

Resource for **Policy Makers**



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INTRODUCTION TO THE MODULE

Mining plays a significant role in the development process of the Southern African Development Community (SADC) by creating wealth and employment and a market for other industries such as manufacturing and services.

Assuring the safety and protecting the health of the large workforce employed by the mining sectors is a concern of policy makers and regulators across the Southern African sub-region. A review of existing legislation in 10 countries of the region, namely in Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe, shows that countries have set up complex legislative and regulatory frameworks for OSH in mining, often rooted in the colonial past of the countries and failing to address the challenges that come with the expansion and privatization of the mining industry.

Policy makers have a key role in ensuring there is robust legislation in place to protect the mineworker from occupational injuries and diseases, related loss of earnings paired with medical expenses eventually leading to dependence on social support systems burdened on the state or exacerbating poverty where no such systems are in place.

Acknowledging that a thriving mining sector can contribute to economic development, alleviation of poverty and an improved standard and quality of life throughout the region, member states of SADC have signed a Protocol on Mining agreeing to adopt internationally accepted regional standards within the mining sector (Enforced 10/02/2000)⁶.

The manifold aspects of ensuring the safety and health of mineworkers have not been sufficiently addressed in law reforms in the wider region so far. Particularly the aspect of prevention of dust-related occupational diseases, such as mineworkers' pneumoconiosis, is governed by complex regulatory systems set out in labour laws and regulations, public health laws and regulations and mining laws and regulations, complicating controls and the enforcement of standards.

Law reforms are lengthy undertakings requiring the consultation of stakeholders in government, civil society and the private sector. New legislation will also have to reflect on the broader issue of occupational safety and health across sectors in a country. However, the legislative review shows that regulators have the powers to introduce mandatory practices ensuring that safety and health concerns are treated according to international standards, as the example of South Africa shows.

Bearing in mind that regulators, with their diverse professional backgrounds and experiences, are often unaware of such standards, this module aims to familiarize the latter with state of the art approaches to the prevention and surveillance of dust related occupational diseases in mining and provide resources opening up new routes to the better protection of mineworkers' health.

The objective of this module is to increase policy makers' knowledge about occupational dust hazards in mining workplaces, state of the art dust control programmes and standards as well as concepts and good practices for improving or amending national regulatory dust control frameworks.

⁶ SADC (1997): Protocol on Mining in the SADC. Online <http://www.sadc.int/documents-publications/show/808>

BACKGROUND READING

Occupational lung diseases in mining

Since the early days of mining the relationship between dust exposure and lung diseases has been described and investigated. The inhalation of respirable dust over prolonged periods of time causes mineworker pneumoconiosis, which is one of the most important occupational diseases worldwide. The World Health Organisation (WHO) defines that “the respirable particulate fraction (of dust) is that fraction of inhaled airborne particles that can penetrate beyond the terminal bronchioles into the gas-exchange region of the lungs^{7,8}”. South Africa considers 200 eight-hour shifts exposure to elevated levels of respirable dust as a risk for developing pneumoconiosis. The disease is characterised as being progressive and irreversible⁹. The fine dust particles, which are invisible to the eye, penetrate the lungs and cannot be expelled by the immune system. They cause microscopic scarring of lung tissue. The scars reduce the ability of the lung to extract sufficient quantities of oxygen from the air, resulting in shortness of breath and eventually leading to the premature death of the person.

Dusts for which the respirable fraction offers greatest hazard include quartz and other dusts containing free crystalline silica as well as cobalt-containing and other hard metal dust.

Specific names have been given to illnesses caused by various dusts:

Coal workers' pneumoconiosis (black lung)	Coal workers' pneumoconiosis is caused by breathing in respirable coal dust.
Silicosis	Silicosis is caused by particles of free crystalline silica (quartz, sandstones, flint).
Asbestosis	Asbestosis is caused by excessive mineral fibre exposure. These mineral fibres are comprised mainly of silicate chains. They may also cause cancers of the bronchial system, lung tissue and abdominal organs.
Siderosis	Siderosis is caused by mineral dusts emanating from iron ore.
Stannosis	Stannosis is caused by mineral dusts emanating from tin ore.
Aluminosis	Aluminosis is caused by mineral dusts emanating from bauxite ore.

Pneumoconiosis is incurable and therefore prevention of the condition is the best strategy a country can employ. If a mineworker contracts pneumoconiosis, this makes him or her more prone to contracting tuberculosis (TB). TB is a disease caused by bacteria (*Mycobacterium tuberculosis*), which are prevalent in working and living environments. Most TB infections manifest in the lungs (also called pulmonary TB), but there are also other forms of tuberculosis. A healthy body (intact immune system) getting in contact with TB bacteria would not automatically manifest the disease. A person suffering from any kind of disease compromising the body immune and defense system, such as HIV or pneumoconiosis, has an increased risk or susceptibility to contracting TB and developing the illness. TB transmission is more likely to happen in confined spaces and in dusty, hot and humid working environments, distinctively prevalent in underground mining operations.

⁷ WHO (1999): Hazard Prevention and Control in the Work Environment: Airborne Dust WHO/SDE/OEH/99.14. Chapter 1

⁸ Note: Dust particles smaller than 10 microns are labelled as respirable dust.

⁹ Greenberg, M; Waksman, J; Curtis, J (2007): Silicosis: A review. *Disease-a-Month*, 53:394-416 0011-5029/2007

Mineworkers' pneumoconiosis is considered a preventable disease today, when appropriate control measures are applied in the workplaces. WHO, in its Global Programme on the Elimination of Silicosis, points out: "Today, society possesses all the necessary means to combat this preventable disease and there is no excuse for silicosis persistence throughout the world. In the absence of effective specific treatment of silicosis, the only approach towards the protection of workers' health is the control of exposure to silica-containing dusts".¹⁰



Prevention of occupational lung diseases in mining

The reality in mining is that dust emissions can never be avoided. The drilling, blasting and cutting of rock as well as the loading and transport of ore produce considerable amounts of dust. The quantity of crystalline silica contained in the dust emanating from these operations depends on the rock formation.

It is therefore critical to control the work environment and prevent the exposure of mineworkers to elevated amounts of respirable silica dust. Equally, it is essential to do health status surveillance of the mineworker ensuring that first signs and symptoms of pneumoconiosis are detected and (a) further exposure is avoided, and (b) the mineworker is included in treatment, care and compensation programmes slowing down progression of the disease and guaranteeing the highest possible quality of life with the condition.

Policy makers are required to provide legislative frameworks orienting the mining industry towards the elimination of dust related occupational diseases.

The following model depicts areas that policy and legislation need to address to provide a protective framework for mineworkers.

¹⁰ Fedotov, I (2003): The ILO/WHO Global Programme on Elimination of Silicosis. GOHNET Issue No. 5

DUST GENERATION



Blasting



Drilling



Loading

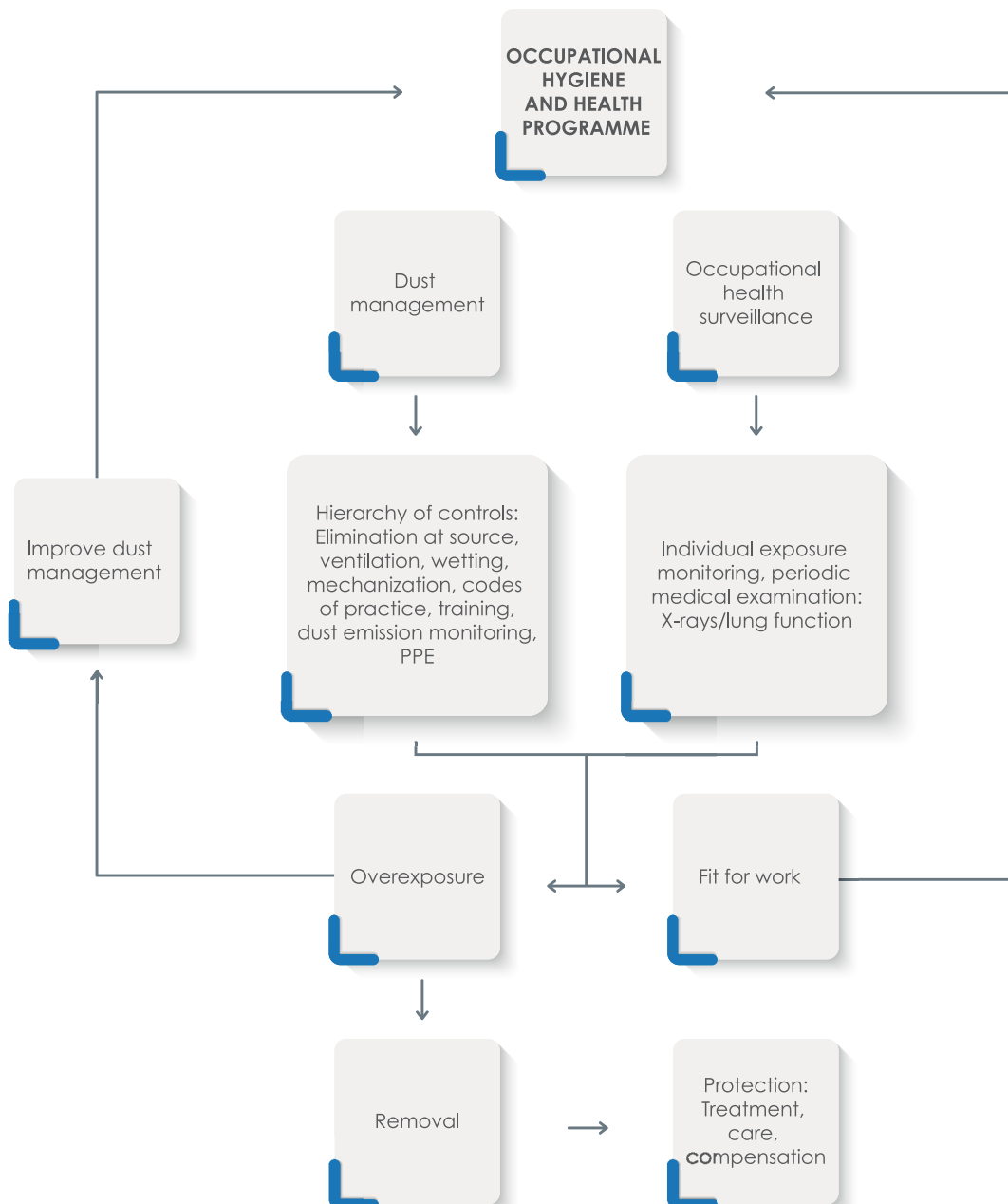


Cutting



Transporting

PREVENTION



SOCIAL PROTECTION

(1) Prevention of harmful dust exposure



To do surveillance of the work environment and prevent mineworkers from exposure to harmful dust emissions it is critical to define occupational exposure limits (OELs). Many countries in the SADC region do not yet have documented OEL for crystalline silica dust. It is therefore advised that those who do not have such exposure limits work to the *United States National Institute for Occupational Safety and Health (NIOSH)* standards.

Recommended exposure limit (REL)

- Crystalline Silica - 0.10 mg/m³ TWA
- Coal Dust: Respirable fraction less than 5% SiO₂ - 2.4 mg/m³ TWA
- Coal Dust: Respirable fraction greater than 5% SiO₂ - 10 mg/m³ / (%Silica+2) TWA)

Legislation must also define how such dust levels are to be measured, monitored and reported to ensure adherence to set standards. Failure to comply should result in a fine being imposed on the employer or result in the mine being shut down.

To comply with national occupational exposure limits, employers must establish occupational safety and health (OSH) policies and programmes, which address:

- Occupational hygiene standards
- Occupational health surveillance

Occupational hygiene

Legislation should make provision for the following aspects of dust-related occupational hygiene programmes to be employed in the mining environment:

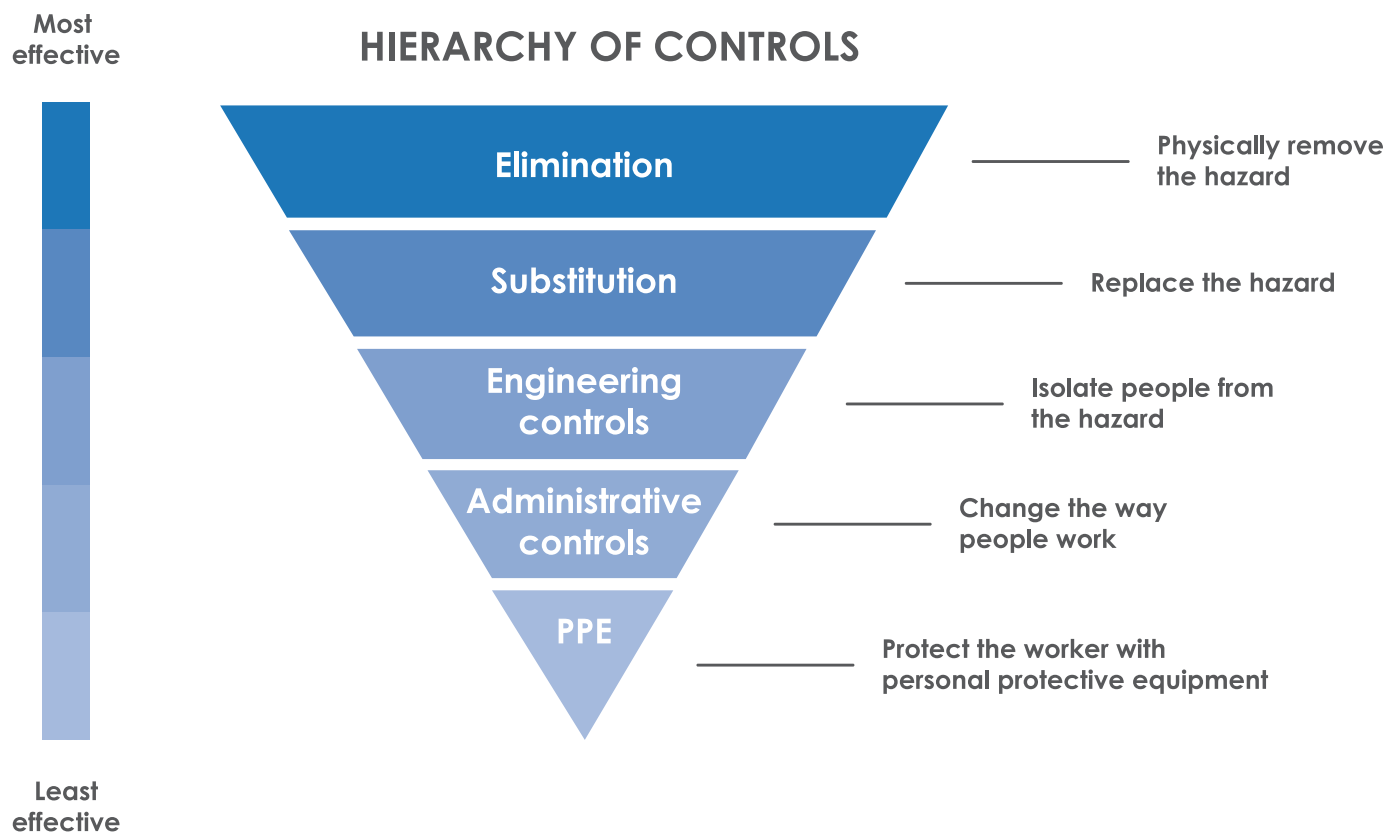
Mandatory risk assessment [Industrial Hygiene Risk Assessment (IHRA)]

- Hazard identification: Silica content quantification in rock formation including dust sampling and analysis methods and equipment.
- Hazard quantification in breathing air: Silica content in dust emissions from different operations including sampling and analysis methods and equipment.
- Establishing of exposure risk profiles for homogenous exposure groups (HEG).
- Development of risk mitigation and exposure monitoring plans including dust sampling strategies and measuring equipment to be used.

Risk mitigation

- Provisions and specifications for ventilation systems: Exhaust ventilation systems and air filtration systems.
- Provisions and specifications for dust suppression systems: Wet drilling and water spray techniques or alternative techniques (e.g. in diamond industry where wet drilling is not possible due to the rock formation in which the diamond sits).
- Provisions and specifications for personal protection equipment in high risk areas: (e.g. respirators, face masks (Note: disposable N95 or FFP3 filtering face piece and reusable half face respirators can be used only if silica dust levels are less than 10 times the dust limit) for HEGs.
- Provisions for minimum requirements for hygiene facilities, such as change-house and ablution (washing) facilities, to be provided on site to ensure that contaminated clothing and equipment is not taken off-site where it may endanger the lives of other persons.

The model below is derived from the United States National Institute for Occupational Safety and Health (NIOSH) model on the hierarchy of controls that should be employed in dusty work environments when doing risk mitigation.





Risk monitoring

- Mandatory risk and exposure monitoring consistently conducted in accordance with risk assessment outcomes.
- Periodic re-assessment of risk.
- Penalties should be introduced through levies if a mine was found to have a higher OEL than the agreed national limit.

The employer must further be responsible for providing adequate and sufficient training and awareness programmes to all employees about the dangers of mine related airborne particulate matter (dust) and the necessary protective measures needed for personal health and safety.

Occupational health surveillance

A good occupational health surveillance programme will assist in the early detection of possible lung diseases and to evaluate the efficiency of the dust management system.

Legislation should make provision for mandatory occupational health screening for current and ex-mineworkers and include risk-based entrance, periodic, exit and benefit medical examinations (for ex-mineworkers).

The examinations should include completion of an appropriate respiratory questionnaire profiling the mineworker's current and past cardio-respiratory health, a full sized chest x-ray and a lung function test.

The employer is responsible for protecting the mineworker from harm and providing him or her with a safe place of work. The legislation must provide specific instructions on what kind of engineering controls can be applied to protect the mineworker such as wetting down surfaces or use of exhaust ventilation to control the dust at source and during its transmission.

(2) Social protection of diseased mineworkers

The mine safety and health legislation should clearly specify which occupational lung diseases are compensable. TB should be recognised as a compensable disease where there has been significant exposure to silica dust at work such that this exposure would be sufficient to cause silicosis, as evidenced by radiography or histology. This dose (a function of time and exposure level) needs to be defined properly. The minimum exposure duration for compensation eligibility in South Africa is two hundred eight-hour shifts worked.

Periodic or benefit medical examinations (BME) for ex-mineworkers should be offered after an employee has left the mine in correspondence with the type and duration of work. In South Africa all ex-mineworkers are entitled to a two yearly BME according to the Occupational Diseases in Mine and Works Act (ODMWA), however other countries may determine the frequency of BMEs by how long the ex-

miner worked on the mine and the level of exposure. The legislation should make provision for an ex-mineworker to have easy access to an accredited occupational health facility or public health facility (if appropriate) where x-rays and lung function tests may be done and suitably qualified staff are able to diagnose pneumoconiosis and make submissions to the social security/workercompensation systems in that country.

Compensation legislation should cater for monthly pension payments rather than for once-off lump sum payments in the event of pneumoconiosis. The disease is a progressive life-long condition that will eventually lead to a situation where an ex-mineworker is unable to generate any income. Furthermore, legislation must cater for medical expenses and assistive devices (e.g. oxygen concentrators) that improve the quality of life of the ex-mineworker with the disease.

International frameworks for OSH in the mining sector

The following section provides an overview of international and regional frameworks guiding the development of coherent occupational and safety laws and regulations. They can be used as orientation when reviewing and amending existing legislation or when developing new policies, regulations or guidelines (e.g. codes of practice).

The International Labour Organisation (ILO) has elaborated a set of conventions and recommendations which provide ratifying countries with regulatory frameworks for introducing or improving existing occupational health and safety standards in general and particularly in the mining sector.

In 1950, the ILO and the World Health Organisation (WHO) defined occupational health as "the promotion and maintenance of the highest degree of physical, mental and social wellbeing of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs."

Occupational health considers the impact of hazardous workplace exposures on workers' health, working closely with the occupational hygiene discipline within a risk management framework. Occupational health provides a risk-based medical surveillance approach, which includes occupational medicine and occupational epidemiology.

Beside the conventions in the table, the ILO has adopted more than 40 standards specifically dealing with occupational safety and health, as well as over 40 *Codes of Practice*¹¹.

¹¹ ILO (1981); C155 – Occupational Safety and Health Convention, 1981 (No. 155) http://www.ilo.org/century/history/iloandyou/WCMS_211520/lang-en/index.htm



A review of the ILO Conventions yields the following important points:

- a)** There should be the adoption of a coherent national occupational safety and health policy and governments should promote occupational safety and health to improve working conditions. One of the key features of this regulatory framework is the introduction of a single overarching Occupational Safety and Health (OSH) law, replacing earlier laws, to cover all workers and all hazards at work.
- b)** There should be minimum requirements for mine management and the functioning of occupational health services that consider the health and wellbeing of the worker.
- c)** A preventative safety and health culture should be promoted with the view to progressively achieving a safe and healthy working environment.
- d)** The employer is mandated to assess and eliminate all risks, control the risk at source and minimize the risk by means that include the design of safe work systems.



The table below lists the relevant ILO Conventions and the priority areas they relate to:

PRIORITY	ILO CONVENTION	DESCRIPTION
Prevention	ILO Convention No. 155, (1981) on Occupational Safety and Health (OSH)	<p>Provides for the adoption of a coherent national OSH policy, as well as action to be taken by governments and within enterprises to promote occupational safety and health to improve working conditions.</p> <p>A key feature is the introduction of a single overarching OSH law, replacing earlier laws, to cover all workers and all hazards at work.</p>
	ILO Convention No. 187 Promotional Framework for Occupational Safety and Health (2006)	<p>Aims to promote a preventative safety and health culture and to be progressively working to achieve a safe and healthy working environment.</p> <p>It requires of member states that ratify the conventions to develop, in consultation with the most representative organisations of employers and workers, a national policy, a national system, and a national programme on occupational safety and health.</p>
Protection	ILO Convention No. 161 (1983) on Occupational Health Services (OHS) and its accompanying recommendation No. 171 (1985)	<p>Serve as models for establishing requirements for the organisation and functioning of occupational health services. According to the convention the term "occupational health services" means services entrusted with essentially preventive functions, responsible for advising the employer, the workers and their representatives in the workplace on:</p> <p>The requirements for establishing and maintaining a safe and healthy working environment which will facilitate optimal physical and mental health in relation to work.</p> <p>The adaptation of work to the capabilities of workers in the light of their state of physical and mental health. (Article 1(a)).</p> <p>Good occupational health practice, according to Article 1(a) of this convention, involves health promotion and protection activities of workers' health. This means that the improvement of working conditions and environment carried out by occupational safety and health professionals as well as other specialists, such as occupational hygienists, is vital.</p>
	ILO Convention No. 176 on Safety and Health in Mines	<p>The employer is mandated to assess and eliminate all risks, control the risk at source and minimize the risk by means which include the design of safe work systems.</p> <p>If the risk were to remain, the employer is to provide personal protective equipment, that is reasonable, practicable and feasible, and conforms to good practice and the exercise of due diligence.</p>

	The Occupational Health Services Recommendation No. 171	<p>OSH departments should monitor workers' exposure to health hazards, provide personal protective equipment for workers and collaborate on job placement and better adaptation of work to the workers.</p> <p>OSH departments should also participate in the analysis of occupational accidents and occupational diseases and in accident prevention programmes.</p> <p>The surveillance of the working environment should include the identification and evaluation of the environmental factors, which may affect the workers' health.</p> <p>Occupational hygiene assessments and organisational and environmental risk factors should be documented and mitigated.</p>
Compensation	ILO Conventions C017 and C018 as well as C018's revised version C042	This is concerned with the <i>Compensation of Occupational Injuries (C017) and Diseases (C018/042)</i> . Convention C042 covers, among others, the compensation of silicosis, silico-tuberculosis and workplace related intoxications (e.g. mercury intoxications).

Regional frameworks guiding occupational safety and health

As outlined in Article 12 of the Charter of Fundamental Rights in SADC every worker in the region has the right to health and safety at work and to a healthy and safe environment that sustains human development and access to adequate shelter. The article stresses the importance of ILO Convention No. 155 and addresses workers' rights to services that provide for the prevention, detection and compensation of work-related illness or injury. This includes emergency care, with rehabilitation and reasonable job security after injury and adequate inflation adjusted compensation. For the latter rights, provisions are made in further ILO conventions.

OSH is explicitly mentioned in the SADC Protocol on Health, which was approved by the SADC Heads of State in August 1999 and implemented in August 2004 and says that "State parties shall assist each other in the development and delivery of integrated occupational health services and cooperate in reducing the prevalence of occupational injuries and diseases." In this context, TB and silicosis have been getting focused attention.

In 2012, the SADC Heads of State signed the "Declaration on TB in the mining sector". The declaration acknowledges that mineworkers in the SADC region have contributed significantly to the wealth of the region at great personal cost to their health and welfare and that given the fact that the mining sector is one of the hardest TB-hit sectors immediate action is needed to protect mineworkers from occupational lung disease and suffering.





The declaration is further specified in the SADC Code of Conduct on Tuberculosis in the Mining Sector¹², designed to drive HIV/AIDS/TB and Silicosis (HATS) initiatives on the mines and peri-mining communities.

It highlights the urgent need for:

- Tracking and tracing, that there is development of a single database to track miners' employment history and healthcare across the region.
- Strengthening disease surveillance and programme monitoring and evaluation.
- More detailed research on the economic impact and financing mechanisms for HIV/AIDS Tuberculosis and Silicosis (HATS).
- Strengthening policies and legislative environment.

In addition, the declaration calls on mining houses to commit to strengthening systems and structures for the elimination of silicosis and regular medical follow up of ex mineworkers who were exposed to silica dust or encountered TB during or after employment.

The Framework for the Harmonized Management of Tuberculosis in the Mining Sector (published in 2014) is an operational guideline for the harmonisation of TB diagnostics and treatment in the Southern African region. SADC countries may wish to adapt their legislation according to the international frameworks.

Good practice example

South Africa has committed to a national programme for the elimination of silicosis. The programme aims to reduce the prevalence of silicosis by 2015 and to eliminate silicosis in workplaces by 2030. The country has established a regulatory and enforcement system, which focuses on the prevention of and protection from exposure to hazardous respirable crystalline silica dust. A central element of the programme is the 'Mandatory Code of Practice for an occupational health programme on personal exposure to airborne pollutants'¹³. The South African 'Chamber of Mines (COM)' has played a critical role in the rollout of the programme in the mining industry through its 'Mine Occupational Safety and Health (MOSH) learning hub. South Africa Department of Mineral Resources collects data on silica dust emissions from all mining operations in the country.

Artisanal small-scale mining

Legislation should be consistent and address the occupational safety and health standards of all employees or contractors in the mining industry. However, in the SADC region a significant artisanal small-scale mining (ASSM) segment has formed over the past decade. Estimates for Tanzania and Mozambique are around 750,000 mineworkers employed in this segment and Zimbabwe estimates the workforce at around 500,000. The legislation in most of SADC countries foresees and promotes the establishment of this type of mines (primary mining license, river bed panning license, etc.). However, although the owners of artisanal small-scale mines hold valid mining licenses, they tend not to apply the OHS regulations and standards issued by mining, health or labour authorities.

¹² Southern African Development Community (2014): Code of conduct on tuberculosis (TB) in the mining sector

¹³ Published under South Africa Department of Mineral Resources Guideline Circular No: 035-OHTTT-28-08-2006.

Concepts on how to address the safety and health challenges related to this type of manual and hand-tool focused labour do not exist. It is understood that it is difficult to apply the same international safety and health norms and standards to this mining segment, but the workforce has the same “right to health and safety at work and to a healthy and safe environment that sustains human development and access to adequate shelter¹⁴” as any other person in the SADC. It is crucial that policy makers assess the scale of the safety and health problems found in ASSM and develop policies establishing minimum safety standards and educative programmes protecting artisanal mineworkers. Furthermore, occupational health screening and services must be extended to this population. Mutual or micro insurance approaches should be considered for that purpose. Given the high number of artisanal mineworkers in some SADC countries there is a sufficiently wide base of potential customers and business volume for this to be a viable option. It would further support formalisation of artisanal small-scale mineworkers.



¹⁴ Article 12 of the Charter of Fundamental Rights in SADC

TOOLS FOR POLICY MAKERS

Good practice: South African mining industry best practice on the prevention of silicosis

(Available on the CD)

The best practice booklet on silicosis prevention has been developed to strengthen existing programmes on dust control in the mining industry and to give substance to the milestones developed by the Mine Health and Safety Council (MHSC) on the elimination of silicosis. Silicosis can be prevented and silica dust sources must be identified and better work practices must be implemented to reduce dust generation and capture dust at source. The best practice guidance gives policy makers a good overview of the problem and what needs to be done. Policy makers can refer to the specific interventions referred to in the document that they may want to model in their country by ensuring the legislation requires the industry to do so.

Good practice: Guideline for the compilation of a mandatory code of practice for occupational health programme on personal exposure to airborne pollutants [South African Department of Minerals and Energy]

(Available on the CD)

To protect, monitor and promote employees' health status, an occupational health programme is indicated where exposure to such significant risks occur. The Mine Occupational Health Advisory Committee prepared a guideline covering both occupational hygiene and medical surveillance to ensure compliance and uniform standards.

The Code of Practice (COP) can be implemented in a country placing more responsibility on the employer and empowers the Chief Inspector of Mines to stop poor industry practice. Policy makers can adapt this COP and introduce regulation to ensure the employer must prepare and implement a COP based on this guideline in the case where the employer's risk assessment indicates a need to establish and maintain either a system of occupational hygiene measurements or a system of medical surveillance.

This guideline assists employers with the establishment of an Occupational Health Programme, but does not stipulate specific requirements for specific circumstances. It sets out a basic system for managing risk to health.





TB in the Mining Sector Southern African Programme (TIMS)

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