INTERNATIONAL LABOUR ORGANIZATION

Sectoral Policies Department

Occupational safety and health in the oil and gas industry in selected sub-Saharan African countries

Issues paper for discussion at the Sub-Saharan African Tripartite Workshop on Occupational Safety and Health in the Oil and Gas Industry
(Maputo, Mozambique, 17−18 May 2017)

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Abbreviations and acronyms

AfDB	African Development Bank
BCM	billion cubic metres
DGS	Direction des Statistiques Générales et des Etudes Economiques (Gabon)
FAR	Fatal Accident Rate
FIFO	fly-in, fly-out
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
H2S	hydrogen sulphide
ICT	information and communication technology
IEA	International Energy Agency
IGT	*Inspecção Geral do Trabalho* (General Labour Inspectorate) (Angola)
ILO	International Labour Office /Organization
IOGP	International Association of Oil and Gas Producers
MRSA	methicillin-resistant staphylococcus aureus
MSD	musculoskeletal disorder
NBS	National Bureau of Statistics
NIOSH	National Institute for Occupational Safety and Health (United States)
OSH	occupational safety and health
PPE	personal protective equipment
SME	small and medium-sized enterprises
SSA	sub-Saharan Africa
TCM	trillion cubic metres
TMT	thousand million tonnes

Executive Summary

Oil and gas is one of the most lucrative industries in sub-Saharan African (SSA) countries. It is an important driver of economic growth in the region and as such has contributed to poverty reduction and technology transfer and competitiveness. At the same time the industry can also be hazardous, and is sometimes faced with occupational safety and health (OSH) challenges. Occupational accidents and diseases create a human and economic burden, a serious concern for the ILO and its constituents in SSA countries. Tackling this challenge requires a collective effort by governments, employers and workers to build, implement and continuously strengthen a preventative safety and health culture.[1]

Most SSA countries have taken advanced measures to address OSH issues. However, challenges still exist. First, OSH legislation and regulations, industry best practices and other factors are not sufficiently developed to achieve a preventative safety and health culture in the industry. Second, there is an urgent need to strengthen the capacities of the tripartite constituents. The competent authorities lack technical and scientific knowledge for good policy-making in the industry. The industry needs to arm itself with technological competencies and skills to improve overall safety operations. Workers need to have correct information and up-to-date knowledge about OSH laws and regulations as well as skills and equipment needed to protect themselves and other workers in their work environments. In addition, there is a need for more efficient and effective mechanisms for recording and notification of occupational accidents and diseases.

In particular, the ratification and implementation of the ILO Occupational Safety and Health Convention, 1981 (No. 155), its 2002 Protocol, and the Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187) are critical to achieving a preventative safety and health culture. Convention No. 155 sets out the basic principles and methodology required for improvements in OSH management. The 2002 Protocol complements it and reinforces the requirement to collect relevant information to assess progress. Convention No. 187 strengthens the requirement to promote safe and healthy working environments. It details the cyclical nature of the national policy process and how such policies, through national programmes, contribute to building and maintaining a preventative safety and health culture. In consultation with the most representative organizations of employers and workers, governments are requested to formulate and promote such a preventative safety and health culture in the industry by all means, including laws, regulations, policies, collective agreements, labour inspectors and any other compliance mechanisms, systems and initiatives.

[1] See: Occupational Safety and Health Convention, 1981 (No. 155), its 2002 Protocol, and the Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187)

1. The oil and gas industry in sub-Saharan African countries

Sub-Saharan Africa (SSA), the area of the African continent that lies south of the Sahara Desert, accounts for a relatively small percentage of world reserves and production of oil and gas. However, the oil and gas industry plays a critical role in the national economies of many SSA countries. According to the *BP Statistical Review of World Energy* (2016), Africa's proven reserves of crude oil amounted to 17.1 thousand million tonnes (TMT) in 2015, accounting for 7.6 per cent of world proven reserves. Africa produced 8,375 thousand barrels per day in 2015, or 9.1 per cent of world crude oil production. The continent's total proven reserves of natural gas amounted to 14.1 trillion cubic metres (TCM) in 2015, accounting for 7.5 per cent of world proven reserves. Africa produced 211.8 billion cubic metres (BCM) of natural gas in 2015, accounting for 6.0 per cent of world production. Table 1 shows the amounts of crude oil and natural gas produced in 2014 in selected countries of the SSA region.

Table 1. Production of crude oil and natural gas, selected African countries, 2014

	Thousand tonnes of oil equivalent	
	Crude oil	Natural gas
Angola	85 859	604
Cameroon	3 867	556
Côte d'Ivoire	967	1 651
Gabon	11 816	276
Kenya	n.a.	n.a.
Mozambique	59	3 472
Nigeria	116 289	34 641
South Africa	232	869

Source: IEA, 2016.

Available employment figures show that the oil and gas industry creates relatively little employment, despite its importance to national economies. For example, according to the *Annuaire Statistique du Gabon* (DGS, 2009), the extraction of crude oil and natural gas sector in Gabon employed 3,196 workers in 2009. According to the *National Manpower Stock and Employment Generation Survey* (NBS, 2010), the same industry in Nigeria employed 21,794 workers in 2010.

2. International labour standards and national legal frameworks

2.1. ILO instruments

The Promotional Framework for Occupational Safety and Health Convention (No. 187) and its accompanying Recommendation (No. 197) are of critical importance for the promotion of OSH in all sectors, including the oil and gas industry. These instruments provide for the adoption of a coherent national OSH policy, as well as action to be taken by governments and within enterprises to promote OSH and improve working conditions.

Convention No. 187 is based on two key aims: the development of a preventative safety and health culture and the application of a systems approach to managing OSH at the national level. A preventative safety and health culture refers to a culture in which the right to a safe and healthy working environment is respected at all levels, where government, employers and workers actively participate in securing a safe and healthy working environment through a system of defined rights, responsibilities and duties, and where the principle of prevention is accorded the highest priority (Article 1(d) of Convention No. 187).

The Convention incorporates these basic principles into the three foundational concepts of the instrument: (i) a national policy; (ii) a national system; and (iii) a national programme on OSH. It requires member States to promote the continuous improvement of OSH to prevent occupational injuries, diseases and deaths, through the development of these three mechanisms.

Dialogue with workers' and employers' organizations is at the heart of the Convention. The national policy on OSH should be formulated in consultation with the most representative organizations of employers and workers; and its implementing infrastructure, the national system, should also be established, maintained, progressively developed and periodically reviewed in consultation with such organizations. The formulation, implementation, monitoring, evaluation and periodic review of the national programme on OSH must also be undertaken in consultation with the social partners, and the Convention requires consultations on the periodic consideration of possible measures to ratify the ILO's relevant OSH Conventions.

2.1.1. ILO instruments linked to the promotional framework

Convention No. 187 complements the Occupational Safety and Health Convention, 1981 (No. 155) and its 2002 Protocol. The implementation of a policy focused on prevention constitutes a blueprint for the application of a systems approach to OSH. Convention No. 155 establishes the foundation for a preventative approach, and Convention No. 187 refers specifically to Convention No. 155 in both its preamble and with respect to national OSH policies. In particular, Convention No. 155 defines the concept of national policy and recognizes the importance of its formulation, implementation and review. Convention No. 187 builds on this concept, re-emphasizing that the policy is a key mechanism for the promotion of a safe and healthy working environment and underlining the importance of having a framework for the implementation of such a policy.

Other international labour standards relevant to OSH in the oil and gas industry include instruments on protection against specific risks, especially the Occupational Cancer Convention, 1974 (No. 139), the Working Environment (Air Pollution, Noise and Vibration) Convention, 1977 (No. 148), the Asbestos Convention, 1986 (No. 162), the Chemicals Convention, 1990 (No. 170), the Prevention of Major Industrial Accidents Convention, 1993 (No. 174), the Radiation Protection Convention, 1960 (No. 115), and their accompanying Recommendations.

2.2. OSH legal framework in selected SSA countries

2.2.1. Angola

The Angolan legislation can be described as a legal system that preserves the structural features inherited from Portuguese law. The Constitution of the Republic of Angola establishes the right of the worker to OSH in accordance with the law. The main legal acts containing provisions on OSH are:

- The Constitution of the Republic of Angola;
- Act No. 2/00 of 11 February, the General Labour Law;
- Decree No. 31/94 of 5 August, approving the principles for the promotion of safety, hygiene and health at work; and
- Decree No. 53/05 of 15 August, approving the legal regime of accidents at work and occupational diseases.

The competent national authority responsible for safety and health at work is the General Labour Inspectorate (*Inspecção Geral do Trabalho* − IGT). The IGT is a service of the Government of Angola which aims to improve working conditions through the enforcement of labour standards and the promotion of OSH. It covers the entire country, including all public and private companies but excluding specific labour relations in the public administration. It is integrated in the Ministry of Public Administration, Employment and Social Security (MAPESS).

Labour inspectors are civil servants of the State Administration. Their employment periods are indefinite. The status and conditions of service assure them of stability of employment and independence of any change of government or of improper external influences.[2]

The enforcement of the OSH regulations in the oil and gas industry in Angola is mandated by the national Government and monitored by the Ministry of Petroleum under Decree No. 38/09 of 14 August 2009, which requires, inter alia, that oil and gas companies must ensure that all employees are protected against OSH challenges such as noise, vibration, radiation and exposure to chemical products and, simultaneously, provide medical assistance in case of illness caused in the workplace.

2.2.2. Cameroon

Most Cameroonian legislation originated in the English common law and the French civil law from the British and French colonial periods. Cameroon can thus be said to have a dual legal system. OSH is essentially governed by Title VI of the Labour Code, “Safety and Health at Work”. Besides this, the main OSH regulation is Order No. 039 /MTPS /IMT of 26 November 1984 (on general measures for health and safety in workplaces), which contains regulations concerning the respective obligations of employers and workers; the composition of health and safety committees; the determination of general conditions of hygiene relating to, among other things, construction, ventilation, temperature and lighting; the determination of safety measures and transportation; the definition of hazardous

[2] LEGOSH, ILO: http://www.ilo.org/dyn/legosh/en/f?p=14100:1100:0::NO:1100:P1100_ISO_CODE3,P1100_YEAR:AGO,2014:NO.

substances; rules of prevention and firefighting; and the establishment of means of control and sanctions.

Under Cameroon's Labour Code, the most important decisions and decrees concerning health and safety at work are:

- Decree No. 93/210/PM of 3 March 1993, on the organization and functioning of the National Commission on occupational health and safety;
- Order No. 038/MTPS/IMT of 26 November 1984, completing the list of work-related illnesses eligible for compensation, the time limits of insurer or employer liability, and notification conditions under Order No. 005/TLS/SS of 9 March 1962;
- Act No. 77-11 of 27 July 1977, on repair and prevention of accidents at work and work-related illness;
- Order of 15 October 1979, on the organization and functioning of medical services at work; and
- Decree No. 79-96 of 21 March 1979, on procedures for medical services at work.

The Directorate of Health and Safety at Work and the National Commission on Industrial Health and Safety is the competent authority for OSH matters.[3]

2.2.3. Côte d'Ivoire

In Côte d'Ivoire, the Labour Code, adopted in 1995, sets out general safety and health provisions in Title IV. In addition, the main OSH legislation is Decree No. 67-321 on Occupational safety and Health, adopted in 1967, which lays down the regulatory development of Title VI of the Labour Code. The legal provisions of the decree address general OSH measures concerning workplaces and work environments, prevention against fire risk and occupational accidents, as well as more specific measures such as those related to tools and machinery and specific risks at work. Other decrees provide a number of other labour provisions concerning night work, working hours, OSH committees, National OSH Advisory Committee, health services, occupational disease and protection against particular hazards. The Social Security Code lays down in Chapter IV, some provisions on occupational diseases. The Occupational Safety and Health Directorate of the Ministry of Public Service and Employment is the competent national authority for OSH matters.[4]

2.2.4. Gabon

Gabon's legal system draws inspiration from the French civil law system and customs and can be divided into three levels: national and regional legislation, and international treaties. National legislation in civil, criminal, and social matters is either maintained by laws inherited from the French colonial period or has been modified according to customary laws. As is the case in most former French colonies, the Civil Code of 1804, introduced in the colonies in 1833, is the baseline document for the legal system. When it won its

[3] LEGOSH, ILO: http://www.ilo.org/dyn/legosh/en/f?p=14100:1100:0::NO:1100:P1100_ISO_CODE3,P1100_YEAR:CMR,2014:NO.

[4] LEGOSH, ILO: http://www.ilo.org/dyn/legosh/en/f?p=14100:1100:0::NO:1100:P1100_ISO_CODE3,P1100_YEAR:CIV,2013:NO.

independence in 1960, Gabon continued to use the Code, but with the ambition of gradually adjusting it to local realities.

The main regulations protecting the health and safety of workers are:

- Act No. 3/94 of 21 November 1994, on the Labour Code;
- Ordinance No. 018/PR/2010 of 25 February 2010, on the modification of certain clauses in the Labour Code;
- Decree No. 01494/PR/MTEPS of 29 December 2011, determining general regulations for health and safety in the workplace; and
- Act No. 6/75 of 25 November 1975, on the social security code.

The Labour Code requires employers to respect the liberty and dignity of workers. Conditions under which work is performed shall enable the worker and his/her family members to satisfy their basic needs, to protect their health and to enjoy decent living conditions (Labour Code, Art. 3). Title 4 entitled "Safety and Health" of the Labour Code provides some basic general rules on safety and health for the purpose of the most effective protection of workers' health (Labour Code, Art. 196).

The Minister of Labour is in charge of ensuring the enforcement of laws and regulations and the implementation of the general policy of the Government on labour, employment and social security issues (Labour Code, Art. 230). Labour inspectors, physician labour inspectors and social security authorities' inspectors are in charge of the enforcement of general OSH regulations (Labour Code, Art. 224). An Advisory Committee on Occupational Safety, Hygiene and Health Protection is established under the auspices of the Minister of Labour. Its remits, organization and internal functioning are determined by rules and regulations under the new Article 250 of the Labour Code, and by Ordinance No. 018/PR/2010 of 25 February 2010.[5]

2.2.5. Kenya

The Occupational Safety and Health Act and the Employment Act are the two main acts containing provisions in relation to OSH, and more specific provisions can be found in the Factories (First-Aid) Order, the Factories (Woodworking Machinery) Rules, the Factories (Examination of Plant) Order, the Mining (Safety) Regulations, and the Employment (Sanitation) Rules. The Ministry of Labour, Social Security and Services is the competent national authority for safety and health at work.[6]

The Minister for Energy is granted wide-ranging powers under the Petroleum Exploration and Production Act (PEPA), including the power to negotiate petroleum agreements, supervise petroleum operations, and make regulations to govern the exploration and production of hydrocarbon.

[5] LEGOSH, ILO: http://www.ilo.org/dyn/legosh/en/f?p=14100:1100:0::NO:1100:P1100_ISO_CODE3,P1100_YEAR:GAB,2015:NO

[6] LEGOSH, ILO: http://www.ilo.org/dyn/legosh/en/f?p=14100:1100:0::NO:1100:P1100_ISO_CODE3,P1100_YEAR:KEN,2015:NO

2.2.6. Mozambique

The Constitution of the Republic of Mozambique establishes the rights of the worker to hygienic and safe working conditions. This is the main provision in OSH legislation, which also includes general requirements provided for in the Labour Law and specific developments for certain sectors of economic activity, namely industry, construction and mining. Parts of Mozambique's OSH legislation especially that concerning the economic sectors, is inherited from Portuguese law during the colonial period, so that Mozambique can be described as having a dual legal system.

The main OSH acts are the following:

- Labour Act No. 23/2007 of 1 August; and
- Decree No. 53/05 of 15 August, on the legal regime of accidents at work and occupational diseases.

Cooperation between the State and organizations of employers and trade unions is realized through a tripartite body: the Labour Advisory Committee (*Comissão Consultiva do Trabalho*). The General Labour Inspectorate is the main service with competences in OSH matters.[7]

In the wake of discovering large hydrocarbon reservoirs in the Rovuma Basin in northern Mozambique, the Government recognized the need to review its Oil and Gas Upstream Activities Law enacted in February 2001. The new law (the Oil and Gas Upstream Operations Law, No. 21/2014) aims to respond to basic requirements for the implementation of a clear set of rules governing the rights and duties of the industry's stakeholders, and to enable the stable development of the oil and gas projects in the context of international standards.

2.2.7. Nigeria

It is the duty of the Federal Ministry of Labour and Productivity (Inspectorate Division) to enforce the Factories Act of 1990, while the Labour, Safety, Health and Welfare Bill of 2012 (which repealed the Factories Act) empowers the National Council for Occupational Safety and Health of Nigeria to administer the proceeding regulations on its behalf. The Employee's Compensation Act of 2011 (which replaces the Workman's Compensation Act, 2004) makes provisions for the compensation for any death, injuries, diseases or disabilities due to employment. However, the enforcement of these regulations is said to be inefficient due to lack of adequately skilled personnel (Diugwu et al., 2014). The regulatory and supervisory body for the oil and gas industry is the Federal Ministry of Petroleum Resources under the Department of Petroleum Resources. Applicable regulations include: the Petroleum Act, 1969, providing for grants by the Minister of Petroleum Resources of three types of interests – exploration, prospecting and production rights; the Gas Re-injection Act, 1979; the Federal Environmental Protection Agency Act (FEPA), the Environmental Impact Assessment Act, 1992; the Mineral Oil (Safety) Regulations, 1995; the Petroleum (Drilling and Production) Regulations [Cap 350] LFN 1990; the Environmental Standards and Guidelines for the Petroleum Industry in Nigeria, 1991; and the National Oil Spill Contingency Plan.

[7] LEGOSH, ILO: http://www.ilo.org/dyn/legosh/en/f?p=14100:1100:0::NO:1100:P1100_ISO_CODE3,P1100_YEAR:MOZ,2014:NO.

2.2.8. South Africa

The Occupational Health and Safety Act (OHSA) is the leading OSH legislation in South Africa. Its primary aim is to "provide for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with activities of persons at work; to establish an advisory council for occupational health and safety; and to provide for matters connected therewith" (Preamble).

There are ancillary occupational safety and health laws (e.g. the Explosives Act 15 of 2003 and Hazardous Substances Act 15 of 1973) and regulations (e.g. Regulations for the Integration of the Occupational Health and Safety Act, 1995).

The law requires the Minister of Labour to designate an officer serving in the Department as chief inspector for the purposes of the OHSA. In addition, the Minister may designate any person as an inspector to perform, subject to the control and directions of the chief inspector, any or all the functions assigned to an inspector by the OHSA. The inspectors conduct investigations in terms of the Act. In addition, the chief inspector has the power to conduct a formal inquiry into any incident which has occurred at or originated from a workplace or in connection with the use of plant or machinery which has resulted, or in the opinion of the chief inspector could have resulted, in the injury, illness or death if any person (OHSA 85 of 1993, §§ 27-33).[8]

[8] LEGOSH, ILO: http://www.ilo.org/dyn/legosh/en/f?p=14100:1100:0::NO:1100:P1100_ISO_CODE3,P1100_YEAR:ZAF,2013:NO.

3. OSH challenges in the oil and gas industry

3.1. Data on occupational injuries and diseases

According to member companies' safety reports compiled by the International Association of Oil and Gas Producers (IOGP), the African region reported the second largest number of fatalities in 2014 and 2015, after the North America region (table 2). It has not been possible to obtain data on occupational fatalities, injuries and diseases in the sub-Saharan Africa (SSA) region.

Table 2. Fatalities, fatal incidents and fatal accident rate by region, 2014 and 2015

Region	Fatalities		Fatal Accident Rate (FAR)		Fatal incidents	
	2015	2014	2015	2014	2015	2014
Africa	10	5	1.84	0.86	7	5
Asia and the Pacific	7	11	0.76	1.02	4	10
Europe	4	4	1.17	1.04	4	4
Former Soviet Union (FSU)	4	2	1.60	0.81	3	2
Middle East	7	2	1.07	0.33	7	2
North America	20	16	2.31	1.56	13	14
South and Central America	2	5	1.41	1.13	2	5
Overall	54	45	1.45	1.03	40	42

Source: IOGP, 2016.

Convention No. 187 provides that mechanisms for the collection and analysis of data should take into account the relevant ILO instruments, including the Protocol of 2002 to the Occupational Safety and Health Convention, 1981 (No. 155), the List of Occupational Diseases Recommendation, 2002 (No. 194), and the ILO Code of Practice on Recording and Notification of Occupational Accidents and Diseases, 1996. Article 7 of the 2002 Protocol to Convention No. 155 provides that "statistics shall be established following classification schemes that are compatible with the latest relevant international schemes established under the auspices of the ILO or other competent international organizations". Systems for the recording and notification of accidents and diseases are instrumental to the collection of the data necessary for developing preventative action. It encourages governments, in consultation with the most representative organizations of employers and workers, to ensure that such systems are established in law and function effectively in practice. This may include undertaking an examination of the causes of under-reporting, including insufficient knowledge and avoidance of insurance costs related to reporting, and then taking proactive measures to address the difficulties identified

3.2. OSH challenges for oil and gas workers

3.2.1. Offshore workers

In the oil and gas industry there are many tasks in which the health and capacity of a worker could have an impact on the safety of a task being conducted, or could worsen the health conditions of the worker. Workers who are unable to complete a task safely place themselves and others at risk.

The primary occupational hazards associated with offshore exploration and production operations include illnesses from exposure to geographical and climatic elements, stress

from travelling long distances over water, and personal injury. Psychological problems may result from the physical isolation of exploratory sites and their remoteness from base camps, and the extended work periods required on offshore drilling platforms.

Some workers cannot handle the stress of working offshore at a demanding pace, for extended periods of time, under relative confinement and subject to ever-changing environmental conditions. The signs of stress in workers include unusual irritability, other signs of mental distress, excessive drinking or smoking or use of drugs.

Seasickness and drowning, as well as exposure to severe weather conditions, are other hazards in offshore work. Injuries while working in drilling and production activities may result from many causes, including slips and falls, pipe handling, lifting pipe and equipment, misuse of tools and mishandling explosives. Burns may be caused by steam, fire, acid or mud containing chemicals such as sodium hydroxide. Dermatitis and skin injuries may result from exposure to crude oil and chemicals (Valentic et al., 2005; Parkes, 2010).

3.2.2. Physical hazards

A physical hazard is a factor within the environment that can harm the body without necessarily touching it. Vibration and noise are examples of physical hazards. Côte d'Ivoire's Labour Code requires employers to take all the necessary measures according to the operating conditions of a workplace to protect the life and health of workers. In Angola, employers are required to establish protective measures, provide information and notify authorities regarding ionizing radiation. In Cameroon, in closed areas assigned to work that are deprived of or insufficiently provided with openable windows directly overlooking the outside, measures shall be taken to introduce fresh air at a rate of 30 cubic metres at least per hour and per person. Similarly, Gabon's law requires that premises in which work is performed shall be ventilated. Premises shall be supplied with windows or other openings directly to the outside and which ensure a sufficient natural or artificial ventilation. The atmosphere of workplaces shall be free from smells obstructing breathing, from condensation and from hazardous unhealthy and inconvenient pollutants such as steams, gases or dust.

3.2.1.1. High temperatures

Workers may be at risk of heat stress when exposed to hot environments or extreme heat. This can result in illnesses including heat stroke, heat exhaustion, heat syncope, heat cramps and heat rashes, or death. Heat also increases the risk of workplace injuries such as those caused by sweaty palms, fogged-up safety glasses or dizziness, and may reduce brain function responsible for reasoning ability, creating additional hazards. Heat stress can be reduced by modifying metabolic heat production or heat exchange by convection, radiation or evaporation. Although most healthy workers will be able to acclimatize over a period of time, some workers may be heat intolerant. Heat intolerance may be related to many factors; however, a heat tolerance test can be used to evaluate an individual's tolerance, especially after an episode of heat exhaustion or exceptional heat stroke (Moran, Erlich and Epstein, 2007).

Some SSA countries have specific provisions for protecting workers from high temperatures. According to the Cameroonian hygiene law, closed working spaces shall be equipped with winders or other openings and shall ensure adequate ventilation to prevent excessive temperature rises. Under Mozambique's laws, workers exposed to high temperatures must use personal protective equipment. Mining activities must be suspended when the temperature exceeds 33ºC (Legislative Decree No. 48/73 of 5 July; General Safety Rules at Work in Industrial Units 1973-07-05 (Art. 135)). In Gabon, the law states that the ambient temperature shall be at an acceptable level, consistent with workers' health and without discomfort for physical obligations required to perform the job. It shall be monitored

by thermometers installed in workplaces. The temperature shall not cause any discomfort or any risk to workers' health and safety (Decree No. 01494/PR/MTEPS, Art. 40). The Decree contains detailed provisions related to thermal environment, in particular:

- rest periods granted to workers exposed to extreme temperatures;
- means to protect workers from heat (Art. 42); and
- personal protective equipment for workers who perform their work outside to protect them from bad weather (Art. 44).

In 2016, the US National Institute for Occupational Safety and Health (NIOSH) substantially updated criteria for a Recommended Standard on Occupational Exposure to Heat and Hot Environments, reflecting the recent research and findings of incidents including the Deepwater Horizon oil spill response of 2010. NIOSH recommends that employers implement measures to protect the health of workers exposed to heat and hot environments. Employers need to monitor environmental heat and determine the metabolic heat produced by workers (e.g. light, moderate or heavy work). Additional modifications (e.g. worker health interventions, clothing and personal protective equipment) may be necessary to protect workers from heat stress, on the basis of increases in risk. In hot conditions, medical screening and physiological monitoring are recommended. Employers, supervisors and workers need to be trained to recognize symptoms of heat-related illness; proper hydration; care and use of heat-protective clothing and equipment; effects of various risk factors affecting heat tolerance (e.g. drugs, alcohol, obesity); the importance of acclimatization; the importance of reporting symptoms; and appropriate first aid. Employers should have an acclimatization plan for new and returning workers, because the lack of acclimatization has been shown to be a major factor associated with worker heat-related illness and death. NIOSH recommends that employers provide the means for appropriate hydration and encourage their workers to hydrate themselves with potable water at less than 15°C (59°F) made accessible near the work area. Workers working in hot environments for less than two hours and involved in moderate work activities should drink one cup (8 oz.) of water every 15–20 minutes, but during prolonged sweating lasting several hours, they should drink sports drinks containing balanced electrolytes. In addition, employers should implement a work/rest schedule and provide a cool area (e.g. air-conditioned or shaded) for workers to rest and recover. These elements are intended to protect the health of workers from heat stress in a variety of hot environments.

3.2.3. Ergonomic hazards

An ergonomic hazard is a physical factor within the environment that harms the musculoskeletal system. Ergonomic hazards include, among others, repetitive movement, manual handling, inappropriate workplace/job/task design, uncomfortable workstation height and poor body position. In Angola, the employer must ensure that no worker is exposed to manual handling of loads without being informed about the damage that they can cause to his/her health and the preventative measures to be taken. The employer must ensure the health surveillance of workers exposed to risks, giving particular attention to those who perform monotonous or cadenced work. The Gabon law requires worker to have enough free space where he/she may work without any risk for his/her safety and health. Each workstation shall be supplied with a suitable seat. Workplaces and premises for workers shall have, as far as possible, natural lighting and shall be supplied with adequate artificial or electric lighting to ensure good vision to workers. Similarly, in Cameroon, the law requires that there shall be provided suitable seats for the use of workers whose work is carried out while sitting continuously or intermittently.

3.2.4. Biological hazards

Biological hazards are organic substances that pose a threat to the health of humans and other living organisms. They include pathogenic micro-organisms, viruses, toxins, spores, fungi and bio-active substances. In Angola, the law obliges the employer to ensure that no worker is exposed to the action of biological agents without being informed about the damage that they can cause to his/her health and the preventative measures to be taken. The employer must ensure health surveillance of workers exposed to risks. In Gabon, the law requires that appropriate measures shall be taken in all workplaces where hazardous materials are produced, handled, used, stored or transported.

3.2.4.1. Communicable diseases

Communicable diseases are infectious diseases transmissible from person to person by direct contact with an affected individual or the individual's discharges or by indirect means. Oil and gas workers often work in confined areas for extended periods of time, which presents the risks of exposure to communicable diseases including Ebola, enterovirus D68, flu, hantavirus, hepatitis B, HIV and AIDS, measles, Methicillin-resistant Staphylococcus aureus (MRSA), pertussis, rabies, sexually transmitted diseases, shigellosis, tuberculosis, West Nile virus and Zika. The ILO List of Occupational Diseases (revised in 2010) reflects the state-of-the-art development in the identification and recognition of occupational diseases in the world today. It indicates clearly where prevention and protection should take place. This list serves as a model for the establishment, review and revision of national lists of occupational diseases. In addition, the ILO adopted an international labour standard on HIV and AIDS in the world of work in 2010 which provides policy and legislative guidance (the HIV and AIDS Recommendation, 2010 (No. 200)).

3.2.4.2. Chemical hazards

Hazardous chemicals in the workplace are substances, mixtures and materials that can be classified according to their health and physico-chemical risks and dangers. Such hazards include skin irritants, carcinogens or respiratory sensitizers that have an adverse effect on a worker's health as a result of direct contact with or exposure to the chemical, usually through inhalation, skin contact or ingestion. The Globally Harmonized System of Classification and Labelling of Chemicals (GHS) (UN, 2011) brings together effective systems to improve safety of management of chemicals across borders. Chemical hazards particularly relevant to oil and gas workers include:

- Hydrogen sulphide (H2S): H2S is often found in oil and natural gas deposits, and in some mineral rocks, and can irritate lungs, throat, nose and eyes. With high levels of H2S, poisoning can be quick and fatal with little warning.

- Drilling fluids: During drilling, a high volume of drilling fluids is flown through the well and into systems that are open, partially enclosed or completely enclosed at elevated temperatures. When those fluids are agitated, as they are during part of the recirculation process, workers may suffer significant exposure and subsequent health effects.

- Silica: Silica is a fundamental component of sand and rock. Prolonged breathing of fine crystalline silica dust will cause silicosis disease. The particles are deposited in the lungs, leading to thickening and scarring of lung tissue. Initially, employees with silicosis may have no symptoms, but when the disease progresses they may suffer shortness of breath, severe coughing and weakness. These symptoms can become worse over time and induce death. Workers carrying out the activities listed below are at high risk of breathing silica dust:

- abrasive blasting using silica-containing products;
- drilling using dry product additives that contain quartz;
- cementing operations;
- shale dryer maintenance (dry particulate may comprise quartz);
- hydraulic fracturing (loading, unloading, moving or storing sand); and
- sweeping or moving sand or gravel that contains silica.

- Mercury: mercury can be released from geological deposits by heat and pressure, and then migrated to oil and gas traps as a vapour. When those gas reservoirs are produced and processed fluids are cooled, the liquid mercury can condense in heat exchangers, separators, coolers, valves and piping. When such equipment (components made from aluminium alloys or magnesium) is disassembled for maintenance or repair, employees can be exposed to mercury vapour.

These hazardous substances for which sufficient hazard and exposure data are available continue to be of great concern, particularly those to which workers may be exposed for long periods of time. Examples of these include heavy metals; substances that cause respiratory diseases, such as coal dust; solvents harmful to the nervous system; substances that induce asthma and dermatitis; or carcinogens. A good number of these substances are identified in national lists of occupational diseases. Most SSA countries establish and maintain lists that regulate hazardous substance concentration levels to which workers may be exposed via inhalation, ingestion or skin contact, for specified time periods without being at risk. These limits can be binding or indicative, and may also cover other hazards such as heat, noise, radiation and cold.

In Angola, the law requires employers to ensure the health surveillance of workers exposed to risks. The prevention of occupational risks must be developed according to the principles, standards and programmes applicable to substances and agents, occupational exposure limit values, technical standards, sampling, measurement and evaluation of results. In Côte d'Ivoire, the law requires employers to take special precautions for the protection of workers who perform painting or varnishing spraying work or those working with lead and benzoyl.

3.2.5. Psychosocial hazards

Psychosocial hazards include, among others, stress, violence and substance abuse. There are circumstances in which work can have adverse consequences for health and well-being. Risks to psychological health at work may arise from organizational or personal factors, with the major factors being poor design of work and jobs, poor communication and interpersonal relationships, bullying, occupational violence and fatigue. Risks to psychological health due to work should be viewed in the same way as other health and safety risks and a commitment to prevention of work-related stress should be included in an organization’s health and safety policies.

Workers who make use of drugs or alcohol often do so in the misperception that they help to reduce the stress of work, or for mood adjustment, performance enhancement, helping to get over peer pressures, or socializing. However, substance abuse generally leads to increased chances of accident, increased absenteeism, and lower productivity and general performance of the company. To some extent, some SSA countries have laws prohibiting substance abuse in the workplace.

3.2.6. New and emerging risks

The oil and gas industry utilizes advanced technologies. International labour standards such as Recommendation No. 197 highlight the importance of identifying new and emerging hazards and risks in the workplace. The accelerating trend towards digitalization has led to new working models, accompanied by new OSH risks among other factors, poor work design, the lack of a social work context, and the proliferation of information and communication technology (ICT). New realities in the workplace, and the accompanying risks, should be addressed.

3.2.7. Working time arrangements

Various working time arrangements are utilized in the oil and gas industry. Fly-in, fly-out (FIFO) rosters are one example. These are frequently two weeks on/two weeks off, although schedules of two weeks on/three weeks off and even two weeks on/four weeks off are also observed. Extended rosters such as four weeks on/four weeks off are seen in some remote/overseas locations. Offshore specialists routinely move from one installation to another and tend to have no fixed work/leave cycle. These irregular working time arrangements could give rise to concerns for workers and their families. Furthermore, FIFO workers are often expected to work extended shifts; a 12-hour shift is the most common. There is a consistent relationship between long working hours and negative effects on workers' health, alertness and performance.

3.2.8. Women workers

The representation of women in the oil and gas industry in SSA countries appears to be low, but it was not possible to obtain precise estimates concerning the number of women in the industry. Globally, only 10 per cent of professionals in the extractive industries, including the oil and gas industry, and 1 per cent of board members or CEOs, are women. One study finds that only 12 per cent of members of Boards of Directors in the African oil and gas industry are women (ILO, 2013a). Some companies are hiring more women workers: one national oil and gas company in Nigeria, for example, has achieved a 30 per cent female representation on its Board of Directors (AfDB, 2015).

The high level of workplace hazards in the oil and gas industry generally represents a concern for the health of women in this sector, depending on how well these risks are managed. When pregnant, women face additional risks: exposure to hazardous substances including biological agents can affect the foetus and lead to higher mortality rates or congenital malfunctioning (Guiffrida, Iunes and Savedoff, 2001).

The oil, gas and mineral value chains provide important opportunities for women's employment. Gender equality can be enhanced throughout the chain of exploration, contracting and licensing, operations and extraction, value addition, tax and royalty collection, and revenue distribution and management (ILO, 2013a).

3.2.9. Personal protective equipment and clothing

Protective measures are the essential last step in preventing fatalities, accidents or injury to health. The provision of suitable personal protective equipment (PPE) and clothing are absolutely necessary when risks cannot be adequately addressed through measures to eliminate or minimize them.

Member States in SSA countries have introduced legislative measures requiring the provision of PPE to workers. For example, in Angola, the employer must provide workers with PPE when appropriate and when general measures do not ensure complete protection. In Cameroon, the employer has a duty to ensure that workers, considering their activities,

are protected through the supply, maintenance and renewal of collective and personal protective measures recognized as effective. In Côte d'Ivoire, employers shall provide PPE particularly for specific risks, including exposure to intoxications from benzene. In Mozambique, whenever it is necessary the employer must provide PPE and working clothes appropriate to prevent the risk of accidents or harmful effects to the health of workers.

Under these laws, there is a duty to ensure the usage of PPE. For example, South Africa has established legislative requirements relating to the provision of PPE and clothing at no cost to the worker. In Mozambique, the law prohibits an employer from making any deductions from an employees' remuneration for anything the employer is required to do or provide in the interest of the health and safety of an employee. These requirements should be implemented in practice in relation to all workers, including those in non-standard forms of employment, and in small and medium-sized enterprises (SMEs) such as contractors and subcontractors.

3.2.10. Corruption

Corruption not only hinders national development but is also detrimental to OSH improvements. Due to corruption on the part of state officials or businesses, the enforcement of laws and regulations is rendered ineffective. For example, evidence indicates that labour inspectors are often bribed or take money from companies in order to conceal OSH compliance violations. This also results in under-reporting and/or complete lack of reporting. In situations like these, the issue is not the incomprehensive nature of the law or a lack of law, but rather the lack of commitment on the part of both the inspectors from the relevant state institutions and the company officials in question (Ayittey, 2005).

3.3. Measures to address OSH challenges

3.3.1. Management systems on OSH

Occupational safety and health management systems (OSH-MS) are a widely utilized tool in the oil and gas industry. This tool for continual OSH improvement is voluntary and is in no way a substitute scheme for official laws and regulations; however, OSH-MS is helpful in promoting compliance, as it provides a sound organizational framework within which legal obligations and responsibilities can be more readily identified and met.

The ILO Guidelines on Occupational Safety and Health Management Systems (ILO-OSH 2001) provide detailed guidance and tools for assisting organizations, competent national institutions, employers, workers and other social partners in establishing, implementing and improving occupational safety and health management systems, with the aim of reducing work-related injuries, ill health, disease, incidents and deaths.

ILO-OSH 2001 provides a unique international model, compatible with other management system standards and guides. The guidelines also reflect ILO values such as tripartism and relevant international standards. They comprise a set of five elements integrated in a continuous cycle of policy, organizing, planning, implementation, evaluation and action for improvement. These follow the internationally accepted Demming cycle of Plan-Do-Check-Act, which forms the basis of the "systems" approach to managing OSH. ILO-OSH 2001 encourages the integration of OSH management system elements into overall policy and management arrangements of the enterprise. Although it is not legally binding and its application does not require certification, as with other international standards, countries may formally recognize it as good practice and use it in developing their own guidance on the subject. ILO-OSH 2001 promotes the establishment of a national framework for OSH-MS including the nomination of competent institution(s) for OSH-MS, the formulation of a coherent national policy, and the establishment of a framework for an effective national application of ILO-OSH 2001.

3.3.1.1. Assessment of occupational risks and hazards

Preventing occupational accidents and diseases requires, first, the identification of hazards, and second, the determination of measures to address them. Accordingly, risk assessment, as a principle and a practice, is essential to the preventative approach to safety and health. The assessment of occupational risks or hazards is a basic principle that should be promoted through the national OSH policy, and the national OSH programme should be based on the principles of the assessment and management of hazards and risks, in particular at the workplace level.

In the workplace, risk assessment is a practical tool for improving safety and health. It consists of a process of identifying hazards, analysing and evaluating the risk associated with the hazards identified and determining the appropriate manner to eliminate or control the hazard. It is indeed a continual process that consists in the careful examination of what could cause harm to people and that enables a consideration of whether enough precautions are in place or whether more should be done to prevent harm to those at risk, including workers and members of the public. The five main steps for a successful risk assessment at the workplace are: (1) identify the hazards; (2) identify who might be harmed and how; (3) evaluate the risk and identify and decide on the safety and health risk control measures; (4) record who is responsible for implementing which control measures, and the time frame; and (5) record the findings, monitor and review the risk assessment and update when necessary.

3.3.2. Cooperation on OSH at the enterprise level

Cooperation on OSH between management, workers and their representatives is an essential element in the prevention of occupational accidents and diseases. In this regard, ILO Recommendation No. 197 provides that promoting the establishment of joint safety and health committees in the workplace, in accordance with national law and practice, is an important component of promoting a national preventative safety and health culture. A majority of SSA countries require the establishment of structures for cooperation between management, workers and their representatives at the level of the undertaking, and several of these countries also provide for a general obligation to engage in cooperation at the level of the undertaking on OSH.

Some countries provide that workplaces of a certain size are required to establish health and safety committees. Côte d'Ivoire's law sets out a threshold of more than 50 employees for establishing an OSH committee. Gabon's Labour Code states: "The establishment of an occupational safety and health committee is only compulsory if the workforce size was composed of 50 workers during 12 months, be it consecutive or not, over the previous three years (Labour Code, Art. 214). In Mozambique, an OSH committee must be established in industrial enterprises with a workforce of over 50 employees, and in enterprises that present exceptional risks of occupational accidents, an occupational safety commission must be established. In South Africa, a committee would be established in any enterprise with over 20 employees.

Promoting cooperation between management, workers and their representatives is challenging in small and micro-enterprises, and establishing bipartite OSH committees may be difficult for such enterprises. Yet these essential preventative mechanisms may be most needed in smaller workplaces, where a large number of accidents occur. Angola's law guarantee that unions can participate in OSH activities regardless of company size.

3.3.3. Collective agreements

International labour standards recognize that collective agreements are an important element of OSH. For example, Convention No. 187 specifically identifies collective

agreements as a mechanism that, where appropriate, can be an important component of a national OSH system. The Convention also provides that effect can be given to certain of its provisions through collective agreements. Such agreements should contain precise provisions to ensure compliance with OSH in the oil and gas industry, including the prevention of occupational accidents and diseases, the use of individual and collective protective equipment, and measures on ventilation, light and safety signs, among others.

3.3.4. Labour inspection

The principal role of labour inspection is to secure the application of the legal provisions concerning the conditions of work and the protection of workers; as such, there are prevention and enforcement powers granted to labour inspectors in respect of OSH matters. The crucial importance of providing labour inspectorates with the necessary equipment and human resources to ensure that they can function effectively must be noted. Adequate funding is a necessary prerequisite in this regard.

4. OSH awareness raising and training

Building and maintaining a preventative safety and health culture requires tripartite engagement. International labour standards provide concrete guidance on the measures that can be taken to develop such a national culture, including measures to: raise awareness of OSH through national campaigns; promote education and training mechanisms on OSH for tripartite constituents; introduce OSH concepts into education and vocational training; facilitate the exchange of data on OSH; provide information and advice to employers, workers and their respective organizations; promote, at the workplace level the establishment of safety and health policies and joint safety and health committees and the designation of workers' OSH representatives; and measures to address the constraints faced by micro-enterprises, SMEs and contractors.

4.1. Raising awareness on prevention

International labour standards are legal instruments drawn up by the ILO's constituents (governments, employers and workers) and setting out basic principles and rights at work. They are either Conventions, which are legally binding international treaties that may be ratified by member States, or Recommendations, which serve as non-binding guidelines. In many cases, a Convention lays down the basic principles to be implemented by ratifying countries, while a related Recommendation supplements the Convention by providing more detailed guidelines on how it could be applied. Recommendations can also be autonomous, i.e. not linked to any convention. Member States are requested to ratify and effectively implement Conventions.

The ILO instruments on OSH recognize the important role that society as a whole can play in promoting a preventative safety and health culture. Recommendation No. 197 identifies the vital role of raising public and workplace awareness on OSH, including through national campaigns. In this regard, member States are requested to take measures to raise awareness with a view to facilitating the development of a national preventative safety and health culture. This includes the observation of the World Day for Safety and Health at Work[9] which offers an important opportunity to raise public awareness and highlight OSH matters.

[9] See http://www.ilo.org/safework/events/safeday/WCMS_546785/lang--en/index.htm.

4.2. OSH education and training, including of contractors and subcontractors

Training in the oil and gas industry must contribute to promoting a preventative safety and health culture. Convention No. 155 identifies OSH training as a topic to be taken into account in the national OSH policy, underlining that the acquisition and maintenance of knowledge and skills, at both the national level and in the workplace, are essential for OSH outcomes.

Generally, among member States of the ILO, practical measures are being implemented to provide training on OSH, and in many member States generally their legislation requires employers to provide such training to workers. Member States are also requested that OSH concepts should be introduced into educational and vocational training programmes. Recommendation No. 197 provides that member States should seek to promote mechanisms for the delivery of OSH education and training to, inter alia, safety representatives, and certain countries in the world have reported the measures taken to provide workers' representatives with such training. Accidents are more prevalent in specialized and service companies than in regular companies. According to the IOGP (2016), at global level, 54 company and contractor fatalities were reported in 2015, taking place in 40 separate incidents: 12 company fatalities as a result of six separate incidents and 42 contractor fatalities as a result of 34 separate incidents.

It is believed that large oil and gas companies benefit from thousands of specialized and service companies. Thus, it is critically important to establish responsibility for ensuring that OSH rules and regulations are implemented in the supply chains. OSH should feature prominently in contracts between operators and contractors, and contractors and subcontractors.

Many international oil companies have safety programmes to help their contractors improve OSH. In one instance, this reduced the incident rate by more than 12 per cent per year from 2000 to 2009. The international oil company's employees and contractors received rigorous training; they participated in safety teams, conducted safety observations and helped improve safety procedures. In 2008, more than 1,600 of the company's contractor supervisors and managers participated in leadership workshops, over 20 per cent more than in 2007, including in Angola and Nigeria.

4.2.1. Emergency preparedness

Dealing with potentially vast and serious incidents has remained a challenge for the oil and gas industry in SSA countries, where there is an evident lack of emergency response structures and technical competence, as well as inadequate legal and regulatory frameworks. Therefore, training personnel for emergency preparedness is critical for saving lives, putting out fires, managing evacuations and other rescue procedures. As a requirement for working in offshore installations, workers should pass a number of required safety and offshore survival courses and training sessions to acquire accredited safety certificates. Emergency preparedness also entails periodic testing/training on response to various emergency scenarios.

4.2.2. Training for labour inspectors

Oil and gas inspectors are required to have higher levels of technical and scientific qualifications than other inspectors. The Points of Consensus adopted at the Global Dialogue Forum on Future Needs for Skills and Training in the Oil and Gas Industry (Geneva, 12−13 December 2012) stress that: "Governments need to work with oil and gas companies to ensure that labour inspector training reflects developments in the industry" (ILO, 2013b, p. 20).

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