of gold per ton (Philex Mining website, 2008).

Environment of Sibutad was destructed by gold and copper mining in the 1990’s and early 2000s as Philex Gold Mining began to operate (Goodland, R. & Wicks, C. (2008). Further, there was an overflow from Philex’s tailings dams repeatedly affected the immediate surroundings, silt the bay and damage mangroves, which resulted in half massive fish kills (Bautista, 2008 cited by Goodland, R. & Wicks, C. 2008). Murcielagos Bay was affected not only by sedimentation but also by mercury and cyanide pollution from the mine spills (University of San Carlos, 1998). Goodland, R. & Wicks, C. (2008) recommended that the Government of Zamboanga Del Norte particularly in Sibutad to ban mining in critical water catchments and to prioritize the immediate protection of the environment including reforestation, food security and human rights including the right to a healthy environment for present and future generations.

Thus from the foregoing, it is necessary to assess the status of Sibutad as far as their community’s environment and health conditions are concerned. The researchers will launch a public awareness program on the effects of the heavy metals in mining on human health, in partnership with the concerned agencies like Department of Health (DOH) and the Local Government Units. In addition extend environmental management and care
campaign with the cooperation of the Department of Environment and Natural Resources (DENR).

Objectives of the Study

In this study, the researchers will determine the environmental awareness and the health conditions of Libay, Sibutad, Zamboanga Del Norte during the Calendar Year 2012 – 2013.

Specifically, it determined the following:

1. to obtain the biographical profile of the artisanal miners;
2. to examine the environmental status of Libay, Sibutad, Zamboanga del Norte;
3. to determine the level of awareness on mercury exposure among artisanal miners and ball mill operators; and
4. to explore the health condition of artisanal miners.

Research Methods

In this study, the researchers will utilize the descriptive evaluative research with the aid of Environmental and Health Assessment Questionnaire (Appendix A). The target – respondents are artisanal miners and some members of the household living within or near the mining site. They are selected through random sampling procedures.

Demographic Profile and environmental awareness and health assessment of artisanal miners

In this study, the researchers will utilize primary and secondary sources of data. Furthermore, they will personally administer the instrument and will conduct personal interview regarding awareness of their environment condition. The instrument (EHAQ) is modified from Filho, et.al., (2004) used to examine the demographic profile of the artisanal miners and to indicate symptoms of mercury poisoning. Further, a secondary data will be collected from the office of the DENR, Sibutad Rural Health Community Hospital. Other sources of data were the key informants, Local Government Units, and the small-scale miners and processors in the study site who were covered by a brief survey conducted for the study.

Results and Discussions

Biographical Profile of Artisanal Miners

Tables 1 and 2 are the biographical profile of miners in Libay, Sibutad Zamboanga del Norte as to their role and other profile characteristics. In this study, the researchers select two types of miners, the ball mill operator and the miner itself. A total of 44 small-scale miners were covered by the survey, which is about 15.60% of the total miners in the area. Simple random sampling was utilized in order to determine the representative miners included in the study. As presented in Table 1 there are about 63.64% of the miners to be included in the study while 36.36% of the respondents are processor. This processor/ball mill operator constitutes of about 30.77% while only 12.17% from the estimated number of ball mill operators and miners in the area.
Almost half of the miners and ball mill operators (40.90%) aged 26 to 35 years old (Table 1). Majority (81.82%) are married but elementary graduates (79.55%) and all male (100%) respondents. This means that only males are engaged in mining activities this is because males generally who handle grinding machines and traditional approach in gold processing. Some of them aged below 18 years old at the same time did not finish even their elementary education due to financial crisis. Furthermore, there are some children of the household members who are also engaged in mining (source: key informants). Women’s participation in artisanal and small-scale mining involves in trading of minerals such as gold and silver. Not so much on that, women involvement not only limits to mining but they are also involved in the supply of food, drink, tools and equipment.

Based on personal interview some of the reasons for children involvement in mining are mainly poverty driven and low family income. Further reasons of their involvement namely: parents do not have enough income for school material, clothing and food supply, and lack of awareness for child labor in mining.

Environmental Status of Libay, Sibutad Zamboanga del Norte due to mining

Table 1 Profile of Miners in terms of their Role in mining activities

<table>
<thead>
<tr>
<th>Role</th>
<th>Target Respondents</th>
<th>Estimated Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td>Processor (Ball Mill Operator)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>36.36%</td>
</tr>
<tr>
<td>Miner</td>
<td>28</td>
<td>63.64%</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 2 Profile of Miners and Ball Mill Operators in Libay, Sibutad, Z.N.

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 and below</td>
<td>10</td>
<td>22.73%</td>
</tr>
<tr>
<td>26 – 35</td>
<td>18</td>
<td>40.90%</td>
</tr>
<tr>
<td>36 – 45</td>
<td>10</td>
<td>22.73%</td>
</tr>
<tr>
<td>46 and above</td>
<td>6</td>
<td>13.64%</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>44</td>
<td>100%</td>
</tr>
<tr>
<td>Female</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Civil status</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>8</td>
<td>18.18%</td>
</tr>
<tr>
<td>Married</td>
<td>36</td>
<td>81.82%</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Highest Educational Attainment</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary</td>
<td>35</td>
<td>79.55%</td>
</tr>
<tr>
<td>High school</td>
<td>9</td>
<td>20.45%</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>100%</td>
</tr>
</tbody>
</table>

Almost half of the miners and ball mill operators (40.90%) aged 26 to 35 years old (Table 2). Majority (81.82%) are married but elementary graduates (79.55%) and all male (100%) respondents. This means that only males are engaged in mining activities this is because males generally who handle grinding machines and traditional approach in gold processing. Some of them aged below 18 years old at the same time did not finish even their elementary education due to financial crisis. Furthermore, there are some children of the household members who are also engaged in mining (source: key informants). Women’s participation in artisanal and small-scale mining involves in trading of minerals such as gold and silver. Not so much on that, women involvement not only limits to mining but they are also involved in the supply of food, drink, tools and equipment.

Based on personal interview some of the reasons for children involvement in mining are mainly poverty driven and low family income. Further reasons of their involvement namely: parents do not have enough income for school material, clothing and food supply, and lack of awareness for child labor in mining.
Environmental costs of artisanal miners are in general higher than those other types of mines, this means that artisanal miners are dirtier per unit of output than medium, large and modern mining operations (Priester, et.,al.,2002). This is evident during personal interview on key informants; artisanal miners are the great individual number of great polluters, normally concentrated in the situated research environment (Libay). Aside from that, difficulties occur such us great control, monitor and enforced environmental violations due to lack of resources and the insufficient manpower of the local government as overseers.

Artisanal and small – scale miner produces negative impacts of physical and social environment during the different stages of mining (Priester, et.,al.,2002). In Sibutad, particularly in Libay, the most important environmental problems, improperly constructed tailing ponds, improper closure, cyanide pollutions (plants), erosion damage and deforestations (key informants: community member of Libay). This multiple cases and damages of severe environment impacts are causes of lack of knowledge, education and technical and environmental training among miners (per observation and personal interview). Furthermore, inefficient technology and limited techniques, inefficient administrative management, lack of access to better techniques, lack of control and enforcement of laws on small-scale mining from LGU and government concerned.

In small-scale gold mining areas mercury is used to extract gold from the ore this is known as amalgamation process. This process is the most common method utilized among small – scale miners in Libay, Sibutad Zamboanga del Norte. Accordingly, 1 to 2 kilograms of mercury are used to process 1 kilogram of gold. Once the gold is extracted from the mercury, the highly toxic metal is dumped directly into the air, water and in the surroundings. Mercury is an ecological disturbance that brings in the deforestation and environmental devastation of left in the wake of the gold washers, poisoning of fish stocks and consequently of the people that depends on the fish as a dietary staple (WHO, 2008).

The small-scale miners and workers doing amalgamation in ball mills generally are not required to use gloves as protector in the handling of mercury and other chemicals during processing (see figure 1). All of the operators mentioned that they had tailings ponds to contain the wastes they produced. However, key informants said that the ponds were generally inadequate to handle the volume of wastes. This was evidence by the fact that of those operators who said that their sites were close to a water body, the majority also mentioned that insignificant siltation, less sedimentation and a decrease of fishery resources have occurred in the water body since their processing activities commenced. This was supported by Bautista (2008) as cited by Goodland R. and Wicks C. (2008) that heavy sedimentation of Murcielagos Bay disrupted the ecological balance so that marine life became weak and dead.

**Figure 1 Gold Processor squeezed out**

Most mercury in the modern environment comes from human activities and heavy industry. A dramatic evidence of this problem occur of methylmercury contamination of their food is of their own making (toxics.usgs.gov/pubs/FS-051-02).
Figure 2 shows the draining of slurry after grinding ore. This process is known as *banlas* in Bisayan term. With this process, the area is contaminated with mercury. Gonzales, et al. (1999) showed that Sitio Lalab1, the creek and sediment contained high levels of mercury which is 0.10 ppm. Furthermore, it showed that mercury is not poisonous in liquid form, but it is readily absorbed when finely divided or vaporized. However, most mercury compounds are very toxic and a single gram of it provides a lethal dose for an adult human.

![Figure 2 Washing of grinding ore (Banlas)](image)

**Figure 2 Washing of grinding ore (Banlas)**

**Awareness on mercury among Small – Scale Miners**

Awareness among miners on health risk and severe environmental impacts on mercury pollution is another important indicator in this study. Sad to say that all (100%) of the respondents said less important to them about their awareness on the impact of excessive exposure on mercury to the environment. They only believed that mercury is only dangerous during amalgamation process but not on the process of grinding ore mixing with mercury. However, based on researchers’ readings mercury poses a serious threat to human health and is deleterious to a wide range of ecological entities. Once in the environment, mercury undergoes a change in speciation from the inorganic to a stable methylated state by non-enzymically and microbial action, and when ingested, ecotoxicological effects result (*Hilson, 2002*).

![Figure 3 Gold extraction from the ore](image) ![Figure 4 Amalgamation Process (Torching)](image)

**Figure 3 Gold extraction from the ore** **Figure 4 Amalgamation Process (Torching)**

It was observed in the area mostly, if not all, ball mill situated on an average of 50 meters to 200 meters away from the seashore of Libay, Sibutad, Zamboanga del Norte. Inspite of tailing pond present in the processing area it’s not enough to justify that the environment of the study site is free from mercury contamination. Majority of the miners and ball mill operators are with direct contact with mercury without requiring gloves as...
protective equipment on gold processing. They used their bare hand to stir the mixture to the ball mill (Figure 3).

Figure 4 portrays how does gold is separated from mercury with the process known as amalgamation method (torching). Experts on mining suggest torching should be done in a close room just to keep safe away from the community and in the environment. Since it is open to the air then the environment of Libay, Sibutad is contaminated with mercury because it will evaporate to the surroundings. Thus, it is recommended that further study on the impact of mercury contamination on the environment.

**Health Conditions among Miners**

The researchers employed a survey questionnaire and personal interview as instrument in gathering the needed data about health conditions among miners in Libay, Sibutad, Zamboanga del Norte. Majority of the respondents do not get tired easily, accordingly they will take vitamins every day. In other words they are full of energy, and they didn’t feel sleepy and drowsy.

In terms of their diet, majority (76.5%) of miners eat fish or shell at least once a week. They know that the sources of fish or shell areas away from mining site. But some reports also mentioned from key informants that their source of fish and other marine products where in the areas impacted by mining. As to the source of drinking water, coming from areas distant from mining it was estimated 1 kilometer to 2 kilometers away from the mining site.

Generally, per observation and assessment on the health conditions of miners and ball mill operators appear not evident mercury exposure is harmful to them. It is because most of them participated in the study are too immature in mining activities, with an average of 5 years. Thus, there is no enough evidence to conclude that this miners and ball mill operators were contaminated with mercury. However, it is recommended that they will subject through blood and hair sample for mercury analysis.

**Conclusions**

Based on the findings the subsequent conclusions are hereby offered. Small-scale mining provides an importance source of livelihood particularly to poor households and those who cannot afford to support in pursuing their children to education. In other words, most of them were not really aware how dangerous mining activities to the adolescence. Ball mill operators had direct contact with mercury on their skin. Thus, there is a harmful effect on their health with a prolonged exposure on mercury. It is therefore the knowledge and information interrelated to mercury exposure will protect miners and ball mill operators health at risks. If Mining and grinding of ore continue, then environmental problem arises particularly in Sibutad, Zamboanga del Norte. An increase of mercury contamination in the coastal areas will harm marine habitats and agricultural products.

**Recommendations**

Based on the findings and conclusions, the following are hereby recommended. Massive campaign on the health hazards of mercury exposure should be done in Libay,
Sibutad Zamboanga del Norte and neighboring areas as well. Programs or activities may be offered to children that would encourage them to go to school and finish a degree rather than being contented on mining involvement. Moreover, impose and implement laws on health and environment safety particularly on mining activities. Dissemination on awareness campaign among miners and ball mill operators on the importance on how to protect their lives on mercury exposure and health risks should be done by the concerned agency (DOH). Miners and ball mill operators should be encouraged to submit themselves for blood sampling for mercury analysis. Further studies will be conducted about mercury exposure among small-scale miner and ball mill operator of Libay, Sibutad, Zamboanga del Norte.

References


