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Environmental Governance Programme

Environmental monitoring and access to information

Knowledge extracted from webinar and Goxi forum Discussions

1. Emerging Critical Issues
The webinar gave a broad overview of the subject of environmental monitoring including considerations of aspects related to Human Rights principles and procedural rights. Environmental monitoring during the different stages in the mining process (from planning to post-closure) was discussed, although the focus was on the exploitation phase. A case from Mongolia was used for discussion and sharing of experiences.

The first presentation touched upon issues that need to be considered in environmental monitoring of the mining sector, including procedural and Human Rights issues. In addition, it explored environmental monitoring from the point of view of the technical and administrative staff who are charged with performing it. This presentation touched on the main challenges facing the regulators, including how to develop monitoring programmes, and what to require from mining companies in terms of self-monitoring.

Environmental monitoring and human rights
Monitoring the environment is closely connected to human rights. Principle 10 of the Rio Declaration (1992) shows the connection between environmental monitoring and human rights. With no environmental monitoring carried out, there will be no information that can be accessed. With no information available, consequently there will be no meaningful public participation. And finally, without the information and data, there will be limited possibilities for legal action for any affected person or group.

Why do we do environmental monitoring?
Environmental monitoring is extremely important in a properly performed environmental impact assessment. Whoever proposes a mining project is expected to have carried out environmental monitoring for a prolonged period, perhaps several years, before submitting an application for a permit.

• Any mining operation, in a well-functioning society, will have to comply with discharges and emissions permits. Monitoring is done to ensure that these conditions are met.

• Monitoring is carried out to evaluate the “environmental state”. This type of work would not normally be focused on a specific industrial activity, or mine but rather seeks to understand the cumulative impacts of all existing activities.

• The work related to the analysis of the “state of the environment” can also be linked to research conducted for a variety of purposes, such as investigating new threats to the environment, or testing new methods and surveillance strategies.

Who does environmental monitoring?
Central and regional authorities carry out monitoring. In addition, mining companies perform self-monitoring - and usually the authorities require this. In some cases, there are community initiatives, where their members or representatives participate in environmental impact assessments. Researchers are also carry out some monitoring, often with the funding of state agencies. Finally, multilateral international agencies are also involved in the implementation of a variety of activities related to environmental monitoring.

Why self-monitoring?
Self-monitoring increases understanding of local environments, flora and fauna in areas that have limited data. Furthermore, data can be used to assess actual impacts to original predictions. It provides critical feedback into EMP (Environmental Management Programs) and various procedures that are designed to reduce environmental impacts. It has fast turn around and response time when issues are detected.

What do we monitor in mining?

- Potentially toxic metals.
- Acid rock drainage
- Process chemicals
- Nitrate/Ammonia - of explosives from undetonated explosives
- Suspended solids/erosion
- The particles and gases in the air
- Noise and vibrations

Toxic metals

Most of the potentially toxic metals that can cause environmental impacts in mining areas come from the actual ore that is being mined (with the notable exception of mercury). Examples of common ore minerals are - Galena and Sphalerite - these are mined for their lead and zinc content respectively. These same minerals contain significant amounts of other metals, and this is one of the fundamental reasons why there is a possibility of heavy metal contamination in mining areas. They can end up in surface and underground waters.

Contaminants in soils

Metals can end up contaminating the soil. This is more common in areas where there is smelting or in places where you have roasting of ores. These pollutants are transported by air and fall from the air to the ground. Nowadays roasting of minerals is not being performed frequently as other methods of mineral processing and extraction have been developed.

Biological diversity

Pollution can have an impact on biological diversity. In rivers pollution can easily be measured through the capture and counting of the number of species or taxa of animals that live on the bottom of the river. In addition, we can also look for the presence of certain indicator species. One could, for example look at larvae of mayflies and stoneflies. Stoneflies are generally more sensitive to contamination and their presence can be used as an indicator of good water quality.

Air quality: particulates and gases

Impact investigations related to air quality near mining sites have generally focused on particles. For human health, very fine material is more harmful than coarser particles, therefore, researchers investigate data related to the concentrations of particles in the air with a diameter less than 10 microns (or even 2.5 cf human hair - around 100 micrometers). Impacts related to gases are more unlikely in sites close to the mines, while there are more common around smelters (where one usually monitors a wide range of gases, SO2, NOx, etc.).
Noise and vibrations

Noise and vibrations can be a serious problem near mining sites. The noise and vibrations are caused by blasting, loading, crushing and heavy traffic.

Are impacts serious? Evaluation of results and data

Once the data has been collected, the question is usually asked - is this serious? To answer this question, you may want to compare the data you have with:

• Against “Background”, that is, the natural conditions. Knowing what is considered natural, especially in a mineralized zone is quite difficult.

• Against the “baseline”, which is a condition that has been previously established, for example in the Environmental Impact Assessment. Using this method it can be considered for whom or what the situation can be considered serious. Often, humans can cope with contaminant levels that are higher than what other more sensitive organisms can tolerate.

• Thus, you may want to compare information with guidelines that are specifically related to human health (e.g. World Health Organization) or you may want to consult the standards that have been established to protect biota and ecosystems (e.g. standards developed by United States Environmental Protection Agency)

Why is data management important?

Data is the record of environmental facts. We use the facts to prove impacts and enforce compliance. In addition, access to environmental data is a human rights issue; only proper management ensures access to human rights. Moreover, data has legal significance and needs to be reliable. Monitoring is expensive. Therefore data is valuable.

Key steps in data management

Environmental data collection is only one of the components of the monitoring process. Thereafter follows analysis, assessment data storage and dissemination etc. Data management problems may occur at each stage of the monitoring process:

• During the design of the monitoring program, we have to prepare sampling forms, prepare labels for the sampling vessels, and make sure that the data is recorded correctly.

• During the field work, the people in charge of taking the samples must register the data correctly and make sure to deliver the samples to the laboratory or to the monitoring agency.

• The laboratory that analyzes the samples should follow the sampling codes and ensure that the data is archived and sent to the monitoring agency. In general, a laboratory uses a laboratory information management system (a LIMS database) to manage its sampling data.

• The monitoring agency must archive the data in its own database, to find them when necessary and to be able to extract the data efficiently for analysis and keep them as a reference for the future.
• The monitoring agency, the researchers or perhaps the general public are the last link in the data management chain. They are the end users that use the data to draw conclusions about the impacts and to enforce the rules. The entire management chain is necessary so that, ultimately, the data can be used to achieve changes in environmental performance by giving feedback to the mining enterprises, or to support permits and other legal processes, or to support policy discussions.

Community monitoring

Monitoring and evaluation is a key part of any mining project. In addition, it is very important who carries out the monitoring. In some countries there is distrust among the mining companies, the government and communities. In such cases, and to prevent such mistrust from occurring in the first place, it is important that data monitoring is not only done by mining companies and the government, but also the community needs to play an active part in monitoring. It is recommended that in one way or another, the affected communities are being involved in the monitoring of mining activities.

Such community-based monitoring should not be considered as contrary or in conflict with the monitoring of the company, but as a complement to it. And, if done well, it can create a fertile ground for dialogue between businesses, communities and governments.

Prevention of conflicts

Community-based monitoring can be a key element in conflict reduction and mitigation, as it helps communities have better control over their environment and resources. Community members should also participate in decision-making. If the community can directly influence decision-making processes and understand the state of their environment, then the community is more likely to trust the mining companies and be prepared to welcome the investments that these companies can bring.

In addition, it is important to avoid and/or reduce the negative environmental and social impacts caused by mining companies. If the community has the power to control and monitor potential environmental and human rights problems, companies will be less likely to commit human rights or environmental related abuses.

Monitoring of water

The main focus of community-based monitoring is often the monitoring of water. Water reacts very quickly to increases or decreases in pollution and its analysis can be easy and low cost.

Water parameters that are easy to monitor include:

• **pH**: Measures the acidity or alkalinity of the water. It is key to early identification of spills (example: cyanide) or acid rock drainage.

• **Conductivity**: Measures the amount of dissolved elements in the water. It is an indirect measure of some pollutants. Low conductivity usually means low pollution, high conductivity does not always mean high pollution, but it can be a strong indicator. High conductivity simply means a high concentration of soluble elements and some of these may be contaminants and others may not.
• **Temperature:** is a very direct measure and an increase in temperature can be an indicator of contamination (e.g. acid drainage).

• **Heavy metals:** Heavy metals are often a concern in mining areas. Mining activity can contaminate rivers with heavy metals in different ways. Metal analysis is difficult to carry out and costly if performed in accordance with international high quality standards. However, there are some instruments that can be used at the community level to measure some metals if the concentration is high. For example, there are some “analysing kits” that can measure iron, copper, zinc and some other metals, usually this is done by using a portable UV/VIS spectrometer.

**Monitoring health**

Health is very difficult to measure at the community level. The analysis of blood, urine and hair allows assessment of the bio-accumulation of certain elements (heavy metals) and can be a useful parameter to monitor the impacts of mining. The increase of some specific diseases can also be monitored at the community level. Problems with the skin and eyes, for example, or even incidences of miscarriages can be a useful indicator. However, in most countries, this kind of data is very difficult to obtain.

**Regular reporting**

Monitoring needs to produce regular reports. The data collected through community based monitoring should be available to the public, at least within the community itself, as this is very important to avoid internal conflicts. The ideal result is to have a common platform where the data can be shared with the company and the local government. A public web page with all the data collected is very useful for transparency, but not everyone has access to the web, so local radio stations and local newspapers can also play an important role.

It is key to involve the entire community in the reporting process. Community meetings are an excellent tool to disseminate the results of environmental and social monitoring, and they are also very important to encourage community participation. These community meetings must be held quarterly, or at least twice a year.

**Women**

Women play an important role within communities and can often also be the most affected (in developing countries, for example, they are often more involved in activities that use local water). Therefore, it is very important to involve women in the monitoring system and in the generation of reports.

2. **Public authorities and other actors sharing experiences**

The community of Carrizalillo in Mexico is located near a large gold and silver mine. This community has successfully implemented a complete monitoring system. In 2012, they created a monitoring committee composed of six people (three men and three women) to monitor water pollution once a week. They monitor three rivers by measuring pH, conductivity and temperature. Once a month they collect a sample from each river, preserve it with nitric acid and send it to an international laboratory for the analysis of
heavy metals. Once every three months they report in the community assembly and once a year they publish a document to be shared with the local authorities and the mining company. Thanks in part to this monitoring system, the community was able to start direct negotiations with the company and then define and obtain compensation measures valued at some 50 million dollars over 5 years. This compensation consisted of a new drainage system for the community that served as new water source and dust mitigation. In addition, they obtained some social compensation such as a new hospital and 90 annual scholarships for students in the community.

Sweden

In Sweden, central authorities such as the Swedish Environmental Protection Agency (Naturvårdsverket) are responsible for the design of the national monitoring program. The County Administrative Boards are responsible for regional programs. This does not mean that the authorities do all the monitoring themselves. In most cases, university institutions or consultants are hired to carry out investigations.

Mongolia - Oyu Tolgoi

Oyu Tolgoi is a major copper-gold mine and one of the largest in the world, and because of its size, the involvement of international mining companies, the sensitivity of the surrounding Gobi Desert environment, and the ambition of the Mongolian government to hold the project to account in terms of environmental impacts, there is a wealth of relevant aspects to explore.

Challenges in Mongolia

Mining makes up to 25% of Mongolia’s GDP. Some of the main social challenges related to the Mongolian mining are health and safety, competition for water and land, community consultation and disclosure, lack of understanding of ecosystems and its benefits as well as linking project level and county level monitoring.

Challenges in community based monitoring in Mongolia include the difficulty in understanding the technical language of collected data as well as building mutual trust between the companies and the community. In general community members are willing to participate in environmental monitoring but they often do not have sufficient technical capability.

Developing Monitoring Programs in Mongolia

Monitoring programs are based on a combination of:

- Predicted impacts from the ESIA process
- Mongolian National legislative requirements
- IFC/EBRD performance standards (not required for all mines)

Performance targets are based on:

- National legislative requirements
- International standards in the absence of national standards
- IFC/EBRD performance standards
The monitoring program for Oyu Tolgoi consists of three main components

1. There are 400 water level monitoring and water quality monitoring bars near the mine. Water samples are taken on a monthly level.

2. Self-monitoring of the environment consists of the air mission management plan, (measuring of weather, air quality and green-house emissions) noise and vibration management plan and the soil quality monitoring (i.e. measurement of heavy metals, general and physical properties, hygiene and bacteriology, long term top soil stockpile quality).

3. Biodiversity
   - Land Disturbance Control and Rehabilitation Management Plan dedicated to controlling land degradation and land clearance.
   - Biodiversity Management Plan which consists of the Biodiversity monitoring and evaluation plan and ecosystem service monitoring and evaluation plan.
   - Offset management Plan that consists of Suite of Biodiversity offset programs and net positive impact forecast

4. Questions from Webinars and GOXI Audience
   - How can a mining operation’s impacts on the surrounding environment best be assessed - what should be monitored?
   - Who should be monitored and what role should mining companies play in self-monitoring?
   - How should environmental monitoring data be managed and controlled and to what extent should it be shared, and made available to the public?
   - What role, if any, can civil society play in environmental monitoring, for example through community based participatory monitoring?
   - What key human rights principles are most relevant to the subject of environmental monitoring?
   - Has there been a community conflict near to the Oyu Tolgoi mine in Mongolia and if so, how has it been resolved?
   - In developing countries, how are local community monitors trained to undertake environmental monitoring? Also, you presented an example of hand-held tools to assist in monitoring, even though these tools are relatively inexpensive, how are communities able to purchase them?
   - In terms of participatory monitoring, who is responsible for covering the cost? Would that be the impacted communities, national/local governments, or impacting mining companies?
   - How frequent do central agencies carry out environmental monitoring at one site?
   - How could we address the topic of environmental governance in The Extractive Industries Transparency Initiative (EITI)? With regard to the costs of having a reliable
database, what kinds of databases are available for local communities? How are local communities storing the data that they gather?