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Occupational health and safety risks in artisanal and small-scale mining

Summary

Working in Artisanal and Small-Scale Mining (ASM) exposes people to a series of occupational health and safety risks (OHS). Research by the Centre of Expertise in Mining Governance (CEGEMI) at the Catholic University of Bukavu has recently documented this for the case of the Eastern Democratic Republic of Congo, digging into the lived experiences of different categories of mine workers. The research found that 1) OHS should be approached differently for different types of workers and operations, and 2) managing OHS should start from existing practices and policies, and involve state agencies, miners' cooperatives, mine workers and other societal stakeholders.

The problem

Although millions of people in developing countries depend it for their livelihood, ASM is also associated with a number of negative health and environmental effects. In this brief we focus on health effects. In a recent review, Cossa & al (2021) compiled and analysed the results of 176 studies on health problems in ASM (155 of which were on gold) in 38 different countries (out of the 124 countries in the world where ASM is carried out). They conclude that in many countries the health effects of ASM are still understudied. Most of the studies included in the review by Cossa et al. (154) are based on human and/or environmental samples, with mercury (Hg) and lead (Pb) being the metals most frequently investigated. Infectious diseases and non-communicable diseases have hardly been studied (idem). So can we obtain a more holistic view on how working in ASM affect people's health? How do the workers themselves experience this?

The research

This brief is based on data collected between 2019 and 2021, as part of different research projects: a FWO project on the informalization of gold mining, a FWO-EOS project on technological transformation in ASM, and a VLIR project on health in ASM. Data included 624 non-representative surveys with mine workers in the territories of Watsa and Shabunda, situated in Haut-Uélé and South-Kivu provinces; 174 individual interviews and 11 focus group discussions in the towns of Kamituga and Misisi, both in South-Kivu province; participatory mapping exercises, numerous observations and informal conversations. The research teams were multidisciplinary and all members were involved in different stages of the research, from design to publication and outreach – as documented in Geenen & al (2022). The research focused on artisanal and small-scale gold mining (ASGM).

Findings (1): diverse OHS risks

A first important finding is that not all ASM workers are exposed

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to the same risks, to the same extent. Their exposure depends on the type of work they are doing in the mine, with tasks ranging from underground drilling to manual stone grinding and carrying. Moreover, ASGM takes different forms, from alluvial operations to underground pits and dredging. The table below lists the main types of operations with involved workers and associated OHS risks.

Operation	Workers involved	Main OHS risks
Alluvial panning: alluvial sediments are washed in a pan to separate the gold	Manager, panner	Exposure to polluted water
Channelling: an operation that channels water through wooden channels and filters the gold	Shoveller, mercury worker	Exposure to polluted water and mercury
Crushing: tailings are crushed by hand or in a mechanized ball mill	Manager, financier, machine operator, specialist in electrical and mechanical tools, OR manual grinder, transporter	Exposure to dust, risk of being injured by tools or machines
Dredging: sediments from the riverbed are sucked through long pipes into a sluice	Pit manager, financier, technical director, financial director, diver and assistant, engine technician and assistant, cook	Risk of asphyxiation and injuries by stones or mud falling into the water
Open pit mining: open operations where layers of rocks and sand are removed by hand or excavator	Pit manager, financier, team leader, technical director, financial director, mercury worker, shoveller, sand worker, day labourer, cook	Risk of injuries by landslides or rockfalls
Underground pit mining: underground tunnels and pits going up to 50 meter deep and 200 meter long	Pit manager, financier, team leader, technical director, timber worker, mercury worker, driller, shoveller, sand worker, security guard, cook	Risk of asphyxiation and tunnel collapse
Washing (loutra): tailings are sieved and washed with a pan in dug out water basins	Owner of washing space, panner, security guard	Exposure to polluted water and mercury

Health risks

Heavy metal poisoning

Chemicals such as cyanide and mercury are used to separate the gold from the ore. For cyanidation, ASM operators build tanks and cyanidation plants. For mercury, this task is often done by specialized mercury workers. Studies have shown that mercury intoxication slows down mental development, causes blindness, language and auditory troubles. In most of the sites studied, workers indeed showed signs of mercury pollution, such as pre-paralysis or body shaking (Nkuba & al, 2021). Exposure to heavy metals may also be the cause of the gynecological problems, such as irregular menstruation in female mine workers, miscarriages and malformations in newborn babies.

Respiratory diseases

ASM workers are continually exposed to inhalation of crystalline silica dust, a highly dangerous particle released during rock fracturing. Inhalation of this dust causes severe lung disease, with symptoms including breathlessness, severe coughing, fatigue and, in the most advanced cases, respiratory failure. Many underground workers (drillers and shovelers) and machine operators (operating the mechanized crushers or ball mills) develop acute respiratory illnesses such as pulmonary edema and bronchospasm. Exposure to respiratory irritants leads to chronic inflammation of the airways, the most visible symptoms of which are chronic cough, excessive mucus production, shortness of breath and asthma attacks (Bashizi, 2020).

Infectious diseases

Prevalence of infectious diseases such as HIV and other Sexually Transmitted Infections (STI) is high. Data from Kamituga show that 15% of men and 16% of women who were tested, were HIV positive, which is ten times as much as the national average (Geenen & al. 2021). Urinary infections are caused by the exposition to unclean water, often for women who are working in alluvial panning or who sort and wash stones (Geenen & al. 2021).

Traumatic diseases

Working in the mines requires extraordinary physical effort in extreme conditions. Transporters, for example, lift bags weighing up to 50-70 kilos. They suffer from musculo-skeletal pain, tiredness and headaches. The drillers have to extract rocks using a simple hammer, being constantly in a bent position in a crammed underground tunnel. They suffer from muscular pains and hernias. Female panners complain about muscular pains because they are in a bended position all the time.

Stress and harassment

The constant pressure of the physically and mentally intense work leads to high levels of stress, fear and fatigue. Many ASM workers turn to alcohol and drugs to cope, especially the drillers and shovelers working underground. However, the use of alcohol and drugs leads to other health and safety problems. Excessive use of alcohol and drugs increases workers' anxiety and makes them less attentive, increasing the risk of accidents and violence in the workplace. The risks of harassment and physical aggression on mining sites are particularly high, and cases of sexual abuse of female workers are numerous (Bashwira & Cuvelier, 2019).

Malnutrition

Workers (and their families) frequently suffer from malnutrition, which is exacerbated by high food prices and low agricultural productivity around most mines (Geenen & al 2021). Female workers do not have access to proper pre-and postnatal services. They often have to get back to work immediately after having given birth, in

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order to gain some money for food. This causes many problems of early weening, with negative long-term effects on children's health.

Safety risks

Asphyxiation and exposure to gas particles

Asphyxia represents a significant risk for underground workers like drillers, shovelers and timber workers. It is caused by a lack of oxygen or inhalation of noxious gases. Although underground workers try to ventilate pits by making ventilation shafts or blowing air in, the risk of asphyxia is omnipresent. Even more dangerous are the gas fumes escaping from diesel pumps that are used inside the pits to pump the water out – although this is officially forbidden (Geenen & al 2021; Marijsse & Munga 2021).

Collapses and landslides

When underground tunnels are not well supported by wooden structures, or the soil is unstable, tunnels may collapse. Small landslides are also frequent due to destabilization of the ground or to heavy rains. In September 2020, a major landslide in Kamituga took the lives of 75 people.

Machine-related accidents

ASM increasingly makes use of machines, which are at the source of many accidents (Nkuba & al 2021, Geenen & al 2021). The mechanized ball mills regularly cause injuries, including the amputation of limbs. According to our data this may happen to women who bring stones to the ball mills for crushing, and whose long clothes get stuck in the machine's belt. The excavators and the semi-mechanized dredges have also caused several injuries. The same goes for explosives, which are commonly used underground to break massive rocks (Nkuba & al 2021).

Findings (2): managing OHS

Our research found that managing OHS should start from existing practices and policies, and involve state agencies, miners' cooperatives, mine workers and other societal stakeholders.

Workers' practices

Miners generally work in teams, which can vary from a handful to hundreds of workers. Despite the informality of this economy, their work is highly organized (Geenen, 2015). In the case of an accident or illness, immediate assistance is generally provided by team members. For instance, if an accident happens, team members provide the first aid, although they have not been trained for that. A common practice in the case of asphyxia is to bring the victim to the pit entrance and make cuts in the skin, which is believed to stimulate the body again. Some cooperatives (see below) and informal associations also provide assistance in case of illness or accidents. They can, for instance, provide financial assistance to widows of deceased workers.

Mine workers are surely aware about many of the OHS risks. Geenen and Bikubanya (2024) report that "a large majority of respondents reporting being 'always' or 'very often' concerned about health and safety". Geenen et al (2021) note that interviewees are generally aware of the risks that are most noticeable, like the presence of dust. But they are less aware of less visible risks such as infections or mercury, and they do not know much about the long-term health effects of their work.

In terms of protecting themselves at the workplace, most workers wear little or no protective equipment. Many even work without proper clothes or boots. The reasons for this are mainly financial. Instead, some turn to the ancestors or to divine protection to protect them from the risks they are facing on a daily basis.

Policies and interventions

The Congolese Mining Code and Mining Regulations include a number of provisions to protect the environment, health and safety in ASM sites. For instance, the technical service in charge of ASM, SAEMAPE, should check compliance with environmental regulations and impose rules concerning, for instance, the minimum width of the walls between two tunnels, the minimum height and width of tunnels, or good practices for shaft timbering. Their regular inspections could prevent some of the landslides and cave-ins. The environmental agency should follow up on attenuation and rehabilitation plans as well as environmental and social impact studies.

Technical, material and financial support should normally come from cooperatives and state services. Although some cooperatives do play a role in regulating practices, preventing accidents and assisting families in the event of accidents, many of them are unable to fully meet the needs of their members. State services, apart from a few specific and very limited interventions do not play their part in the prevention and protection of workers.

It should also be noted here that very few initiatives have been taken by international donors and NGOs to improve the health situation in these sites. Up to now, almost all efforts in relation to the DRC have focused on security risks ("conflict minerals"), ignoring health and environmental risks. Fortunately, this is gradually changing. At the international level, this is illustrated, among other things, by the declaration of Delve, a global platform that collects data on EMAPE with a view to supporting the sector. Delve declared 2021 the year of occupational health and safety in ASM (World Banque, 2020). This is opening up opportunities for more targeted interventions.

Recommendations

1. Information

Workers and the community need to be better informed about the specific health risks of working and living in mines. Such information could be provided by cooperatives and SAEMAPE, but NGOs, churches, the media and social media can play a key role too. Health personnel in these mining sites also needs targeted training on OHS in ASM.

2. Prevention

At the level of the mining pit, pit managers may need to intensify the technical inspections, such as checking the woodwork, loose rocks, or the appearance of cracks. We could also think of early warning

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Research output

- Special issue in Extractive Industries and Society : Technologies & transformation in DR Congo's artisanal and small-scale gold mining, with 6 articles
- Article in Development and Change: Heterogeneity and Labour agency
- Seven working papers (in French)
- Comic strip : La fièvre de l'or
- Photo essay : Technologies and tranformations
- Exhibition, posters, conferences

Philippe Dunia Kabunga
Institute of Development Policy, University of Antwerp
kabunga.dunia@student.uantwerpen.be

Sara Geenen
Institute of Development Policy, University of Antwerp
sara.geenen@uantwerpen.be

Anuarite Bashizi
Institute of Development Policy, University of Antwerp
anuarite.bashizi@uantwerpen.be

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Institute of Development Policy
University of Antwerp
iob@uantwerpen.be
+32 3 265 57 70

uantwerp.be/iob

systems on sites that alert workers when a danger such as a landslide or lack of oxygen occurs, and systems that help to evacuate workers more efficiently. In addition, some members of the cooperatives and SAEMAPE could receive some basic first aid training. Signs could also be placed prohibiting access to certain high access to certain high-risk areas, such as ball mills.

3. Protection

Cooperatives and SAEMAPE should assist workers in obtaining protective equipment and adopting more responsible technologies (such as retorts to prevent mercury evaporation or prayers to reduce the level of lead and silica in the air). Attention should be paid to the specific needs of certain categories of workers, including female workers.

4. Access to healthcare

Many workers do not have access to healthcare for a variety of reasons: lack of financial means, geographical inaccessibility, or the general state of health infrastructures and the availability of services, equipment and medicines. Quality health care should be provided by a multidisciplinary team of nurses, midwives, social workers and other health professionals. The use of traditional medicine is very common among mine workers, and should be encouraged but regulated. Sanitary facilities should be opened in the mines. As far as financial resources are concerned, the unstable income and lack of foresight of many workers makes access to medical care difficult, if not impossible. Mutual health insurance schemes could be beneficial.

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