



Occupational Health and Safety in Africa: Current State, Challenges and Recommendations for Improvement-Special Focus on Agriculture, Healthcare, Construction, Extractives and Manufacturing Sectors

Justice Mensah and George Acheampong

Report 09. 2024

alrei.

Occupational Health and Safety in Africa: Current State, Challenges and Recommendations for Improvement-Special Focus on Agriculture, Healthcare, Construction, Extractives and Manufacturing Sectors

Justice Mensah and George Acheampong

Report 09. 2024

alrei.

Justice Mensah, Ph.D

Justice Mensah is a Behaviour Analyst and Senior Lecturer at the Organisation and Human Resource Management Department, University of Ghana Business School. He has extensive experience in Occupational Health and Safety Management, Change Management, Organisational Development, Strategic HR Management, Positive Psychology, and Organisational Behaviour. Justice has consulted for notable Ghanaian organisations, including the Volta River Authority and the Ghana Tourism Authority. He holds a PhD in Behaviour Analysis from Oslo Metropolitan University, Norway, and an MPhil in Industrial & Organisational Psychology from the University of Ghana.

George Acheampong, Ph.D

George Acheampong is a seasoned academic and project manager with expertise in policy-driven projects, working with partners like the Mastercard Foundation and the British Council. He holds a PhD in Marketing and Entrepreneurship from the University of Ghana. His work includes managing impactful projects, such as the Devices and Connectivity Program, focused on education and rural development. Known for aligning research with policy, George excels in bridging academia and implementation to drive sustainable development initiatives.

Lome, 2023© Publisher: ALREI Publishing

All rights reserved

A/2023.12/01/001

ISBN: 978 –9988–3–7170–8 (electronic version)

The African Labour Research and Education Institute (ALREI) is a semiautonomous Research and Education Institute of the African Regional Organization of the International Trade Union Confederation (ITUC-Africa). We support, stimulate and reinforce the Africa Trade Union movement. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the African Regional Organization of the International Trade Union Confederation (ITUC-Africa) or the ALREI. Neither the ITUC- Africa nor the ALREI can be held responsible for them. **This study was conducted with support from a partnership programme co-funded by the Belgian Directorate-General for Development Cooperation (DGD) and the Belgian General Confederation of Liberal Trade Unions (CGSLB), through its Solidarity Support Centre the Movement for International Solidarity (MIS).**

Executive summary

As workplaces continue to evolve with technological advancements and economic shifts, understanding the multifaceted nature of safety, compliance, and the well-being of workers has become imperative. Unfortunately, many African countries continue to face significant challenges in occupational safety and health (OSH). These challenges are multifaceted, encompassing legal, infrastructural, economic, and cultural dimensions; and they vary considerably across different sectors, including agriculture, healthcare, construction, extractives, and manufacturing. Given these challenges, research on OSH in Africa is essential. Such research provides a comprehensive evidence base to inform policy and legislative changes. Without accurate data on the prevalence and causes of occupational injuries and diseases, it is challenging to develop effective interventions.

This report discusses the state and challenges of OSH in Africa by highlighting barriers to ensuring safe working environments; factors contributing to non-compliance with safety standards; prevalence and causes of occupational injuries and diseases; gaps in safety training, awareness, and implementation; OSH and labour-related issues; the role of social protection measures in enhancing OSH; gender-specific OSH challenges; and climate change impact on OSH. Furthermore, the report examines the hazards that workers are exposed to, and the comprehensiveness and adequacy of OSH legislation and regulations in Africa.

The report recommends effective strategies that can be used to improve OSH in Africa by highlighting ways to eliminate hazards in Africa's workplaces; strengthen legal and regulatory frameworks; enhance safety training, awareness, and organisational culture. Furthermore, effective interventions to mitigate the impact of climate change on workers and improve the OSH and labour related issues within the African context are discussed.

Contents

Executive Summary	ii
Table of Contents	iii
Acronyms and Abbreviations	vi
1.1 Introduction	1
2.1 Literature Review	3
2.1.1 Overview of Existing Research on OSH in Africa	3
2.1.2 Benefits of Investing in OSH	4
2.1.2.1 Productivity Gains and Economic Performance	4
2.1.2.2 Psychological Benefits of OSH for Workers	5
2.1.2.3 Social, Community & Sustainability Benefits – Workers' Contribution	6
2.1.3 Trade Union Concerns about OSH in Africa	7
2.1.4 African Trade Unions' Concerns over Climate Change-Related Risks	10
2.1.5 Synthesis of Key Findings and Gaps in Knowledge	11
2.1.6 Legal and Regulatory Frameworks Analysis	14
2.1.7 Enforcement Mechanisms and Compliance Evaluation	16
2.1.8 Prevalence and Impact of Hazards in Workplaces in Africa	18
2.1.9 Implementation of International OSH Standards	20
2.1.10 OSH and Other Labour-Related Issues such as Climate Change, Social Protection and Gender	22
3.1 Challenges Identification & Non-Compliance	24
3.1.1 Barriers to Ensuring Safe Working Environments	25
3.1.2 Factors Contributing to Non-Compliance with Safety Standards	27
3.1.3 Prevalence and Causes of Occupational Injuries and Diseases	28
3.1.4 Gaps in Safety Training, Awareness, and Implementation	29
4.1 Evidence-Based Insights & Expert Interview Results	32
4.1.1 Secondary Data Presentation and Analysis	32
4.1.2 Comparative Study Analysis	33
4.1.2.1 Comparing OSH in Developing Countries to OSH in Developed Countries	33
4.1.2.2 A Comparison of the Current State of OSH in the Various Sectors in Africa	35
4.1.2.3 A Comparison of Challenges in OSH Across the Sectors	40

4.1.3 Delphi Expert Interview Approach	41
4.1.3.1 Demographic Details of Participants	42
4.1.3.2 Overview of Experience and Involvement in OSH	42
4.1.3.3 Challenges Identification & Non-Compliance	44
4.1.3.4 Barriers to Ensuring Safe Working Environments	45
4.1.3.5 Factors Contributing to Non-Compliance with Safety Standards	46
4.1.3.6 Prevalence and Causes of Occupational Injuries and Diseases	46
4.1.3.7 Gaps in Safety Training, Awareness, and Implementation	47
4.1.3.8 OSH & Labour-Related Issues	48
4.1.3.9 Understanding the Role of Social Protection Measures in Enhancing OSH	50
4.1.3.10 Gender-Specific OSH Challenges and Recommendations	50
4.1.3.11 Effective Intervention Measures to Promote Compliance	51
4.1.3.12 Practical Strategies to Mitigate Hazards	52
4.1.3.13 Measures to Improve Safety Training, Awareness & Organisational Culture	53
4.1.3.14 Prioritizing OSH in Political and Development Agendas	54
4.1.3.15 Promoting a Culture of Safety and Health at Work	56
4.1.4 Insights on OSH Challenges and Best Practices	58
4.1.4.1 Prevalence of Hazards	59
4.1.4.2 The Overall Impact of Hazards	59
4.1.4.3 Effectiveness of Safety Training and Awareness Programs	59
4.2.2.4 Implementation of Health and Safety Policies	61
4.1.4.5 Comprehensiveness and Adequacy of OSH Legislation and Regulations	61
5.1 Best Practices Case Studies	63
5.1.1 Agriculture Sector Best Practices Case Study	63
5.1.2 Healthcare Sector Best Practices Case Study	64
5.1.3 Construction Sector Best Practices Case Study	64
5.1.4 Extractives Sector Best Practices Case Study	65
5.1.4.1 Oil and gas	65
5.1.4.2 Mining	66
5.1.5 Manufacturing Sector Best Practices Case Study	68
6.1 Recommendations for Improving OSH in Africa	69
6.1.1 Strategies to Mitigate Hazards in African Workplaces	69
6.1.2 Strengthening Legal and Regulatory Frameworks	70
6.1.3 Enhancing Safety Training, Awareness, and Organisational Culture	70
6.1.4 Aligning and Adapting International OSH Standards	71

6.1.5 OSH and other Labour-Related Issues	71
6.1.5.1 Recommendations for Governments	72
6.1.5.2 Recommendations for Trade Unions and Worker Groups	72
6.1.5.3 Recommendations for OSH Civil Society Groups	73
6.1.5.4 Recommendations for Employers	73
6.1.5.5 Recommendations for Workers	74
6.1.6 Mitigating the Impact of Climate Change	75
6.1.7 Policy and Legislative Recommendations	75
6.1.8 Implementation of Effective Interventions	76
REFERENCES	77

List of abbreviation

AFA	Agriculture and Food Authority
AGSM	Artisanal and Small-Scale Gold Mining
ANADER	National Agency for Rural Development
ARSO	African Organisation for Standardization
ASM	Artisanal and Small-Scale Mining
BIM	Building Information Modelling
CETA	Construction Education and Training Authority
CHSA	Construction Health and Safety Agent
CIDA	Construction Industry Development Authority
CIP	Competitive Industrial Performance
CSMI	Centre for Sustainability in Mining and Industry
CRB	Contractors Registration Board
DMRE	Department of Mineral Resources and Energy
DOSHS	Directorate of Occupational Safety and Health Services
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organisation
FDI	Foreign Direct Investment
FPPs	Fish Processing Plants
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
GhBC	The Ghana Building Code
GhISEP	Ghana Institute of Safety and Environmental Professionals
GhIS	Ghana Institute of Surveyors
GIS	Geographic Information Systems
GSA	Ghana Standards Authority
HBV	Hepatitis B
HCV	Hepatitis C
HIV	Human Immunodeficiency Virus
HPDs	Hearing Protection Devices
HSG	Health and Safety Guidance
HSMS	Health and Safety Management Systems
ILC	International Labour Conference
ILO	International Labour Organisation
ILO-OSH	International Labour Standards on Occupational Safety and Health
ILOSTAT	International Labour Organization Statistics
IMS	International Management System
INCVT	National Institute for Working Conditions
IPC	Infection Prevention and Control

IPM	Integrated Pest Management
IPNET	Infection Prevention Network
ISO	International Organisation for Standardization
ITUC-Africa	African Regional Organisation of the International Trade Union Confederation
IEC	International Electrotechnical Commission
KFC	Kenya Flower Council
MHSA	The Mine Health and Safety Act
MIREMPET	Ministry of Mineral Resources and Petroleum
MNCs	Multinational Corporations
MOSHLPAS	Mine Occupational Safety and Health Leading Practice Adoption System
MQA	Mining Qualifications Authority
MVA	Manufacturing Value Added
NDoH	National Department of Health
NIOH	National Institute for Occupational Health
NGO	Non-Governmental Organisations
NIHL	Noise-Induced Hearing Loss
NNPC	Nigerian National Petroleum Corporation
NOSA	The National Occupational Safety Association
OGISP	The Oil and Gas Industry Service Permit
OAUTHC	Obafemi Awolowo University Teaching Hospitals Complex
OSHA	Occupational Safety and Health Act
OSHA	Occupational Safety and Health Authority
OSHAS	Occupational Safety and Health Assessment Series
OSHHs	Occupational Safety and Health Hazards
OSHMS	Occupational Safety and Health Management Systems
OSH	Occupational Safety and Health
PDCA	Plan, Do, Check, and Act
PPE	Personal Protective Equipment
PTSD	Post-Traumatic Stress Disorder
QMS	Quality Management Systems
RSA	Republic of South Africa
SABS	South African Bureau of Standards
SANS	South African National Standards
SAPS	South African Police Service
SDGs	Sustainable Development Goals
SME	Small and Medium-Sized Enterprise
SMS	Safety Management Systems
TB	Tuberculosis
TUC	Trades Union Congress
WIBA	Work Injury Benefits Act
WHO	World Health Organisation
ZNOSHP	Zimbabwe National Occupational Safety & Health Policy

1.1 Introduction

Occupational safety and health (OSH) essentially focuses on the protection of people against illnesses from work, physical injury, and the provision and availability of facilities to enhance the health and wellbeing of people at the workplace. OSH remains an essential cornerstone for the protection of the health, safety, welfare, and wellbeing of the millions of workers in Africa. This is because creating and building organisations and workplaces anchored on safety culture is fundamental to safeguarding workers from health and safety hazards, and critical to the quest of achieving decent working conditions for all workers on the continent.

Globally, the International Labour Organisation (ILO, 2023) notes that each year 2.41 billion workers experience excessive heat from their workplace, 395 million workers suffer non-fatal injury, 2.93 million workers die annually from work-related issues, and \$361 billion could have been saved if OSH measures were implemented at the workplace (ILO, 2023). The ILO further indicate that younger workers (15-24 years) suffer about a 40% higher rate of non-fatal workplace injuries relative to older workers (>25 years). It must be noted that the rate of work-related injuries and accidents differ across countries relative to the level of industrialization and robustness of their HSMS. Sadly, developing countries, such as those on the African continent, continue to record substantial occupational related injuries and accidents compared to developed countries (Takala et al., 2014). Takala and Urrutia (2009) note that most occupational-related accidents and health issues can be prevented (Takala & Urrutia, 2009) once countries develop and maintain a health and safety culture that is based on effective HSMS, relevant legal and regulatory framework, and the right to a safe, healthy, and decent work environment.

Over the last few decades, Africa has experienced significant growth and development across its construction, service, industrial, agricultural, mining, healthcare and manufacturing sectors (Nageib, 2024). This surge has also exposed workers to unsafe work conditions manifested in the rate of occupational injuries and accidents (Liu et al., 2019; Rikhotso et al., 2022). Iden and Oluranti (2022) posit that although Africa has been the focus of multiple global conversations on OSH improvement, little has been achieved.

The lack of progress in OSH on the continent can be accounted for by poor leadership commitment to health and safety management systems, an outdated or poor legal framework governing OSH leading to non-compliance and exposure of workers to hazards, and poor safety culture (Nageib, 2024; Iden & Oluranti, 2022).

Africa's surest bet to win the war against unsafe working conditions, work-related injuries, and workplace accidents is the existence of a robust OSHMS, which can only be achieved by comprehensive evidence-based research on the current state of OSH on the continent. This is because without accurate data on the prevalence and causes of occupational injuries and diseases, it is challenging to develop effective interventions. This study therefore aims to provide an in-depth review of existing legal and regulatory frameworks governing OSH in selected African countries; investigate the prevalence and impact of physical, chemical, biological, ergonomic, and psychosocial hazards in African workplaces; evaluate the effectiveness of safety training and awareness programs, the implementation of health and safety policies, and the presence of safety management systems in African workplaces; and review international OSH standards and best practices developed by organisations such as the International Labour Organisation (ILO) and the World Health Organisation (WHO).

Using the Delphi expert interview technique and the cross-sectional survey design, the study collected both qualitative and quantitative data from OSH experts in Africa and workers in the agriculture, healthcare, construction, extractives and manufacturing sectors of Africa, and analyses the existing literature on OSH in Africa.

The study is organised in six sections. Section one presents an introduction to the study and highlights the aims, scope and delimitations of the study. Section two focuses on the literature review providing an overview of existing research on OSH in Africa, with a focus on the benefits of investing in OSH; a synthesis of key findings and gaps in knowledge; legal and regulatory frameworks analysis; enforcement mechanisms and compliance evaluation, prevalence and impact of hazards in workplaces in Africa; implementation of international OSH standards; and OSH and other labour related issues such as climate change, social protection and gender. Section three highlights OSH challenges, identification, and non-compliance issues. The evidence-based insights and expert interview results are presented in section four. Best practices case studies in the agriculture, healthcare, construction, extractives, and manufacturing sectors are presented in section five. The recommendations for improving OSH in Africa can be found in section six.

2.1 Literature Review

2.1.1 Overview of Existing Research on OSH in Africa

OSH is a critical aspect of labour conditions, encompassing the policies, practices, and standards that safeguard the health and well-being of workers across various industries (Alli, 2008). In Africa, where economic growth is often juxtaposed with challenges such as informal employment, limited resources, and regulatory enforcement, OSH has emerged as both a vital concern and a complex challenge (Afolabi et al., 2021; Van Dijk et al., 2015; Amponsah-Tawiah & Dartey-Baah, 2011). The existing body of research on OSH in Africa reflects a diverse array of studies that examine the prevalence of occupational hazards, the effectiveness of safety interventions, and the socio-economic impacts of workplace injuries and illnesses (Debela et al., 2022; Abdelrahim et al., 2021; Moyo et al., 2015).

The benefits of investing in OSH are well documented globally, with numerous studies highlighting improved worker productivity (Shabani et al., 2023), reduced absenteeism (Moyo, 2021; Mojapelo & Kok, 2017), and enhanced organisational reputation (Takala et al., 2014). Research also indicates that the implementation of robust OSHMS benefits workers by impacting positively on healthy lifestyle behaviours, improving their long-term health and wellbeing and that of their families, and reducing pressure on health, improving their participation in economic and social activities in the economy (Nilgun et al., 2015; ILO 2012). In the African context, where economic constraints and regulatory weaknesses often compromise workplace safety, the potential benefits of OSH investments are significant leading to substantial economic gains by reducing workplace accidents and diseases and enhancing worker morale and productivity (Moyo, 2021; Mojapelo & Kok, 2017; Takala et al., 2014).

Despite the growing recognition of OSH's importance, there remains significant gaps in knowledge regarding the implementing safety practices in informal sectors, the effectiveness of existing regulatory frameworks, and the socio-economic factors influencing OSH compliance (Mossburg et al., 2019; Moyo et al., 2015). This review aims to synthesize key findings from existing research on OSH in Africa, identify gaps in knowledge, highlight the concerns of trade unions relative to OSH and climate change, and explain the benefits of investing in OSH and other labour related issues, such as climate change, social protection, and gender. The review further examines the prevalence and impact of hazards in workplaces in Africa, enforcement mechanisms and compliance evaluation, and implementation of international standards; and analyses the legal and regulatory frameworks that govern OSH practices across the continent.

2.1.2 Benefits of Investing in OSH

2.1.2.1 Productivity Gains and Economic Performance

Research has shown that effective OSH interventions can lead to significant cost savings for businesses by reducing the incidence of accidents and illnesses, lowering absenteeism, and improving worker productivity (Shabani et al., 2023; Takala et al., 2014). For example, research by the ILO indicates that the economic costs of occupational accidents and diseases amount to approximately 4% of global GDP each year (Takala et al., 2014; ILO, 2015; ILO, 2012). In South Africa's mining sector, for instance, investments in safety measures have been linked to a decrease in fatal accidents and, consequently, to lower operational costs and higher profitability (Stuckler et al., 2013). According to Stuckler et al. (2013), enhanced OSH regulations in South Africa's mining industry led to a decline in workplace accidents, which in turn reduced compensation claims, medical costs, and loss of skilled labour, resulting in overall cost savings for the industry. Similarly, the gold mining industry in Burkina Faso has benefited from enhanced OSH measures.

A report by Ouedraogo (2021) showed how investments in advanced safety equipment and training for miners led to a significant reduction in mining accidents and health problems. For instance, the use of aerial photos and remote detection by the Bureau of Mines and Geology (BUMIGEB) has decreased mapping personnel from 50 to as few as five, while new autonomous drilling equipment has cut the number of required operators from seven to three. In the construction sector of Nigeria, Okoye and Okolie (2014) found that organisations with comprehensive OSH programs reported higher productivity levels compared to those with minimal or no OSH measures in place. The study attributed this productivity increase to reduced workplace accidents and injuries, which resulted in fewer lost workdays and a more stable workforce. Okumu (2016), in a study that examined OSH practices in Kenyan manufacturing companies, found that effective OSHMS minimizes accidents and loss of man hours and consequently organisational productivity.

Furthermore, investing in OSH enhances corporate reputation and market competitiveness, which can lead to financial benefits (Barın & Özmen, 2015). Companies committed to safety and health are more likely to attract investments form partnerships, and gain consumer trust in the global market where corporate social responsibility (CSR) and ethical business practices are valued (Nikolaou, 2016; Barın & Özmen, 2015; Cioca et al., 2014).

2.1.2.2 Psychological Benefits of OSH for Workers

OSH has been a central concern of the labour movement, as it directly influences the well-being, productivity, and overall quality of life for workers. Investments in OSH are not only about compliance with regulations, but also about creating safer work environments that enhance workers' physical, mental, and emotional well-being. The relevance of OSH for the labour movement, including improved participation in economic and social activities, better health, and enhanced happiness, is undeniable, as it directly affects the health, happiness, and participation of workers in both economic and social activities.

One of OSH's most significant contributions is enabling workers to participate more fully in economic activities by ensuring safe and healthy workplaces. For instance, in South Africa's mining sector, enhanced OSH regulations have dramatically reduced workplace fatalities, according to Stuckler et al. (2013). This reduction has lowered operational costs and allowed workers to engage in their jobs without the constant fear of injury. OSH has also supported the inclusion of vulnerable groups such as women and people with disabilities, further promoting equitable economic participation (Loewenson, 2021).

In the agricultural sector, OSH training programs have significantly improved worker health and productivity. Jepson et al. (2014) found that training on safe pesticide handling and machine use led to fewer workplace disruptions and higher productivity, boosting workers' economic participation. The labour movement has played a key role in advocating for these safety measures, understanding that healthier workers contribute more effectively to the economy.

OSH's impact on health is also evident in other hazardous industries. In Angola's petroleum sector, international safety standards have reduced workplace accidents and environmental hazards, leading to a healthier workforce (ILO, 2017). In Kenya's tea industry, safety measures like protective clothing and proper training have reduced musculoskeletal disorders, according to Kipkoech, Wanjohi and Makau (2024), allowing workers to stay productive and to minimize medical costs.

OSH has a profound effect on workers' happiness and job satisfaction. Eladly et al. (2020) found that ergonomic redesign of sewing machine workstations in the apparel industry, which aimed to improve worker performance by adjusting table height and inclination based on operator body measurements, can enhance comfort, improve posture, and boost productivity. Moreover, Mutwale-Ziko, Lushinga and Akakandelwa (2017)

demonstrate that failure to implement Safety, Health, Environment, and Quality (SHEQ) policies in Zambia's construction industry, exposes contractors to various risks, including injuries, accidents, and hazards related to human factors, equipment, materials, and the environment; while effective SHEQ implementation minimizes accidents, reduces compensation costs, and brings benefits such as legal compliance, cost savings, and customer satisfaction. These outcomes illustrate how OSH not only ensures physical safety but also enhances emotional and social well-being, making it a key focus of the labour movement to improve workers' overall quality of life. Safe and healthy working conditions empower workers to engage more fully in their jobs, leading to greater productivity and job satisfaction. Additionally, the protection of workers' health contributes to their overall well-being, allowing them to participate meaningfully in social and civic life. For the labour movement, OSH is not only about workplace safety but also about advancing the rights and dignity of workers, ensuring their continued contribution to society and the economy.

2.1.2.3 Social, Community and Sustainability Benefits – Workers' Contribution

While OSH is traditionally viewed within the framework of workplace safety as being focused on the prevention of accidents and injuries, its implications extend far beyond the confines of individual workplaces, affecting broader social and community dynamics. The social and community benefits of OSH are significantly pronounced in Africa where many communities are closely tied to the industries that operate within them (Aeknarajindawat et al., 2020; Makori, 2012; Kaynak et al., 2016; Shabani et al., 2023).

Consequently, the benefits of investing in OSH extend to broader social and community well-being since research has demonstrated that healthy workers are better able to contribute to their families and communities, and the reduced incidence of workplace injuries and diseases reduces the burden on public health systems (Aeknarajindawat et al., 2020; Makori, 2012; Kaynak et al., 2016; Shabani et al., 2023). One of the most immediate and visible benefits of effective OSH practices is the improvement in community health. When workplaces prioritize safety and health, they reduce the risk of accidents and occupational diseases that can spill over into the surrounding community. In many African contexts, workers are not isolated individuals but members of extended families and communities, meaning that any harm to them also impacts their families and social networks (Shabani et al., 2023; Aeknarajindawat et al., 2020; Kaynak et al., 2016). For example, studies in mining communities in Southern Africa have shown that poor OSH standards contribute to the spread of diseases such as tuberculosis (TB) and silicosis, which not only affect workers but also impacts the health of a wider

community (Khoza et al., 2023; World Bank Group, 2020; Adams et al., 2012). Similarly, in the Kenyan agricultural sector where pesticide exposure is a significant risk, assessing risks to aquatic environments, establishing protective threshold levels for communities, screening farmers for pesticide exposure and poisoning, and developing focused training programs for pesticide retailers and farmers on proper pesticide use, personal protective equipment, and pesticide management have been implemented to reduce incidents of poisoning and other health problems (Marete et al., 2021). These improvements not only benefit the workers but also protect their families and communities from secondary exposure to hazardous substances.

Finally, investing in OSH is integral to achieving sustainable development goals (SDGs) in Africa where economic growth often intersects with complex social and environmental challenges (Haywood & Wright, 2019; Amponsah-Tawiah, 2013). OSH contributes directly to several SDGs, including Goal 3 (Good Health and Well-being), Goal 8 (Decent Work and Economic Growth), and Goal 12 (Responsible Consumption and Production) by promoting safe and healthy working conditions, to achieve targets such as reducing the number of deaths and injuries from hazardous chemicals and occupational accidents (Ávila-Gutiérrez et al., 2022; UN, 2020). For instance, in South Africa, the government's National Development Plan includes provisions for improving OSH standards as part of its strategy for promoting inclusive economic growth and social development (Moyo et al., 2015; RSA, 2012) reflecting a growing recognition of the importance of OSH in supporting sustainable development across the continent.

2.1.3 Trade Union Concerns about OSH in Africa

Trade unions in Africa have expressed growing concerns about OSH as the continent grapples with numerous workplace safety challenges. These concerns stem from inadequate enforcement of safety standards, poor working conditions, lack of access to protective equipment, and insufficient training, which put workers at heightened risk (ITUC-Africa, 2012). Trade unions play a critical role in advocating for better safety regulations, seeking to protect workers' rights and ensure their health and well-being.

One of the major concerns of trade unions in Africa is the inadequate enforcement of OSH regulations (ITUC-Africa, 2012). Although many African countries have ratified the ILO's OSH conventions, a wide gap exists between legislation and implementation. In many cases, weak government institutions and insufficient resources hamper effective monitoring and enforcement of safety standards, leaving workers vulnerable to hazards. For instance, the Petroleum and Natural Gas Senior Staff Association of Nigeria (PENGASSAN) criticized the lack of strict enforcement of safety protocols

after the 2020 Baruwa gas explosion in Lagos. The explosion, caused by a faulty gas tanker, resulted in 18 deaths and destroyed numerous buildings and businesses (Akoni et al., 2020). This tragic incident highlighted the failure to implement safety measures in high-risk areas, which could have prevented the disaster. Despite regulations, many facilities operate without adequate safety precautions, posing constant risks to workers and nearby communities.

The prevalence of workplace injuries and fatalities is another significant concern for African trade unions (ITUC-Africa, 2022). Many sectors, including construction, manufacturing, and extractive industries, report alarmingly high rates of accidents, often linked to the failure to implement basic safety measures. The ITUC-Africa's 2022 statement on International Workers' Memorial Day highlights the global issue of workplace fatalities, with 2.3 million deaths annually and calls for improved OSH measures in Africa, where weak labour inspections and limited OSH conventions exacerbate the problem. ITUC-Africa urges governments to ratify ILO conventions and improve national safety bodies, and employers, not to prioritize profits over worker safety, which leads to preventable accidents and deaths (ITUC-Africa, 2022).

Trade unions have raised concerns about the lack of personal protective equipment (PPE) for workers in high-risk industries, especially in agriculture, mining, and construction (IUF, 2020). This is particularly troubling in African countries where economic constraints often limit employer investment in safety gear. Without proper PPE, workers are exposed to life-threatening conditions, including chemical exposure, hazardous machinery, and extreme environmental conditions. On October 7th, 2020, the Congress of South African Trade Unions-led protests in Johannesburg and nationwide addressed corruption, labour rights, and workplace safety. Joined by multiple unions, the strike condemned poor government performance on issues like gender-based violence, retrenchments, and unsafe working conditions. The marchers highlighted the lack of COVID-19 protections for frontline workers, such as nurses, and called for PPE and fair wages (ITUC-Africa, 2020).

A lack of training and awareness about occupational safety is another critical issue that trade unions in Africa are addressing. The Organisation of African Trade Union Unity (OATUU) focuses on education, research, and advocacy in areas such as promoting democracy, trade union rights, empowerment of women, economic integration, OSH, and social dialogue. OATUU coordinates trade union actions by defending workers' rights, harmonizing labour legislation, and supporting economic justice. It also addresses violations of trade union rights by engaging with governments and filing complaints with the ILO (Adu-Amankwah & Otoo, 2022). In many African countries, workers

in informal and semi-formal sectors receive little or no safety training, which increases the likelihood of accidents and long-term health issues, while others are unaware of their rights to a safe working environment. Moreover, employers often do not invest in adequate safety education programs (Wekoye et al., 2020). A Uganda Workers' Education Association study reveals that Ugandan flower workers face severe challenges, including low wages, long working hours, and inadequate protection from pesticides. Exposure to toxic chemicals leads to various health issues, such as skin irritation and blindness, coupled with the denial of sufficient medical treatment. This failure may even result in death, as in the case of a 2010 pesticide incident. The study highlights the urgent need for stakeholders to improve workers' health, safety, and access to adequate food, as well as to address long-term pesticide exposure impacts.

While physical safety hazards dominate the conversation around OSH, trade unions are increasingly concerned about the neglect of psychosocial hazards in African workplaces. Issues like excessive workloads, long working hours, job insecurity, and workplace violence create stressful conditions that can have a detrimental effect on workers' mental health and well-being. Trade unions argue that psychosocial risks should be treated with the same urgency as physical hazards (Industrial Global Union, 2024). A recent article by Industrial Global Union highlights the connection between work and mental health, emphasizing the increasing prevalence of psychosocial risks, including excessive workloads and unsafe working conditions. The article reiterates how unions can work with employers to assess and mitigate these risks and advocate for better mental health policies by being actively involved in developing guidelines and initiatives to support workers' mental well-being.

Many African trade unions have expressed concern regarding their exclusion from discussions and policy development on OSH standards; and implementation is as much a current problem as it is historical (Hayter & Pons-Vignon, 2018). In as much as the evolution of industrial relations in South Africa, for instance, transitioned from a state-sponsored, racially exclusionary system to a more inclusive one, shifting from the 1910 Union of South Africa's institutionalized labour inequalities to a more inclusive one, the inclusivity is still often constrained within controlled and limited frameworks (Hayter & Pons-Vignon, 2018).

The involvement of unions in OSH decision-making is essential to ensure that workers' voices are heard and that policies reflect the real challenges faced by workers. For example, the Zimbabwe Congress of Trade Unions (ZCTU), in a speech to commemorate the country's independence, emphasized that despite Zimbabwe's 43 years of independence, trade unions face growing repression, exclusion from policymaking, and limited freedom to advocate for workers'

rights. Workers' rights, including occupational safety and health, have deteriorated due to harsh economic conditions, inadequate legal protection, and government favouritism towards foreign investors. The government's failure to include unions in OSH policy development has exacerbated poor working conditions, leading to the exploitation of local and informal workers by foreign investors.

2.1.4 African Trade Unions' Concerns over Climate Change-Related Risks

Climate change poses significant challenges to OSH globally and specifically in Africa, where workers in sectors such as agriculture, construction, and healthcare are especially vulnerable (ILO, 2024). Trade unions across the continent have expressed growing concerns about the impact of rising global temperatures, air pollution, extreme weather events, and the spread of vector-borne diseases on worker health and safety (ITUC, 2024; Integrated African Health Observatory, 2024). These climate-related risks not only threaten the well-being of workers but also reduce productivity and increase the likelihood of workplace accidents.

Rising global temperatures due to climate change have direct implications for OSH in African countries, notably in sectors like agriculture, construction, and transportation as it poses significant risks to workers' health and safety, including heat exhaustion, heat stroke, and dehydration, which can lead to injury or even death if not properly managed (Ncongwane et al., 2021). African trade unions, such as the Congress of South African Trade Unions (COSATU), are increasingly advocating for enhanced OSH measures, including the implementation of cooling strategies, better hydration protocols, and adjusted working hours during peak heat periods. In Côte d'Ivoire's cocoa industry, heat stress has resulted in reduced worker productivity, as farmers are forced to take more frequent breaks to cope with extreme temperatures (Yoroba et al., 2023).

Poor air quality, exacerbated by climate change through increased pollution, wildfires, and allergens, presents a growing threat to workers' respiratory health. Occupational safety and health standards in Africa must evolve to address the rising risks of respiratory diseases such as asthma and chronic lung conditions in high-risk sectors like agriculture, construction, and firefighting (Abera et al., 2021). The Federation of Ugandan Trade Unions (FUTU) has expressed concerns about the inadequacy of current OSH policies to protect workers exposed to polluted air in agriculture, and other outdoor workers.

The frequency and intensity of extreme weather events, such as floods, storms, and cyclones, are rising due to climate change, exposing workers to a range of OSH risks. Disasters like Mozambique's Cyclone Idai in 2019 not only caused widespread damage but also put workers in dangerous situations during recovery and rebuilding efforts. The Mozambique Workers' Trade Union Federation (OTM-CS) has voiced concerns over inadequate OSH provisions for workers in post-disaster recovery zones, where risks include injury from debris, electrocution, and drowning (IFRC & RCS, 2022). In response, unions are advocating for disaster preparedness as a core component of OSH regulations, ensuring that workers are adequately trained and equipped to handle extreme weather-related hazards.

Climate change has expanded the range and prevalence of vector-borne diseases such as malaria, dengue fever, and Lyme disease, putting workers in sectors like agriculture, forestry, and healthcare at heightened risk (Vonesch et al., 2016). Jones et al. (2023), for instance, found that the intensification of food production through large-scale irrigation schemes, such as the Shire Valley Transformation Project (SVTP) in southern Malawi, posed risks for vector-borne diseases like malaria and schistosomiasis. They noted that changes in land-use patterns and frequent extreme flooding, exacerbated by tropical cyclones, create favorable conditions for insect vectors and disease transmission. This necessitates updating OSH policies to include vector control strategies, which is why the Ministries of Agriculture and Health have integrated vector control measures into the SVTP irrigation scheme's planning and budget to manage these risks and influence future irrigation policies, ensuring that health outcomes are safeguarded while advancing agricultural development (Kaudzu, 2023)

2.1.5 Synthesis of Key Findings and Gaps in Knowledge

Research on OSH in Africa highlights several key findings on the effect of OSH practices in reducing workplace injuries, diseases, and fatalities across high-risk industries such as mining, construction, and agriculture. For instance, studies have shown that implementing rigorous OSH interventions improves worker health, enhances productivity, and reduces absenteeism (Cioca et al., 2014; Conradie et al., 2016; Thiede & Thiede, 2015; Stuckler et al., 2013). In the mining sector, enhanced safety protocols have led to a decrease in occupational diseases and accidents, thereby reducing the financial burden on both companies and the state (Debela et al., 2021).

The economic benefits of investing in OSH are well documented, with evidence indicating that OSH investments lead to substantial cost savings by reducing healthcare expenses, and compensation claims, and enhancing productivity (Takala et al., 2014; ILO, 2015; 2012). Beyond individual

workplaces, OSH practices significantly impact social and community well-being with improved physical and psychosocial health of workers, which translates into better community health, economic stability, and social cohesion (Aeknarajindawat et al., 2020; Makori, 2012; Kaynak et al., 2016; Shabani et al., 2023). For example, in the agricultural sector, safety measures have positively affected both workers and their communities by reducing health risks and improving overall well-being (Onwona et al., 2019; Boateng et al., 2023; Marete et al., 2021). OSH is increasingly recognized as a vital component of sustainable development in Africa. Effective OSH practices align with Sustainable Development Goals (SDGs) by promoting decent work, good health, and responsible industrialization (Ávila-Gutiérrez et al., 2022; UN, 2020). Integrating OSH into sustainable development strategies helps achieve these goals by ensuring that economic growth does not compromise worker health, social equity, or environmental sustainability.

Despite these positive findings, several gaps in the literature remain. One significant gap is the limited research on OSH in the informal sector, which constitutes a large portion of the African workforce but often faces a substantial lack of basic OSH measures, and the absence of data makes it challenging to develop targeted interventions (Afolabi, 2019; Moyo et al., 2017; Lund et al., 2016). Additionally, there is inconsistency in data collection and reporting across African countries, which hinders accurate assessment and comparison of OSH outcomes (Rikhotso et al., 2022; Partner Africa, 2021). For instance, reporting systems for construction site incidents vary across countries, with developing nations often lacking formal regulatory frameworks, leading to underreporting or minimal reporting of accidents under outdated factory laws with limited detail on their causes (Darimaani et al., 2024; Raheem & Hinze, 2014).

Another gap is the lack of focus on gender and vulnerable groups. While some research addresses the specific OSH needs of women and other vulnerable populations, more studies are needed to develop gender sensitive and inclusive OSH policies (European Agency for Safety and Health at Work, 2003). Gender disparities in OSH in Africa expose women to greater risks due to inadequate protective measures, limited access to training, and poorly enforced regulations in informal sectors, necessitating targeted interventions and gender-sensitive policies (Mariam et al., 2021). Gender disparities in the use of personal protective equipment (PPE) and observation of safety protocols are often influenced by cultural attitudes, such as the ‘macho’ mentality among men and the empathetic nature of women (Schlünssen & Jones, 2023). Men, driven by a sense of invulnerability and the desire to prove their toughness, may be less likely to wear PPE or strictly follow safety protocols, viewing such measures as unnecessary or a sign of weakness (Stergiou-Kita et al., 2015). In contrast, women, who are often more empathetic and cautious, may be more diligent in adhering to safety practices and using PPE correctly (Andrade-Rivas & Rother, 2015).

Moreover, research indicates that PPE has historically been designed for the average white man, leading to a poor fit for many, especially women, in healthcare, who make up over 75% of frontline workers (TUC, 2017). A survey during the COVID-19 pandemic revealed that women experienced significantly more issues with PPE fit, and feeling less safe in their roles compared to men despite PPE fit problems also affecting some men (Janson et al., 2022). This finding highlights the need for targeted interventions that challenge harmful gender norms and promote a safety culture that values protective measures for all workers, regardless of gender (Schlünssen & Jones, 2023). Furthermore, although the contribution of OSH to sustainable development is acknowledged, there is limited research on how to effectively integrate OSH into national and regional sustainable development strategies (RSA, 2012). Understanding how OSH intersects with environmental sustainability and long-term economic development is crucial for advancing these goals.

The challenges related to resource constraints and OSH implementation are underexplored. Although many studies have highlighted these issues, there is still a need for research on innovative approaches or models that can overcome these barriers, such as community-based interventions or public-private partnerships (Kunodzia et al., 2024; Moyo et al., 2015).

Thus, additional research is needed on innovative approaches to overcome resource constraints and improve enforcement of OSH regulations. Studies exploring effective models for regulatory enforcement in resource-limited settings could provide valuable insights for improving OSH outcomes. There is also limited comprehensive comparative analysis of OSH legal and regulatory frameworks across African countries. While individual studies provide insights into specific countries, there is limited research comparing the effectiveness of different regulatory approaches across the continent. Therefore, a comprehensive analysis of regional and local variations in OSH regulations within countries and understanding how local contexts influence the implementation and effectiveness of OSH laws could help in designing more effective regulatory frameworks.

Furthermore, the effectiveness of international OSH standards in improving workplace safety in Africa has not been thoroughly examined. It is therefore imperative that OSH research in Africa examine this phenomenon carefully.

2.1.6 Legal and Regulatory Frameworks Analysis

OSH legal and regulatory frameworks are essential for maintaining safe and healthy work environments. However, their effectiveness varies significantly across countries due to differences in economic development, political will, and enforcement capacity. Table 1 provides examples of legal frameworks across the continent. One of the most influential frameworks is the African Union’s Agenda 2063, which emphasizes the importance of sustainable development, including the protection of workers’ rights and the promotion of safe working conditions across the continent. Agenda 2063 calls for the harmonization of labour standards, including OSH regulations, to ensure that all African workers benefit from safe and healthy workplaces, regardless of the country they work in (African Union, 2015).

It is imperative to note that the ILO has also played a pivotal role in shaping OSH frameworks in Africa through its conventions and recommendations, which many African countries have adopted into their national laws (ILO, 2021; 2019). For instance, ILO Convention 155, concerning OSH, and ILO Convention 187, promoting the framework for OSH management systems, have been instrumental in guiding African nations in formulating and updating their OSH regulations (ILO, 2019). Despite the presence of these frameworks, many African countries struggle with enforcement and compliance issues (see Table 1).

Table 1: Legal and Regulatory Frameworks in Selected African Countries

Country	Legislation	Regulatory Body	Implementation	Enforcement	Worker Participation
Burkina Faso	National OSH Policy, updated in 2016	Ministry of Labour and Social Security	Framework relies heavily on sectoral-specific policies	Limited enforcement due to lack of resources	Moderate worker participation, mostly in the mining sector
Senegal	Labour Code (Law No. 97-17 of 1997)	Labour Inspectorate (Ministry of Labour)	OSH incorporated into national health strategy	Strong legal provisions, but enforcement remains weak	Low worker participation
Côte d’Ivoire	Law No. 95-15 (Labour Code)	National Council for Health and Safety at Work	Implementation through national agencies	Enforcement suffers from inadequate inspections	Moderate worker involvement through unions
Morocco	Law No. 65-99 on the Labour Code	Labour Inspectorate, National Safety Institute	National OSH framework integrated with health services	Stronger enforcement, although rural sectors lag behind	Significant participation through well-organized unions

Tunisia	Law No. 66-27 on Social Security (OSH clauses included)	National Institute for OSH	Systematic training and education programs	Enforcement is strong in formal sectors but weak in informal sectors	Strong union involvement in OSH matters
Mali	Labour Code (revised in 1992)	National Directorate of Labour and Social Security	OSH implementation mainly through labour agreements	Weak enforcement due to informal economy dominance	Low worker participation
South Africa	OSH Act, 1993	Department of Employment and Labour	Comprehensive OSH policies across all sectors	Strong enforcement mechanisms and penalties	Strong union involvement through COSATU
Egypt	Labour Law No. 12/2003 (OSH provisions)	Ministry of Manpower and Immigration	Integrated into broader labor rights framework	Strong enforcement in formal sectors, informal sector challenges	Moderate worker participation
Ethiopia	Labour Proclamation No. 1156/2019	Ministry of Labour and Social Affairs	Newer OSH framework with growing implementation focus	Enforcement mechanisms are still developing	Low, but growing union participation
Gabon	Labour Code of 1994 (amended 2010)	Ministry of Labour, Employment, and Social Welfare	OSH guidelines primarily for oil and logging industries	Moderate enforcement; capacity challenges	Moderate worker participation through sectoral unions
Algeria	Labour Code (revised in 1990)	National Institute for Prevention of Occupational Risks	Strong national framework, training for workers	Strong enforcement, especially in public and large private sectors	Strong union participation in industrial sectors
Uganda	Occupational Safety and Health Act, 2006	Ministry of Gender, Labour, and Social Development	Implementation focused on formal sectors	Limited enforcement, especially in rural areas	Low worker participation
Tanzania	OSH Act, 2003	Occupational Safety and Health Authority (OSHA)	National focus on manufacturing and construction	Moderate enforcement; lacks resources for widespread coverage	Moderate worker participation through national unions
Botswana	Factories Act (amended in 1998)	Department of OSH	OSH focus on manufacturing and mining	Moderate enforcement; resources are a limitation	Moderate union involvement, mostly in formal sectors
Zimbabwe	Occupational Safety and Health Act (No. 15 of 2005)	National Social Security Authority (NSSA)	Regular training programs for high-risk sectors	Enforcement challenged by economic difficulties	Moderate worker participation, strong union presence

Namibia	Labour Act (Act No. 11 of 2007, OSH provisions)	Ministry of Labour, Industrial Relations and Employment Creation	Growing OSH framework, with focus on mining and agriculture	Moderate enforcement, focus on large companies	Low to moderate worker participation in safety issues
Ghana	Factories, Offices, and Shops Act, 1970 (Act 328)	Department of Factories Inspectorate	Focuses on formal sectors, especially manufacturing	Limited enforcement; few inspectors for wide coverage	Moderate union participation through the Trades Union Congress
Kenya	Occupational Safety and Health Act, 2007	Directorate of Occupational Safety and Health Services (DOSHS)	Growing implementation focus in urban areas	Moderate enforcement; resource constraints in rural areas	Strong worker participation through active labor unions
Cameroon	Labour Code (1992) with OSH provisions	Ministry of Labour and Social Security	OSH regulations focused on formal sectors	Limited enforcement in informal sectors	Moderate union participation; informal sector excluded
Angola	General Labour Law, 2015 (with OSH provisions)	Ministry of Public Administration, Labour and Social Security	Strong implementation in oil and mining sectors	Strong enforcement in resource industries, but weaker in others	Moderate worker participation in resource sectors
Nigeria	Factories Act, 1987 (amended 1990)	Federal Ministry of Labour and Employment	Formal sector focus, especially oil and manufacturing	Limited enforcement, informal sector largely uncovered	Strong union activity in formal sectors, especially oil and gas
Rwanda	Labour Law No. 66/2018 (OSH provisions)	Rwanda Social Security Board (RSSB)	Focus on newer industries (ICT, construction)	Moderate enforcement; growing capacity	Moderate worker participation; unions expanding
Zambia	OSH Act, 2010	Occupational Safety and Health Institute (OSHI)	Focused on mining and manufacturing sectors	Strong enforcement in mining, limited in other sectors	Moderate worker participation through Mineworkers' Unions

2.1.7 Legal and Regulatory Frameworks Analysis

OSH regulations are crucial for ensuring worker safety, but enforcement mechanisms across many sectors in Africa remain weak. Key industries, such as construction, healthcare, extractives, and manufacturing, are plagued by inconsistent compliance, often due to insufficient regulatory frameworks, under-resourced enforcement bodies, and political and economic pressures (Eyiah et al., 2019; Gervas et al., 2023; Umeokafor et al., 2014). Understanding

the sector-specific gaps in enforcement is essential to identifying practical solutions that can enhance compliance.

In the construction sector, compliance with OSH regulations is notably poor. In Nigeria, for instance, the Factories Act of 1990 does not even extend to the construction industry, leaving contractors to follow foreign safety standards that may not be suited to the local environment (Umeokafor et al., 2014). Weak regulatory bodies further complicate enforcement, with bribery often used to bypass penalties for non-compliance (Onyeozili, 2005). The absence of pressure from regular inspections leads many contractors to disregard basic safety measures, resulting in frequent workplace accidents. In Ghana, while laws such as the Labour Act and Workmen's Compensation Law are recognized, enforcement of the Factories, Offices, and Shops Act, which is key to construction safety, is inconsistent (Eyiah et al., 2019). Contractors often prioritize cost-saving over safety, and the underfunded Factories Inspectorate Department struggles to conduct regular inspections, adopting a reactive stance only after accidents occur (Asiedu et al., 2023).

The extractives industry faces similar challenges. In Nigeria, the lack of sector-specific regulations leaves mining companies largely unregulated regarding worker safety (Umeokafor et al., 2014). In Tanzania, overlapping responsibilities between regulatory bodies like the Occupational Safety and Health Authority (OSHA) and the Contractors Registration Board (CRB) create inefficiencies and confusion in enforcing safety standards (Gervas et al., 2023). Moreover, political interference in Tanzania often forces contractors to cut corners on safety measures to fulfil promises of job creation, prioritizing economic growth over worker safety. The understaffed OSHA, with only 69 inspectors for the entire country, further contributes to the problem, as companies frequently resort to self-regulation, neglecting OSH practices in the process (Gervas et al., 2022).

In the healthcare sector, weak OSH enforcement poses significant risks to workers during health crises. During the Ebola outbreak in West Africa, inadequate enforcement of safety protocols severely endangered healthcare workers, exacerbating the spread of the disease among frontline staff (Gervas et al., 2022). In many African countries, healthcare facilities are left to self-regulate, and without sufficient resources, many clinics and hospitals fail to implement necessary safety measures. As in other sectors, the shortage of inspectors and enforcement officers further undermines compliance, putting healthcare workers at considerable risk.

The manufacturing sector also faces notable OSH compliance issues. In some cases, client demands and contractual obligations drive compliance, as clients often require adherence to safety regulations during tendering (Famakin

& Fawehinmi, 2012; Windapo, 2013). However, in the absence of stronger government oversight, these market-driven mechanisms are insufficient to ensure widespread adherence. For example, in Ghana, consultants tasked with enforcing OSH standards tend to include only minimal safety clauses in contracts, allowing contractors to sidestep critical safety requirements (Eyiah et al., 2019). Manufacturing companies across Africa face similar enforcement challenges, as regulatory bodies lack the capacity for regular inspections, and corruption allows firms to bypass regulations without penalties (Idubor & Oisamoje, 2013). This creates an environment where economic incentives to evade safety regulations outweigh the risk of facing enforcement.

2.1.8 Prevalence and Impact of Hazards in Workplaces in Africa

The prevalence of occupational hazards across various sectors in Africa is well-documented, with studies highlighting significant physical, chemical, biological, and ergonomic hazards that workers are frequently exposed to, often without adequate protective measures (Debela et al., 2022; Abdelrahim et al., 2021; Moyo et al., 2015). The mining sector, for instance, is notorious for its high rates of respiratory illnesses and accidents, with South Africa being a case in point due to its extensive mining activities (Debela et al., 2021; Stuckler et al., 2013). Fatal accidents remain prevalent despite safety regulations in South Africa.

In 2018, an explosion at the Palaboura Copper Mines in Limpopo Province was caused by a burning conveyor belt highlighting the growing concerns about the increasing dangers in South African mines, which are becoming more perilous for workers: the life-threatening conditions and alarming accidents making these mines potential death traps (Industrial Global Union, 2018). The Palaboura mine disaster was just one example of the many safety issues plaguing the industry with the report further indicating how 55 mineworkers had lost their lives in mining accidents since January that year, making the Mining Health and Safety Council's objective of reaching "zero harm" increasingly difficult to attain. These incidents underscore the ongoing failure to enforce comprehensive safety standards in high-risk mining environments. Similarly, agriculture workers face risks from pesticide exposure, unsafe machinery, and harsh working conditions (Bosompem & Mensah, 2012; Ngowi et al., 2016). The informal sector, which employs a large proportion of Africa's workforce, is mostly vulnerable with studies indicating that workers often operate without basic safety equipment, adequate training, or awareness of potential risks due to the sector's unregulated nature, exacerbating health risks, and contributing to a higher incidence of occupational injuries and illnesses (ILO, 2021; Lund et al., 2016).

Physical hazards, such as exposure to noise, vibration, extreme temperatures, and mechanical dangers such as machinery and falling objects, are among the most pervasive workplace risks and the leading cause of occupational injuries and illnesses (Takala et al., 2024). Beyond immediate injuries, physical hazards have been found to contribute to chronic conditions like musculoskeletal disorders, which diminish workers' quality of life and lead to economic losses through absenteeism and reduced productivity (Takala et al., 2024; Amponsah-Tawiah et al., 2013; 2014). In October 2018, an oil pipeline explosion in Osioma, Abia State, Nigeria, killed over 50 people. The explosion happened when residents attempted to tap into a Nigerian National Petroleum Corporation (NNPC) pipeline, causing it to rupture and ignite. The ensuing fire spread to nearby homes, burning several people alive. Many victims were collecting fuel from the leaking pipeline, a hazardous practice driven by poverty and fuel scarcity. The Nigerian government and NNPC attributed the explosion to pipeline vandalism, which also caused significant property damage and environmental harm (State House, 2018).

Chemical hazards, on the other hand, are prevalent in industries that involve the use of toxic substances, such as agriculture, manufacturing, and mining where workers are often exposed to hazardous chemicals through inhalation, skin contact, or ingestion, leading to acute and chronic health effects (Pillay, 2020). This exposure can lead to respiratory problems, skin conditions, and even long-term effects such as cancer (Sabarwal et al., 2018) with research indicating that their impact is severe in regions (such as Africa) with inadequate regulatory frameworks, safety measures and protective equipment, and poor enforcement of safety standards (Handford et al., 2015; Debela et al., 2022). Biological hazards, including exposure to infectious agents like bacteria, viruses, and fungi, pose significant health risks to workers in healthcare and agriculture, especially where infection control is inadequate (van Niekerk & Nemaconde, 2017; Rothe et al., 2013), with the COVID-19 pandemic underscoring these vulnerabilities and their broader implications such as increased healthcare costs, loss of productivity, and the potential for widespread outbreaks that can disrupt entire industries (Chersich et al., 2020).

Ergonomic hazards arising from work environments that fail to consider workers' physical capabilities, significantly impact workers by causing chronic pain, disability, reduced productivity, and musculoskeletal disorders such as back pain, carpal tunnel syndrome, and tendonitis (Magnavita & Chirico, 2020; Gopinadh et al., 2013). Although ergonomic interventions like workstation redesign and training have been shown to mitigate these issues, the widespread implementation of such interventions is often hindered by financial constraints and a lack of awareness in most low-income settings (Nelson-Wong et al., 2020; Mossburg et al., 2019). Psychosocial hazards, including job insecurity, high work demands, poor management practices, and workplace harassment, are increasingly recognized as critical occupational

health concerns (European Agency for Safety and Health at Work, 2007; Jimenez & Dunkl, 2017; Asumeng, 2015; Amponsah-Tawiah et al., 2013). These hazards are prevalent in high-pressure sectors like healthcare (Rai et al., 2021; Mossburg et al., 2019), security (Aytac, 2015), mining (Amponsah-Tawiah et al., 2014; Amponsah-Tawiah et al., 2013), and finance (Tagoe & Amponsah-Tawiah, 2020; Asumeng, 2015). Their impact includes stress, mental health disorders, and physical health problems (Jimenez & Dunkl, 2017), with severe effects in Africa due to factors such as job insecurity and poor working conditions. Addressing these hazards requires comprehensive strategies that incorporate both workplace interventions and broader socio-economic reforms (Guadix et al., 2015).

2.1.9 Implementation of International OSH Standards

The implementation of international OSH standards is vital for safeguarding workers across industries. While these standards, promoted by organisations like the International Labour Organisation (ILO) and World Health Organisation (WHO), aim to create safe working environments globally, applying them consistently across countries presents significant challenges. Despite the adoption of international conventions, the actual enforcement of these standards at the national level is inconsistent among developing and industrializing nations. This gap between international norms and national enforcement exposes millions of workers to unsafe conditions (Mojapelo et al., 2016).

In South Africa, the automotive sector provides a clear illustration of the difficulties in implementing international OSH standards. A study by Zondo (2021) found that while an automotive assembly organisation had an effective safety management system in place, it did not necessarily reduce occupational diseases or workplace injuries. This case highlights that compliance with international OSH standards is not enough on its own; a strong safety culture must also be established. Without this culture, compliance becomes a tick-box exercise rather than a genuine effort to protect workers. One reason for the lack of deeper implementation is the perception within management that OSH standards increase operational costs. This mindset often leads to resistance, especially in cost-sensitive industries like automotive manufacturing (Amine & Antar, 2017). In such cases, international conventions need to be more than just guidelines—they must be integrated into the fabric of the organisation's operational priorities.

The extractives sector in Tanzania offers another example of how international standards struggle to take root at the national level. Despite being a signatory to several ILO conventions, including the Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187), the Tanzanian

government faces considerable challenges in enforcing these norms. Political interference in the mining industry for instance, often prioritizes job creation over worker safety. Contractors are encouraged to meet production quotas at the expense of adhering to safety standards, reflecting a broader pattern where political expediency trumps worker welfare (Gervas et al., 2023). This case underscores the need for stronger international oversight. Without it, multinational corporations operating in Tanzania and similar countries continue to exploit weak enforcement of OSH standards, putting workers in harm's way. The lack of accountability mechanisms at both the national and international levels exacerbate this problem.

In Ghana's construction sector, the gap between international standards and their application is striking. Although Ghana is a party to the ILO's key OSH conventions, awareness of these standards among workers and employers is limited. Eyiah et al. (2019) found that while there is some understanding of the Labour Act and Workmen's Compensation Law, many contractors are unaware of the Factories, Offices, and Shops Act, which is essential for ensuring safety on construction sites. This lack of awareness leads to inconsistent compliance, where safety measures are often an afterthought. Contractors in Ghana typically include only minimal OSH clauses in construction contracts, prioritizing cost-cutting over safety. The government's regulatory agencies, such as the Factories Inspectorate Department, are underfunded and understaffed, leading to irregular inspections and weak enforcement. This situation highlights how national enforcement mechanisms must be bolstered to meet international standards effectively (Asiedu et al., 2023).

The challenges in implementing international OSH standards are not confined to any single country or sector. Globally, multinational corporations (MNCs) often exploit weaker regulations in developing countries. While international bodies like the ILO work to promote OSH standards, their impact is limited by low ratification rates of key conventions and the reluctance of national governments to enforce these standards rigorously (Amoah & Mlenzana, 2022). Countries like South Africa, Tanzania, and Ghana are not unique in facing these challenges; they represent a broader trend in which economic and political barriers prevent the full implementation of international OSH standards. Moreover, even when countries adopt international management systems like ISO 45001:2018, integrating these systems with existing organisational frameworks remains a challenge. High implementation costs, resistance from employees, and the complexity of aligning multiple management systems can derail efforts to create safer work environments (Marhaviyas et al., 2022).

2.1.10 OSH and Other Labour-Related Issues such as Climate Change, Social Protection and Gender

The convergence of climate change, social protection, and gender disparities with OSH has become a pressing issue in developing countries. OSH frameworks, traditionally focused on physical hazards, must now expand to address these broader social challenges. The impact of climate change poses significant risks to workers in industries such as mining and agriculture, where extreme heat and changing environmental conditions directly threaten their health and productivity.

In Ghana's mining sector, rising global temperatures have exposed workers to heat stress, leading to increased incidents of heatstroke, cardiovascular problems, and respiratory issues (Nunfam et al., 2019). While simple solutions such as providing cooling equipment and increasing water intake have been suggested, they are often insufficient. The Ghanaian government has acknowledged the urgent need to address climate-related health risks, but gaps in policy execution and infrastructure development remain significant obstacles (Ansah et al., 2021). In countries like Ghana, where temperatures regularly exceed 30°C, workers are at even greater risk, highlighting the need for stronger institutional support and improved working conditions (Government of Ghana, 2013; 2015).

Gender is another critical factor often overlooked in traditional OSH practices. Historically, workplace safety standards have been developed with men in mind, leaving women, especially those in male-dominated industries, at a disadvantage. In South Africa's mining sector, for instance, female workers face unique challenges, including a lack of personal protective equipment (PPE) designed for women and insufficient provisions for pregnant workers (Botha & Cronjé, 2015). Although efforts have been made to increase female participation in mining, these gender-specific challenges persist, underscoring the need for OSH policies that account for the needs of women. Masike et al. (2014) argue that involving women in OSH decision-making processes, providing gender-specific training, and ensuring representation in safety committees are vital steps towards creating a safer, more inclusive work environment.

The informal economy presents another significant challenge to OSH. Workers in informal sectors, such as agriculture, domestic work, and small-scale manufacturing, often operate in hazardous conditions without access to social protection systems. In countries like Kenya, informal workers face exposure to harmful chemicals, inadequate sanitation, and unsafe equipment due to a lack of proper safety regulations (Lund, 2012). Traditional OSH frameworks frequently fail to recognize the risks faced by these workers. To

bridge this gap, experts like Lund advocate for an expanded OSH model that integrates informal workers into national safety and social protection systems. This would not only provide these workers with the necessary protections but would also recognize their contributions as legitimate participants in the labour force (Riisgaard, Mitullah, & Torm, 2022).

The intersection of climate change, gender, and social protection with OSH necessitates urgent attention, especially in developing nations where these challenges are most pronounced. As climate change exacerbates health risks and more women enter traditionally male-dominated industries, it is critical to adopt gender-sensitive and climate-adaptive OSH policies (Botha & Cronjé, 2015). Additionally, the growth of the informal economy requires a rethinking of conventional OSH frameworks to ensure all workers, regardless of their employment status, are protected from workplace hazards.

3.1 Challenges Identification & Non-Compliance

Occupational safety and health (OSH) in Africa face multiple challenges, influenced by factors such as poor attention to safety standards, socio-economic disparities, and inadequate enforcement. Across many industries, notably construction and the informal sector, OSH receives minimal focus at both national and organisational levels, leaving workers vulnerable to preventable injuries and occupational diseases. A lack of research and policy emphasis on OSH exacerbates these challenges. For instance, Puplampu and Quartey (2012) highlight that less than 1% of organisational and national research in Africa focuses on OSH concerns. As a result, industries operate without proper safety assessments, training, or compliance, as seen in Ghana where employers often neglect worker safety, creating a high-risk environment (Floyde et al., 2013).

Africa's colonial legacy has also contributed to weak administrative systems for managing OSH. Countries like Nigeria, which inherited underdeveloped safety practices from colonial administrations, continue to struggle with inadequate safety standards in modern workplaces (Othman, 2012). This weak infrastructure is compounded by socio-economic disparities across the continent. High levels of poverty, disease, and political instability push safety management lower on the priority list, especially in the informal sector. Millions of informal workers operate in unsafe environments without basic protective gear or training. In Uganda's capital, Kampala, informal workers are exposed to unsanitary conditions and environmental hazards without any formal OSH training or protection. This issue is worsened by low literacy levels, making it difficult for workers to understand safety guidelines even when provided (Wekoye et al., 2019).

The construction sector in Africa, one of the most hazardous industries, faces unique difficulties in implementing OSH measures. In Zambia, small and medium-sized contractors struggle due to limited resources and poor oversight, resulting in unsafe working conditions. Regular safety audits are rare, which leaves hazardous situations unchecked, putting workers at risk. Similarly, in Egypt, unsafe conditions in the construction industry, including poor housekeeping and a lack of safety equipment, lead to frequent workplace accidents, such as falls and being struck by objects (Adel et al., 2022).

Gender disparities further compound OSH non-compliance. In many African countries, male workers tend to have better OSH practices than their female counterparts, largely due to higher literacy rates and more targeted interventions. In Uganda, women in informal sectors are often overlooked in OSH training, lacking access to personal protective equipment (PPE) and awareness of safety protocols (Wekoye et al., 2019). This highlights the need for gender-sensitive OSH interventions and policy development, as

women face distinct risks that differ from men, especially in the informal economy. To address these challenges, governments and private sectors must collaborate to improve OSH compliance across the continent. In Ghana, stricter enforcement of OSH regulations in high-risk industries like construction and mining, could lead to significant improvements in worker safety. Regular inspections and penalties for non-compliance would force companies to take OSH more seriously. In Uganda's informal sector, educational campaigns and affordable access to PPE could enhance safety awareness and practices among workers. Furthermore, addressing gender disparities in OSH is critical. Women, especially in informal workspaces, must be included in training programs, and policies should be revised to cater to their specific safety needs. Improving OSH across Africa requires long-term commitment and action from both governmental bodies and industry leaders. Through stricter enforcement, targeted educational initiatives, and gender-sensitive interventions, the continent can make meaningful strides toward safeguarding its workforce and reducing occupational injuries and diseases.

3.1.1 Barriers to Ensuring Safe Working Environments

OSH is a critical aspect of workplace management that aims to ensure the safety, health, and welfare of workers. However, ensuring safe working environments, especially in developing countries, faces numerous barriers (Goetsch, 2014). One of the primary barriers to effective OSH implementation is the lack of government commitment and inefficient regulatory authorities. Kamoli et al. (2021) emphasize that the Nigerian government's insufficient proactive involvement severely undermines the development and enforcement of OSH Management Systems (OSHMS). The study highlights that the inefficiency of regulatory bodies, which often lack the necessary resources and authority to enforce compliance, leads to widespread negligence and non-compliance within the construction industry. These regulatory authorities fail to provide consistent and effective oversight, further exacerbating the issue (Kamoli et al., 2021). Similarly, Bidahor and Kheni (2022) reveal that Ghana faces significant regulatory challenges due to the absence of a comprehensive national policy on OSH. This results in disparate regulatory practices across various public institutions, complicating the enforcement of uniform safety standards. Regulatory bodies are often understaffed and ill-equipped to oversee the numerous construction sites scattered across the country (Bidahor & Kheni, 2022). These findings underscore the critical role of government commitment and effective regulatory frameworks in ensuring safe working environments.

Another significant barrier identified is the shortage of expertise in OSH activities. Kamoli et al. (2021) note a significant shortage of trained professionals who can effectively implement and manage OSHMS in Nigeria's

construction industry. According to Ajzen and Sheikh (2013), this gap in expertise not only hampers the adoption of best practices but also leads to a lack of awareness and understanding of the importance of OSH among construction workers and managers. Without proper training and education, the workforce remains ill-equipped to identify and mitigate occupational hazards (Kamoli et al., 2021). Bidahor and Kheni (2022) highlight the inadequacy of suitable OSH education in Ghana, which leaves workers ill-equipped to recognize and mitigate risks. This lack of specialized personnel results in inadequate monitoring and enforcement of safety protocols on construction sites (Bidahor & Kheni, 2022). The studies collectively indicate that improving expertise through targeted training and education programs is essential for enhancing OSH compliance and safety culture in the workplace.

Financial constraints and resource limitations are pervasive barriers affecting small businesses and larger firms alike. Esterhuyzen (2019) investigates the barriers to OSH compliance among small businesses in South Africa, identifying limited financial resources, insufficient managerial skills, and inadequate training opportunities as key impediments. Small businesses often lack the necessary infrastructure and resources to fully comply with OSH directives, and the costs associated with occupational injuries and illnesses are daunting (Esterhuyzen, 2019). Similarly, Bidahor and Kheni (2022) point out that the high cost associated with implementing comprehensive OSH measures poses a significant financial burden on contractors in Ghana, especially within a developing economy. This financial burden is exacerbated by the absence of a contractor's safety awards scheme, which could incentivize adherence to safety standards (Ajzen & Sheikh, 2013; Bidahor & Kheni, 2022). These financial constraints hinder the ability of businesses to invest in necessary safety measures, training, and infrastructure.

Attitudinal and behavioural barriers among workers and management also play a crucial role in hindering OSH compliance. Esterhuyzen (2019) categorizes human barriers to OSH compliance into a lack of proper knowledge, experience, and a positive attitude toward OSH among small business owners and managers. The study highlights that negligence, carelessness, and a lack of adherence to safe working procedures significantly impede compliance (Ajzen & Sheikh, 2013; Esterhuyzen, 2019). In the Nigerian construction industry, Kamoli et al. (2021) identify a lack of awareness and understanding of the importance of OSH among construction workers and managers as a critical barrier. Without proper training and education, the workforce remains ill-equipped to identify and mitigate occupational hazards (Kamoli et al., 2021). These findings suggest that fostering a positive safety culture through education, awareness campaigns, and behavioural interventions is essential for improving OSH compliance.

Furthermore, the complexity and volume of OSH regulations can overwhelm businesses, leading to compliance fatigue. Esterhuyzen (2019) notes that the complexity and volume of OSH regulations are perceived as overwhelming by small business owners and managers, leading to compliance fatigue. This fatigue results in a lack of adherence to safety standards and procedures, further endangering workers' health and safety (Esterhuyzen, 2019). Moreover, Bidahor and Kheni (2022) reveal that the ambiguity in OSH instructions and the absence of motivational packages for workers diminish the impetus for strict compliance in Ghana's construction industry. This lack of clarity and motivation further complicates the implementation of effective OSH measures, underscoring the need for simplified and clear regulatory frameworks that are easier to understand and follow (Probst et al., 2013).

Organisational and managerial barriers, such as time pressures, production emphasis, and inadequate monitoring, also impede effective OSH implementation. Esterhuyzen (2019) found that organisational factors, such as oversights, time pressures, and an emphasis on production over safety, act as significant impediments to OSH compliance. These organisational constraints often result in a neglect of safety protocols and procedures, endangering workers' health and safety (Esterhuyzen, 2019). Bidahor and Kheni (2022) identify the absence of dedicated OSH officers on construction sites as a key barrier in Ghana. This lack of specialized personnel leads to inadequate monitoring and enforcement of safety protocols, further exacerbating the risks faced by workers (Bidahor & Kheni, 2022). Effective organisational and managerial structures that prioritize safety over production are crucial for ensuring safe working environments.

3.1.2 Factors Contributing to Non-Compliance with Safety Standards

Non-compliance with OSH standards is a persistent issue across various industries in Africa, including agriculture, healthcare, construction, and manufacturing. This challenge stems from multiple factors such as weak policies, economic constraints, poor management practices, and corruption. These elements together create environments where safety measures are either inadequate or entirely ignored, placing workers at constant risk. A key contributor to this problem is the lack of comprehensive OSH policies and enforcement mechanisms. In Ghana, for instance, many employers fail to acknowledge their legal responsibilities to protect their employees. Furthermore, economic challenges aggravate non-compliance with OSH standards. Many employers in poorer African nations, prioritize productivity and profits over worker safety. Puplampu and Quartey (2012) argue that the financial burden of implementing proper OSH protocols is often perceived by employers as being too high, leading to widespread neglect of safety standards.

Another major factor contributing to non-compliance is poor management and inadequate worker training. Many organisations in high-risk industries like construction, fail to provide adequate safety training or enforce regulations. In Egypt, for example, construction firms often overlook safety protocols, leading to accidents due to lack of proper training and PPE (Adel et al., 2022). Furthermore, corruption is a major obstacle to enforcing safety standards. Although countries like South Africa have progressive safety laws such as the Occupational Safety and Health Act, enforcement is often lax due to corrupt practices. Employers can bypass regulations through bribery, which leads to widespread non-compliance and dire consequences for workers (Petrick & Rinefort, 2012). In Egypt, corruption exacerbates the high rates of construction site accidents, resulting in significant economic losses for both workers' families and businesses (Adel et al., 2022). The lack of proper governmental inspections, combined with corrupt practices, further undermines worker safety across many African countries.

Figure 1. Factors contributing to non-compliance with safety standards



3.1.3 Prevalence and Causes of Occupational Injuries and Diseases

Occupational injuries and diseases are a significant issue worldwide, with developing regions such as Africa bearing a disproportionately heavy burden. The International Labor Organisation (ILO) reports approximately 2.78 million deaths, 313 million non-fatal accidents, and 160 million work-related diseases globally each year (Dodoo & Al-Samarraie, 2020). Africa's share of this burden is exacerbated by inadequate safety measures, insufficient worker training, and weak regulatory enforcement in sectors like construction, mining, and agriculture. Unsafe worker behaviours, driven by poor training and a lack of awareness about safety protocols, are a major contributor to occupational injuries. Actions such as risk-taking, improper equipment use, and failure to use personal protective equipment and follow safety procedures are common across various industries (Dodoo & Al-Samarraie, 2020) and have been found to lead to injuries and diseases. Organisational factors also play a key role in the prevalence of occupational injuries. Weak safety management practices and a lack of safety culture contribute to high injury rates (Dodoo & Al-Samarraie, 2020). The limited and non-enforcement

of legal and regulatory OSH frameworks across Africa exposes workers to injuries and diseases.

Figure 2. Example of causes of occupational injuries and disease



3.1.4 Gaps in Safety Training, Awareness, and Implementation

Gaps in safety training, awareness, and implementation within Occupational Safety and Health Management Systems (OSHMS) undermine efforts to protect workers across various sectors, including construction, healthcare, extractives, manufacturing, and agriculture. These gaps, often driven by inadequate funding, outdated regulations, and weak managerial commitment, expose workers to significant risks, with practical examples across Africa highlighting the severity of the problem.

The construction sector is one of the most vulnerable, with many companies failing to allocate adequate resources for safety programs. Ochieng (2018) notes that only 25% of firms dedicate even 4% of their budgets to safety training, leaving workers underprepared to manage workplace hazards. This is remarkably concerning given that construction often employs unskilled labourers who lack basic safety knowledge. For instance, in South Africa, the rapid growth of the construction industry has intensified these issues. Workers face significant safety risks as safety protocols are poorly communicated, sometimes due to language barriers in a multilingual workforce, which complicates the understanding of essential safety instructions (Kunodzia et al., 2024). The lack of commitment from senior management further exacerbates the issue, as executives often view safety training as an unnecessary expense,

rather than an investment in worker protection (Mojapelo & Kok, 2017). In healthcare, financial and operational constraints are the primary barriers to effective safety training. At New Abirem Government Hospital in Ghana, budgetary limitations result in sporadic training sessions for healthcare workers, leaving them underprepared for the hazards they face, including exposure to infectious diseases and physical strain (Tawiah et al., 2022). The hospital, like many healthcare facilities in developing regions, lacks dedicated safety personnel, relying instead on infrequent external training, which fails to maintain continuous safety awareness. This is compounded by bureaucratic inefficiencies and understaffing, which lead to non-compliance with internal safety regulations, further endangering healthcare workers.

The extractive sector, known for its hazardous working conditions, suffers from outdated regulations and corruption that impede safety enforcement. In Uganda, OSH regulations have not kept pace with modern technological advancements, leaving workers in mining and oil extraction vulnerable to preventable dangers (Atusingwize et al., 2019). Moreover, the understaffed OSH department, with only 40% of positions filled, results in infrequent inspections and weak safety enforcement. Corruption and political interference further undermine safety efforts, as companies often circumvent regulations through bribery, allowing unsafe practices to continue unchecked. This lack of accountability leaves workers in perilous conditions with little recourse to improve their safety.

In the manufacturing sector, the lack of budget allocation for OSH programs leads to insufficient safety training and awareness. Ochieng (2018) highlights how many manufacturing companies in Tanzania, expose workers to hazardous chemicals and dangerous machinery without proper safety protocols. A key challenge here is the ineffective communication of safety information, where managers may be aware of safety protocols, but workers on the factory floor remain uninformed. This disconnect results in higher incidences of workplace injuries and occupational diseases, especially in smaller firms where safety culture is underdeveloped.

The agriculture sector similarly faces significant gaps in safety training, often due to financial limitations and the absence of formal safety systems. Workers, specifically in countries like Kenya, are regularly exposed to hazards such as pesticide use and operating heavy machinery without receiving adequate training or access to protective equipment (Mojapelo & Kok, 2017). Small-scale farmers lack the resources to invest in comprehensive safety programs. The seasonal or temporary nature of agricultural work further exacerbates these challenges, as workers rarely receive continuous safety training, increasing the likelihood of accidents and long-term health risks.

Figure 3. Gaps in safety training, awareness, and implementation



Inadequate
funding



Outdated
regulations



Weak managerial
enforcement

4.1 Evidence-Based Insights & Expert Interview Results

4.1.1 Secondary Data Presentation and Analysis

This review sought to examine the state of OSH in Africa across the oil and gas, mining, manufacturing, construction, agricultural, and healthcare sectors. A computerized bibliographic search in Web of Science (SSCI), EBSCO, PsycINFO, Scopus, ProQuest, and Google Scholar was carried out to find eligible articles on the state, practices, and challenges of OSH in Africa (until July 30, 2024). The systematic searches were performed by combining every possible combination of three groups of keywords: (1) keywords related to work (e.g., “OSH”); (2) working conditions (e.g., “risk, hazards”); (3) Africa, and (4) specific sub-regions in Africa (e.g., “West Africa,” “East Africa,” “Central Africa”, “Southern Africa,” and “North Africa”). The articles included in this study were empirical, focused on state, practices, and challenges of OSH in Africa, and published from 2018 to 2024. The results from the data analysis are presented in Table 2. The review identified lack of regulations and guidelines regarding safety protocols at mine sites, non-usage of personal protective equipment, odd working hours and poor physical conditions for women.

The findings also revealed the absence of an OSH management system and a poor level of adherence to, and strategies for improving OSH policies. The predominant causes of workplace accidents were identified as physical, mechanical, chemical, biological, noise-related, ergonomic, and psychological hazards, leading to injuries, fatalities, and absenteeism. The findings further reveal that both internal and external factors affect the implementation of the OSHMS. The most important internal factors were risk control strategies, senior management commitment, and support and communication channels. The most common external factors were pressure from clients on project delivery, company reputation, OSH enforcement, and government legislation. The findings also showed that safety and health awareness of workers are impacted by safety and health training. Additionally, it was found that well-informed workers contribute to achieving the goal of zero accidents/incidents in workplaces.

Furthermore, it was found that safety culture influences the reduction of workplace accidents. Moreover, the findings indicate that safety culture plays a pivotal role in increasing workers’ safety and health awareness. Furthermore, the findings showed that healthcare workers face numerous challenges, including inadequate training, absence of protective equipment, long working hours, and exposure to infectious diseases. However, implementation of methods to reduce hazards in most countries is suboptimal.

4.1.2 Comparative Study Analysis

OSH is a critical component of workforce management and productivity, directly impacting the well-being of workers and the efficiency of industries (Johanson et al., 2022). The literature suggests enormous difference in terms of the state, practice and challenges of OSH in developing economies such as Africa and developed economies such as the United States and Europe. Furthermore, in Africa, where sectors such as agriculture, healthcare, construction, mining, oil and gas, and manufacturing form the backbone of many economies, ensuring robust OSH practices is essential.

4.1.2.1 Comparing OSH in Developing Countries to OSH in Developed Countries

Although OSH plays a crucial role in safeguarding the health, safety, and welfare of workers across the globe, significant disparities exist between the implementation and effectiveness of OSH practices in developing regions like Africa and developed regions such as Europe and America (Umar et al., 2022). This comparative analysis examines the differences in OSH frameworks, implementation strategies, challenges, and outcomes between these regions. First, OSH frameworks in developed countries are well established, and guided by comprehensive legislation and regulations as compared to those in developing economies like those in Africa. The European Union (EU) has implemented multiple regulatory frameworks and directives that collectively form a robust system for ensuring OSH across diverse industries and work environments in the EU. These frameworks and directives include:

- 1. Regulation (EC) No 1907/2006 (REACH)** pertains to the registration, evaluation, authorisation, and restriction of chemicals. This regulation aims to ensure that chemicals used in workplaces are managed safely, minimizing risks to human health and the environment.
- 2. Regulation (EU) No 1272/2008 (CLP Regulation)** addresses the classification, labeling, and packaging of substances and mixtures. It ensures that chemical hazards are clearly communicated to workers through standardized labels and safety data sheets.
- 3. Directive 2006/25/EC** addresses the minimum health and safety requirements for exposure to artificial optical radiation. It aims to protect workers from potential risks associated with exposure to light and radiation sources.
- 4. Directive 2009/148/EC** pertains to the protection of workers from risks related to exposure to asbestos. It includes requirements for managing and minimizing asbestos-related hazards.
- 5. Directive 2014/27/EU** amends **Directive 2012/18/EU**, which controls major accident hazards involving dangerous substances. It focuses on preventing major accidents and mitigating their consequences.

6. Directive 2019/983/EU updates regulations related to the protection of workers from carcinogens or mutagens. It provides additional requirements and improvements for safeguarding workers' health from these hazardous substances.

The United States of America has numerous OSH frameworks and standards that enforce standards that ensure safe working conditions including:

1. Occupational Safety and Health Act (OSHA) – 1970: Enforced by the Occupational Safety and Health Administration (OSHA), the Act ensures that employers provide a workplace free from recognized hazards that could cause death or serious physical harm.

2. Hazard Communication Standard (29 CFR 1910.1200): Requires employers to communicate information about hazardous chemicals.

3. Mine Safety and Health Act (MSHA) – 1977: Governs safety regulations in the mining industry to prevent workplace accidents and ensure mine safety; and is enforced by the Mine Safety and Health Administration (MSHA).

4. Construction Safety Standards (29 CFR 1926): OSHA has specific safety standards for the construction industry, including fall protection, scaffolding, electrical safety, and more.

5. Process Safety Management (PSM) Standard (29 CFR 1910.119): Focuses on managing highly hazardous chemicals to prevent accidental releases that could cause catastrophic incidents.

6. Maritime Safety Standards (29 CFR 1915-1919): Regulations addressing safety in the maritime sector, including shipyard employment and cargo handling.

7. Healthcare Safety Standards (29 CFR 1910): Enforces standards such as blood-borne pathogens, hazard communication, and the use of personal protective equipment (PPE) to ensure the safety of healthcare workers.

Regulatory frameworks in the EU and USA are characterized by regular updates, strict enforcement, and well-defined penalties for non-compliance (ILO, 2021) in contrast to developing countries who often lack comprehensive OSH legislation or suffer from weak enforcement mechanisms. Many African nations have outdated or fragmented OSH laws that do not address contemporary workplace hazards (Chen et al., 2020). For instance, Nigeria's OSH framework is criticized for being inadequate, with insufficient coverage of the informal sector, which employs a significant portion of the workforce (Afolabi et al., 2021). Moreover, developed regions like Europe and America benefit from robust institutional frameworks (such as European Agency for Safety and Health at Work and America's National Institute for OSH (NIOSH)), which supports the research, development, implementation and evaluation of OSH policies. Regular inspections, worker training programs, and the use of advanced technology are common practices that ensure high compliance levels. Companies are also incentivized to adhere to OSH

standards through tax benefits, insurance reductions, and other economic incentives (European Agency for Safety and Health at Work, 2023). In African countries, however, the implementation of OSH standards is often hampered by a lack of resources, both in terms of funding and skilled personnel. For example, the Democratic Republic of Congo struggles with insufficient OSH inspectors, leading to poor enforcement of existing regulations (Nkongolo-Bakenda, 2019). Moreover, the informal economy, which constitutes a large part of Africa's workforce, is often outside the purview of OSH regulations, further complicating compliance efforts (Benjamin, 2021).

Pertaining to OSH challenges, Europe and America face challenges such as emerging risks from new technologies and the psychosocial risks associated with modern work environments, which are often met with proactive research, policy updates, and the implementation of advanced preventive measures. For instance, the EU's Horizon 2020 program was the EU's primary research and innovation program from 2014 to 2020, supporting over 13,000 projects globally and addressing critical societal challenges including new and emerging risks to workers' safety and health (EPRS, 2017). African countries on the other hand, face more fundamental challenges, including high prevalence of occupational diseases, poor working conditions, and a lack of access to PPE, which are exacerbated by limited financial resources, inadequate healthcare systems, and political instability in some regions (Ncube & Kanda, 2018). For instance, mining sectors in Southern Africa report high rates of respiratory diseases and accidents due to poor OSH practices (Kistnasamy et al., 2018). Moreover, the COVID-19 pandemic has further strained the already limited OSH resources in Africa, highlighting the need for substantial improvements in this area (WHO, 2020). The effectiveness of OSH interventions in Europe and America is evident in their relatively low rates of workplace accidents, occupational diseases, and fatal occupational injuries, thanks to stringent OSH measures and effective enforcement (ILO, 2021). In the developing context, however, the outcomes are less positive with high rates of workplace injuries, fatalities, and occupational diseases, primarily in high-risk sectors like mining, agriculture, and construction. For example, China, as the largest developing country, faces significant challenges in OSH, highlighted by a high number of workplace accidents and fatalities. In 2015, there were 305,677 production accidents resulting in 68,061 deaths. Additionally, the number of new occupational diseases has been rising, with 31,789 new cases reported in 2016, marking the highest level in recent years. This underscores the concerning OSH situation in China and other developing countries (Chen et al., 2020).

4.1.2.2 A Comparison of the Current State of OSH in the Various Sectors in Africa

Agriculture, a crucial sector employing a large portion of the rural workforce, is plagued with high rates of injuries and illnesses due to exposure to pesticides, dangerous machinery, and ergonomic hazards from manual labour. The sector's informality and lack of regulatory oversight exacerbate

these risks, leaving workers without adequate personal protective equipment (PPE) or safety training (Ngowi et al., 2016; FAO, 2023). In the healthcare sector, workers face significant hazards from exposure to infectious diseases such as HIV, tuberculosis, and Ebola, compounded by a shortage of PPE and inadequate infection control training. Psychosocial stress also poses a major concern, with high patient loads and long working hours contributing to burnout and mental health issues. Despite some progress in improving OSH practices, many healthcare settings, mainly in rural areas, remain under-resourced and inadequately protected (Rothe et al., 2013).

The construction industry, rapidly expanding due to urbanization, is marked by high rates of occupational injuries and fatalities. Workers encounter risks such as falls, exposure to hazardous materials like asbestos, and accidents involving heavy machinery. The sector's high level of informality and inconsistent regulatory enforcement contribute to its poor safety record, with many workers lacking formal training and safety equipment (Boadu et al., 2020; Fulele & Kadama, 2016; van Heerden et al., 2018). Mining, a significant economic driver in Africa, exposes workers to severe hazards including respiratory issues from dust, risks of explosions, and toxic chemical exposure.

Small-scale and artisanal mining operations often lack formal safety protocols, resulting in high accident rates and health problems. While larger multinational companies may follow international safety standards, smaller and informal operations frequently operate with minimal oversight, highlighting the need for comprehensive regulatory frameworks (Amponsah-Tawiah et al., 2014; Nkolimwa et al., 2020).

The manufacturing sector, diverse in its industries, faces various occupational risks such as exposure to hazardous chemicals, machinery-related injuries, and ergonomic hazards. While some large manufacturing plants implement robust OSH practices, smaller and informal operations often fall short, leading to high rates of injuries and illnesses. The sector's growth has not been matched by improvements in OSH standards, leaving many workers vulnerable (Mutegi et al., 2023; Nana & Ewur, 2021). Finally, the oil and gas sector, vital to Africa's economy, presents significant OSH risks including exposure to toxic chemicals, potential for explosions and fires, and physical injuries from heavy machinery. Offshore operations add further dangers such as drowning and emergency evacuation challenges, compounded by the psychosocial stress of long hours and isolation. These high-risk environments underscore the urgent need for stringent safety measures and regulations to safeguard workers (Liu et al., 2020; Olawuyi & Tubodenyefa, 2018).

Table 2. Basic data of all included studies including the study's location, issues and sectors examined, method, and findings

No	Author	Country	Issue	Sector	Method	Findings
1	Kunodzia, R., Bikitsha, L. S., & Haldenwang, R. (2024)	South Africa	Perceived factors affecting the implementation of OSH management systems in the South African construction industry.	Construction	Quantitative	The findings reveal that both internal and external factors affected the implementation of the OSHMS. The most important internal factors were risk control strategies, senior management commitment, and support and communication channels. The most common external factors were pressure from clients on project delivery, company reputation, OSH enforcement, and government legislation. A framework was developed to outline how an OSHMS can be implemented using the PDCA approach based on the findings from this study. The framework can be adopted by the construction industry to improve effectiveness when implementing their OSHMS.
2	Quaigrain, R. A., Owusu-Manu, D. G., Edwards, D. J., Hammond, M., Hammond, M., & Martek, I. (2024)	Ghana	OSH orientation in the oil and gas industry of Ghana: analysis of knowledge and attitudinal influences on compliance.	Oil and Gas	Quantitative	The findings indicate that most workers had both a high level of knowledge and positive attitude toward mitigating occupational health hazards. Moreover, the study reveals that most workers complied with occupational health safety practices. However, the study also reveals that the effect of workers' knowledge and attitude toward occupational health hazards does not translate into deployment of comprehensive safety practices. Interestingly, female workers were found to be more knowledgeable and compliant with OSH practices than their male counterparts.
3	Elegbede, S., Gbajumo-Sheriff, M., Gbadamosi, A., Kolawole, I., & Omotoye, O. (2024)	Nigeria	The influence of industrial health and safety practices on workers' attitude among nurses in Oauth, Osun State	Health Sector	Quantitative	The study found that industrial health and safety significantly influence job satisfaction, worker performance, and worker commitment among nurses in OAUTHC Ile-Ife Osun State. The conclusion from the findings of this study is that industrial health and safety contribute to workers' attitudes when perceived as threatening to their well-being. The frequency of industrial health and safety was observed to be the leading cause of workers' attitudes and low commitment to work, and it affects both the life of the worker and their performance level.
4	Ishengoma, N. M. (2024)	Tanzania	We get affected too: Women's OSH hazards in the fish processing subsector in Tanzania demystified.	Agriculture	Mixed Method	Findings revealed that women in the FPPs were confronted with various OSHHs emanating from the physical, environmental, mental, psychological, and cultural domains that significantly affected their health in the short and long run.

5	Chetty, D. R. V., Boojhawon, R., Bhagwant, S., & Levy, L. (2024)	Mauritius	Factors affecting the OSH of small and medium enterprises in the Construction Sector of Mauritius	Construction	Mixed Method	The SEM analysis shows that the safety and health awareness of workers are impacted by safety and health training. Additionally, it was found that well-informed workers contribute to achieving the goal of zero accidents/incidents in workplaces. Furthermore, it was found that safety culture influences the reduction of workplace accidents. Moreover, the findings indicate that safety culture plays a pivotal role in increasing workers' safety and health awareness.
6	Alimi, U. A. (2024)	Sub-Saharan Africa	A scoping review into the prevalence and determinants of occupational health hazards among female healthcare workers in Sub-Saharan Africa	Health	Systematic Review	The review highlights the pervasive nature of occupational health hazards among female healthcare workers in Sub-Saharan Africa, including needle-stick injuries, ergonomic strains, infectious disease exposure, and psychosocial stressors. These hazards are influenced by various factors such as resource constraints, inadequate training, and organisational culture. While the studies underscore the pressing need for comprehensive occupational health measures, existing research gaps and the role of policy changes in promoting safety are also elucidated.
7	Shabani, T., Steven, J., & Shabani, T. (2024)	Zimbabwe	Significant occupational hazards faced by healthcare workers in Zimbabwe	Health	Systematic Review	The study found that healthcare workers in Zimbabwe face numerous challenges, including inadequate training, protective equipment and long working hours and exposure to infectious diseases. However, implementation of methods to reduce hazards in countries like Zimbabwe is suboptimal.
8	Naicker, K. (2024)	South Africa	Noise-induced hearing loss and hearing protection: Attitudes at a South African coal mine	Mining	Quantitative	Out of 241 completed surveys, this study found that 84% were aware of when to replace earmuffs; 95% believed wearing HPDs could prevent hearing loss in noisy environments; 83% felt their hearing was impacted by loud noise. Additionally, 86% mentioned discomfort from earmuff pressure; 95% emphasized HPD importance; and 95% used HPDs around loud sounds. Moreover, 98% knew how to properly wear earplugs, while lower education levels were linked to higher susceptibility to NIHL.
9	Lyakurwa, D. M., Khalfan, S. S., Mugisha, J., & Yao, W. (2024)	Tanzania	Exposure to Occupational Hazards Among Healthcare Workers in Tanzania	Health	Systematic Review	Healthcare workers in Tanzania were exposed to biological hazards, ergonomics, burnout, chemical, radiology and workplace violence. Most of the literature was on biological hazards (77%), and research on other hazards was limited.
10	Ngajilo, D., Adams, S., Kincl, L., Guernsey, J., & Jeebhay, M. F. (2023)	Tanzania	OSH in Tanzanian aquaculture-emerging issues	Agriculture	Qualitative	The study shows that the Tanzanian aquaculture industry is still in nascent stages, especially in relation to OSH despite some well-established isolated operations in the country. Tanzanian aquaculture workers are exposed to several occupational hazards and their associated health effects have been poorly characterized. Substantial gender disparities exist within the sector, which together with climate change, impact worker health and safety.

11	Debela, M. B., Deyessa, N., Begosew, A. M., & Azage, M. (2023)	Ethiopia	OSH practices and associated factors among workers in Ethiopia's Metehara and Wonji sugar industries: a convergent parallel mixed design.	Manufacturing	Mixed Method	The percentage of good OSH practices was 29.6% (95% CI: 27% to 32%). Inappropriate provision of personal protective equipment (adjusted OR (AOR)=1.42, 95% CI: 1.10 to 1.83), a lack of strict safety regulation (AOR=1.64, 95% CI: 1.27 to 2.12), a lack of incentives (AOR=1.31, 95% CI: 1.04 to 1.66) and inadequate management support (AOR=1.19, 95% CI: 1.04 to 1.66) were identified as associated factors. Health service usage defects, inappropriate protective equipment use and failure to follow occupational safety commands were identified as challenges.
12	Musungwa, T., & Kowe, P.	Zimbabwe	Effects of OSH management systems implementation in accident prevention at a Harare beverage company.	Manufacturing	Mixed Method	The results of chi-square ($p > 0.05$) indicated that there was no association between occurrences of accidents at Delta Sparkling Beverages to OSHMS audits. The research findings further revealed that non-adherence to safe operating procedures (unsafe acts) by workers is the major cause of accidents at the company.
13	Mkungunugwa, T., Owili, P. O., Muula, A. S., & Kuo, H. W. (2022)	Zimbabwe	Implementation determinants of Zimbabwe National OSH policy in Willowvale industrial area, Zimbabwe.	Manufacturing	Quantitative	Participant's knowledge of National OSH Policy (ZNOSHP (Incidence Rate Ratio, IRR = 1.32; 95% Confidence Interval, CI: 1.19–1.46; $p < 0.001$), production department (IRR = 1.13; 95% CI: 1.03–1.26; $p < 0.05$), company years of operation (IRR = 1.33; 95% CI: 1.21–1.46; $p < 0.001$), participants who identified several implementation barriers (IRR = 1.12; 95% CI: 1.01–1.25; $p < 0.001$), and agricultural industry were associated with higher rates of ZNOSHP's implementation.
14	Singo, J., Isunju, J. B., Moyo, D., Bose-O'Reilly, S., Steckling-Muschack, N., & Mamuse, A. (2022)	Zimbabwe	Accidents, injuries, and safety among artisanal and small-scale gold miners in Zimbabwe.	Mining	Quantitative	Accidents associated with experiencing injuries included mine collapses and underground trappings. The major injury risk factors were digging, blasting, being male, being 18–35 years old, crushing, and the underground transportation of workers and materials. Injuries were reported highest among the miners working 16 to 24 h per day. Participants had heard about personal protective equipment (PPE). There was training and routine inspections mainly on PPE use. Mine owners and supervisors were reported as responsible for OSH, which was mainly PPE use. Practices including the use of wire winch ropes and escape routes were rare. There was ignorance on underground mine shaft support.

4.1.2.3 A Comparison of Challenges in OSH Across the Sectors

One of the overarching challenges across various sectors in Africa is the inadequacy of OSH legislation and enforcement. Many countries have outdated or incomplete laws that fail to address the needs of the informal sector, where a significant portion of the workforce is employed. In agriculture and construction, the lack of a comprehensive legal framework results in inconsistent application of safety measures, leaving many workers unprotected (Garrigou et al., 2020; Bosompem & Mensah, 2012; Ngowi et al., 2016). Although some sectors, such as healthcare and extractives, may have more developed regulations, enforcement is often weak, and existing laws may not fully address the high-risk environments specific to these industries.

Awareness and training are critical areas where disparities emerge among sectors. In agriculture and construction, there is a notable lack of awareness about basic OSH practices. Workers frequently do not receive safety training, and employers often do not prioritize safety education. In contrast, the healthcare sector and extractive industries, while not providing some level of training, often face challenges in ensuring that this training is sufficient to address the high-risk nature of their environments (Mashwama et al., 2019; Moyo et al., 2015; Amoah & Mlenzana, 2022). In healthcare, the training may be inadequate to deal with the complex biological hazards, while in the extractive sectors; training may fall short in covering the diverse risks of small-scale and artisanal mining operations.

Resource limitations significantly impact OSH across all sectors. In healthcare, shortages of protective equipment and poor working conditions exacerbate safety risks. Similarly, small-scale mining operations within the extractive sector frequently lack the financial resources to implement effective safety measures. Agriculture and construction also suffer from resource constraints, which hinder the adoption of advanced safety technologies and practices (ILC & ILO, 2010). The financial limitations across these sectors prevent the widespread implementation of necessary safety improvements, perpetuating a cycle of inadequate protection for workers.

The high prevalence of informal work poses a major challenge to OSH in agriculture, construction, and manufacturing. Informal workers often lack access to social protection and safety measures, making them distinctively vulnerable to occupational hazards. This informality is compounded by the lack of regulatory oversight and enforcement, which further exposes these workers to risks. In sectors like manufacturing and agriculture, where informal employment is widespread, the absence of formal safety protocols and protections exacerbates the challenges faced by workers (Lund et al., 2016). While each sector in Africa faces unique OSH challenges, common issues include inadequate legislation, insufficient awareness and training, resource constraints, and the prevalence of informal work. Addressing these challenges requires a targeted effort to update and enforce regulations,

enhanced safety training, the effective allocation of resources, and the provision of protection equipment for informal workers across all sectors.

4.1.3 Delphi Expert Interview Approach

The Delphi Expert Interview Approach was used to collect qualitative data for this study. This methodology was selected due to its ability to harness expert opinion through structured communication, allowing for a comprehensive exploration of complex issues like OSH. The population under study comprised 15 OSH experts, carefully chosen for their extensive knowledge and experience in OSH across various sectors in Africa. These experts were identified from existing OSH literature and through discussions in professional forums. The selection of these individuals was crucial, as their insights would provide a deep understanding of the challenges and opportunities in OSH across the continent.

The sampling technique employed was purposive sampling. This approach was ideal for the study as it ensured that the sample consisted of individuals with specialized knowledge and experience in OSH, making them well-suited to provide informed opinions on the subject matter. Purposive sampling was critical in this context because the study aimed to gather nuanced, expert-driven insights rather than generalizable data from a broader population. The selection criteria were stringent, focusing on experts' demographic information, academic qualifications, professional experience, and contributions to OSH discussions in Africa. This rigorous selection process helped to confirm the respondents as true experts in their field, enhancing the validity of the findings.

The sample size of 15 experts was considered appropriate for a Delphi study, which typically involves a small, focused group of knowledgeable individuals. The size was sufficient to gather a diverse range of opinions while still being manageable for iterative rounds of data collection and analysis. The use of primary data was central to this study, with the Delphi interview technique serving as the primary data collection method. This approach allowed the researchers to directly engage with the experts, facilitating a rich exchange of ideas and opinions. The semi-structured interview guide, used as the data collection instrument, provided a flexible yet focused framework for the interviews, ensuring that key topics were covered while allowing experts to elaborate on their responses. The data was collected from July to August of 2024. The Delphi technique, with its iterative process, was instrumental in gathering data. It involved three rounds of interaction between the interviewer and the experts, aimed at achieving consensus on the state of OSH in Africa. This method is remarkably effective in exploring real-world issues where there is a need for expert judgment. The iterative rounds allowed for the refinement of ideas and the convergence of opinions, making the findings more robust. The interaction between the interviewer and the participants facilitated the collection of narrative OSH expert opinions.

The analytical approach of Thematic Analysis was chosen for this study because it is well-suited to identifying, analysing, and reporting patterns (themes) within qualitative data. This approach allowed the researchers to systematically explore the complex data generated from the Delphi interviews, uncovering key themes related to OSH in Africa. Thematic Analysis provided a structured yet flexible method for interpreting the data, making it possible to derive meaningful insights from the experts' responses.

4.1.3.1 Demographic Details of Participants

Table 3 below provides a comprehensive overview of the respondents' profiles, reflecting various dimensions of their experiences and roles within OSH. The results in Table 3 show that the experts interviewed are from different sectors, years of experience, geographical regions, and organisational categories.

4.1.3.2 Overview of Experience and Involvement in OSH

The Delphi expert interviews revealed a wealth of insights from seasoned professionals in OSH across various sectors in Africa. These professionals, with experience ranging from five to fifteen years, were deeply involved in shaping safety protocols and addressing workplace hazards in their various countries and sectors. They worked across diverse sectors, including agriculture, healthcare, construction, extractives, and manufacturing, holding positions such as Safety Officers, Health Services Directors, Occupational Health Nurses, and Safety Engineers. Their extensive experience across multiple regions in Africa provided them with a broad perspective, allowing them to understand the nuances of OSH in different contexts. One respondent, a male Safety Officer in West Africa's agriculture sector, shared his decade-long experience in OSH, emphasizing his role in developing and implementing safety protocols on farms. He highlighted the importance of training workers on safety compliance, especially in an industry where the use of outdated machinery and lack of protective gear often led to injuries.

Another respondent, a female Safety Engineer in East Africa's construction sector, described her seven-year journey in OSH. She witnessed firsthand how safety was frequently sidelined due to cost-cutting measures, which fuelled her passion for advocating for stronger safety standards. A third respondent, an Occupational Health Nurse in South Africa, reflected on her six years in the healthcare sector, dealing with a range of issues from ergonomic injuries to exposure to hazardous substances. She noted the unique challenges in healthcare, where protecting workers also meant protecting patients.

Table 3. Profile of Respondents

Re- spon- dent	Gender	Sector	Years of Work- ing Experi- ence in OSH	Part of Africa	Category	Position
1	Male	Agriculture	10	West	Private Or- ganisation	Safety Officer
2	Male	Construction	8	East	Civil Soci- ety Organi- sation	Project Man- ager
3	Female	Healthcare	5	South	Public Or- ganisation	Occupational Health Nurse
4	Male	Manufactur- ing	6	Central	Private Or- ganisation	Health and Safety Man- ager
5	Female	Extractives	12	North	NGO	Safety Advisor
6	Female	Agriculture	5	West	Public Or- ganisation	Safety Coordi- nator
7	Female	Construction	7	East	Private Or- ganisation	HSE Specialist
8	Male	Healthcare	15	South	NGO	Health Ser- vices Director
9	Female	Manufactur- ing	5	Central	Civil Soci- ety Organi- sation	Training Of- ficer
10	Male	Extractives	11	North	Public Or- ganisation	Safety Com- pliance Officer
11	Male	Agriculture	9	West	Private Or- ganisation	Farm Safety Manager
12	Female	Healthcare	6	South	Public Or- ganisation	Community Health Worke
13	Male	Construction	14	East	NGO	Safety Engi- neer
14	Female	Extractives	8	North	Private Or- ganisation	Environmental Health Officer
15	Male	Manufactur- ing	11	Central	Public Or- ganisation	OSH Coordi- nator

The varied experiences of these respondents underscored the complexity of OSH in Africa. Their insights revealed that sector-specific approaches were necessary to improve workplace safety, considering the unique challenges and requirements of each industry. Below are some of the views voiced out by respondents:

“I’ve been working in the field of OSH for over a decade now, primarily in the agriculture sector. My work has involved developing and implementing safety protocols on farms and training workers on the importance of safety compliance.” **Respondent 1**

“My journey in OSH began seven years ago in the construction sector. I’ve seen firsthand how safety is often sidelined due to cost-cutting measures, and this has driven my passion for advocating stronger safety standards.” **Respondent 7**

“In my six years as an Occupational Health Nurse, I’ve dealt with a range of issues, from ergonomic injuries to exposure to hazardous substances. The healthcare sector is unique because we’re not only protecting workers but also patients.” Respondent 12

4.1.3.3 Challenges Identification & Non-Compliance

When the respondents were asked about the primary reasons for non-compliance with OSH standards, several factors emerged as significant contributors. Economic constraints were a recurring theme, as many companies operated on thin margins and viewed safety measures as a luxury rather than a necessity. A male respondent from Central Africa’s textile industry (i.e., manufacturing sector) pointed out that non-compliance often boiled down to financial limitations. He explained that many companies in his sector struggled to invest in safety measures due to the high costs associated with implementing proper safety protocols. This economic pressure led to a culture where safety was not prioritized, resulting in frequent accidents and injuries. In the extractives sector, the remoteness of work sites posed a significant challenge to monitoring compliance consistently. A male respondent from North Africa highlighted that while workers might be aware of the regulations, adherence was low due to the lack of regular inspections. The remote nature of many extractive operations meant that enforcing safety standards was difficult, leaving workers vulnerable to hazards. Another respondent from the same sector emphasized the cultural aspect of non-compliance, noting that in some regions, there was a fatalistic attitude towards accidents. This mindset reduced the emphasis on preventative measures, further contributing to non-compliance.

These insights revealed that non-compliance with OSH standards in Africa was a multifaceted issue influenced by economic, geographic, and cultural factors. Addressing these factors was crucial to improving safety outcomes in African workplaces. Below are some of the views voiced out by respondents:

“Non-compliance often boils down to financial limitations. Many companies in the manufacturing sector operate on thin margins, and investing in safety measures is seen as a luxury rather than a necessity.” **Respondent 4**

“In the extractives sector, the remoteness of work sites makes it difficult to monitor compliance consistently. Workers might be aware of the regulations, but without regular inspections, adherence is low.” **Respondent 10**

“There is also a cultural aspect to non-compliance. In some regions, there’s a fatalistic attitude towards accidents, which reduces the emphasis on preventative measures.” **Respondent 14**

4.1.3.4 Barriers to Ensuring Safe Working Environments

The respondents identified several barriers to ensuring safe working environments in African workplaces, including inadequate infrastructure, lack of government support, and insufficient training. In the healthcare sector, one of the biggest barriers was the lack of proper infrastructure. A female respondent from South Africa shared her experiences working in rural clinics, where basic safety equipment like gloves and masks were in short supply. This shortage not only put healthcare workers at risk but also compromised the safety of patients. The lack of adequate infrastructure in these settings made it challenging to implement effective safety protocols.

Underfunding was another significant barrier in the healthcare sector. The same respondent noted that financial strain meant safety measures were often an afterthought, with workers left to manage hazards as best they could. This situation was exacerbated by the lack of government support, specifically in rural areas where resources were already stretched thin. In the extractives sector, the lack of government enforcement was a major barrier to ensuring safe working environments. A female respondent from North Africa explained that even when safety laws existed, they were not always enforced, especially in remote areas where oversight was limited. This lack of enforcement created a culture of complacency, where companies felt little pressure to comply with safety standards. The respondent emphasized the need for stronger government intervention to ensure that safety laws were not only in place but also actively enforced.

These barriers highlighted the need for a comprehensive approach to OSH in Africa, one that included improving infrastructure, increasing government support, and providing adequate training to ensure safe working environments. Below are some of the views voiced out by respondents:

“One of the biggest barriers in the healthcare sector is the lack of proper infrastructure. In many rural clinics, basic safety equipment like gloves and masks are in short supply, putting both workers and patients at risk.” **Respondent 3**

“The healthcare sector is also heavily underfunded. This financial strain means that safety measures are often an afterthought, and workers are left to manage hazards as best they can.” **Respondent 8**

“In the extractives sector, one major barrier is the lack of government enforcement. Even when safety laws exist, they’re not always enforced, especially in remote areas where oversight is limited.” **Respondent 5**

4.1.3.5 Factors Contributing to Non-Compliance with Safety Standards

The respondents discussed several factors that contributed significantly to non-compliance with safety standards, including inadequate safety culture, lack of accountability, and economic pressures. In the construction sector, a female respondent from East Africa noted that there was a pervasive lack of safety culture. She explained that safety was often viewed as a secondary concern, with this mindset trickling down from management to workers. This lack of emphasis on safety resulted in a work environment where accidents were more likely to occur. Economic pressures also played a significant role in non-compliance. A female respondent from Central Africa's manufacturing sector pointed out that there was a tendency to cut corners to save costs. She explained that safety measures were seen as expensive and time-consuming, leading to non-compliance, especially when there was no immediate consequence. This short-term thinking often resulted in long-term costs, both in terms of worker health and financial liabilities. Accountability was another issue that contributed to non-compliance. A male respondent from East Africa's construction sector noted that when accidents happened, it was rare for anyone to be held responsible. This lack of accountability created an environment where there was little incentive for companies to adhere to safety standards. The respondent emphasized the need for stronger enforcement mechanisms to ensure that those responsible for safety violations were held accountable.

The respondents' insights suggested that to improve compliance with safety standards, there needed to be a shift towards a stronger safety culture, greater accountability, and a recognition of the long-term benefits of investing in safety. Below are some of the views voiced out by respondents:

“There's a pervasive lack of safety culture in the construction sector. Safety is often viewed as a secondary concern, and this mindset trickles down from management to workers.” **Respondent 7**

“In manufacturing, there's a tendency to cut corners to save costs. Safety measures are seen as expensive and time-consuming, which leads to non-compliance, especially when there is no immediate consequence.” **Respondent 9**

“Accountability is another issue. When accidents happen, it's rare for anyone to be held responsible, so there's little incentive for companies to adhere to safety standards.” **Respondent 2**

4.1.3.6 Prevalence and Causes of Occupational Injuries and Diseases

Occupational injuries and diseases were prevalent in the sectors covered by the respondents, with causes ranging from poor safety practices to environmental hazards. In the agriculture sector, a male respondent from

West Africa noted that injuries were common due to the use of outdated machinery and lack of protective gear. Many farmers, he explained, were either unaware of the risks or simply could not afford the necessary safety equipment. This lack of resources and awareness led to frequent accidents, often resulting in severe injuries or even fatalities. In the construction sector, the prevalence of injuries was equally concerning. A male respondent from East Africa described how falls from heights and equipment-related accidents were frequent occurrences. These incidents were often due to inadequate training and supervision, which left workers unprepared to handle the risks associated with their jobs. The respondent emphasized the need for better training programs and stricter supervision to reduce the incidence of injuries in the construction sector. The manufacturing sector similarly faced significant challenges with occupational diseases. A male respondent from Central Africa explained that chemical exposure was a major cause of long-term health issues among workers. He noted that workers were often not provided with adequate protection, leading to chronic illnesses such as respiratory problems and skin conditions. The respondent stressed the importance of implementing safer practices and providing workers with the necessary protective equipment to prevent such diseases.

The prevalence of occupational injuries and diseases across these sectors underscored the urgent need for better safety practices, more rigorous enforcement of standards, and increased access to protective equipment. Below are some of the views voiced out by respondents:

“In agriculture, injuries are common due to the use of outdated machinery and lack of protective gear. Many farmers are unaware of the risks or simply cannot afford the necessary safety equipment.” **Respondent 11**

“Construction is notorious for high injury rates. Falls from heights and equipment-related accidents are frequent, often due to inadequate training and supervision.” **Respondent 13**

“In the manufacturing sector, chemical exposure is a significant cause of occupational diseases. Workers are often not provided with adequate protection, leading to long-term health issues.” **Respondent 15**

4.1.3.7 Gaps in Safety Training, Awareness, and Implementation

Significant gaps in safety training, awareness, and implementation contributed to the high rates of occupational injuries and diseases reported by the respondents. In the agriculture sector, a female respondent from West Africa highlighted the lack of formal training for workers. She explained that many agricultural workers received little to no instruction on how to handle machinery or apply pesticides safely, leading to frequent accidents. This gap in training was further exacerbated by a lack of awareness about the risks associated with agricultural work. In the healthcare sector, awareness of safety protocols varied widely. A female respondent from South Africa described how some hospitals had rigorous training programs, while

others in rural areas, offered minimal training. This inconsistency in safety training left many healthcare workers vulnerable to hazards such as needle-stick injuries, exposure to infectious diseases, and ergonomic issues. The respondent emphasized the need for more comprehensive and consistent training programs across all healthcare facilities to ensure that workers were adequately prepared to handle the risks associated with their jobs. In the extractives sector, the implementation of safety protocols was inconsistent. A female respondent from North Africa noted that even when training was provided, it was often not followed up with proper enforcement. This lack of follow-through resulted in significant gaps between training and actual practice, leaving workers exposed to unnecessary risks. The respondent stressed the importance of not only providing training but also ensuring that it was implemented effectively in the workplace.

These gaps in training, awareness, and implementation highlighted the need for more comprehensive and consistent safety education programs, as well as stronger enforcement mechanisms to ensure that training translated into practice. Below are some of the views voiced out by respondents:

“There is a huge gap in safety training in the agriculture sector. Many workers receive little to no formal training on how to handle machinery or apply pesticides safely.” **Respondent 6**

“In healthcare, awareness of safety protocols varies widely. While some hospitals have rigorous training programs, others, especially in rural areas, offer minimal training, leaving workers vulnerable.” **Respondent 12**

“Implementation of safety protocols is inconsistent in the extractives sector. Even when training is provided, it’s often not followed up with proper enforcement, leading to gaps in actual practice.” **Respondent 14**

4.1.3.8 OSH & Labour-Related Issues

The respondents discussed the interconnections between OSH and other labour-related issues such as climate change, social protection, and gender. These interconnections played a significant role in shaping the safety and health of workers in Africa. Climate change was increasingly impacting OSH across various sectors. A male respondent from South Africa’s healthcare sector explained how rising temperatures and extreme weather events were exacerbating existing health risks and creating new challenges for healthcare workers. He noted that heat stress was becoming a more common issue, primarily in poorly ventilated clinics, where workers were struggling to maintain safe working conditions. The respondent emphasized the need for adaptation strategies to mitigate the impact of climate change on healthcare workers.

In the extractives sector, social protection measures such as health insurance had a direct impact on worker well-being. A female respondent from North

Africa pointed out that many workers in the extractives industry lacked access to social protection, which left them vulnerable when accidents occurred. She explained that without insurance or other forms of social protection, injured workers often had to bear the financial burden of their recovery, leading to long-term economic hardship. The respondent called for stronger social protection measures to ensure that workers were not left to fend for themselves in the event of an accident. Gender-specific OSH challenges were also a significant concern. A female respondent from East Africa's construction sector described how women faced additional risks due to inadequate personal protective equipment (PPE) designed for male bodies. She explained that this not only compromised their safety but also discouraged women from entering the field. The respondent advocated for the development of gender-sensitive safety policies that considered the specific needs of women, including proper PPE, fair task allocation, and protections against discrimination.

The respondents' insights revealed that OSH was deeply interconnected with other labour-related issues. Addressing these interconnections was crucial to creating safer and more equitable workplaces in Africa. Below are some of the views voiced out by respondents:

“Climate change is increasingly impacting OSH in the healthcare sector. Rising temperatures and extreme weather events are exacerbating existing health risks and creating new challenges for healthcare workers.”

Respondent 8

“In the extractives sector, social protection measures like health insurance have a direct impact on worker well-being. However, these measures are often lacking, leaving workers without a safety net when accidents occur.”

Respondent 5

“Gender-specific challenges are also significant. In the extractives sector, women often face additional risks due to inadequate personal protective equipment (PPE) designed for male bodies, as well as gender-based discrimination.”

Respondent 10

“In manufacturing, we're seeing increased heat stress among workers due to rising temperatures. This is affecting productivity and increasing the risk of heat-related illnesses.”

Respondent 4

“Construction workers are mostly vulnerable to climate change impacts. Extreme weather conditions, like heavy rains and heatwaves, are making it more difficult to maintain safe working conditions.”

Respondent 13

“To mitigate these impacts, we're implementing measures like better ventilation in workspaces, providing more breaks during extreme heat, and ensuring that workers are hydrated.”

Respondent 8

4.1.3.9 Understanding the Role of Social Protection Measures in Enhancing OSH

Social protection measures played a critical role in enhancing OSH, as noted by the respondents. These measures, including health insurance, sick leave, and injury compensation, were essential for providing workers with the support they needed to recover from workplace injuries and illnesses. In the agriculture sector, the lack of social protection was a significant issue. A male respondent from West Africa explained that without access to social protection, injured workers often had no choice but to continue working, even when they were not fully recovered. This not only prolonged their recovery but also increased the risk of further injury. The respondent emphasized the importance of providing farmers with access to social protection measures to ensure that they could take the time needed to recover from injuries. In the healthcare sector, social protection measures were also crucial. A female respondent from South Africa described how healthcare workers often faced high levels of stress and burnout due to the demanding nature of their work. She explained that social protection measures, such as mental health support and paid leave, were essential for helping workers cope with these challenges. Without such measures, workers were more likely to suffer from long-term health issues, which could impact their ability to provide quality care.

The respondents' insights underscored the importance of social protection measures in enhancing OSH. These measures provided workers with the support they needed to recover from injuries and illnesses, thereby improving their overall well-being and reducing the risk of further harm. Below are some of the views voiced out by respondents in the following quotes:

“Social protection measures like health insurance and paid sick leave are crucial for ensuring that workers can recover from injuries without facing financial ruin. However, these measures are often inadequate or non-existent in many African countries.” **Respondent 12**

“In the extractives sector, the lack of social protection means that when accidents happen, workers are left to fend for themselves. This not only affects their health but also their economic stability.” **Respondent 5**

“For farmers, having access to social protection can mean the difference between continuing to work after an injury or being forced into poverty. It's essential for improving overall worker well-being.” **Respondent 11**

4.1.3.10 Gender-Specific OSH Challenges and Recommendations

Gender-specific OSH challenges were a recurring theme in the respondents' discussions. Women in male-dominated sectors such as construction and extractives faced unique risks and barriers that needed to be addressed through targeted interventions. In the construction sector, a female respondent from East Africa described how women often faced additional risks due to

inadequate PPE designed for male bodies. She explained that ill-fitting PPE not only compromised women's safety but also made it more difficult for them to perform their jobs effectively. This, in turn, discouraged women from entering or remaining in the construction field. The respondent called for the development of gender-sensitive safety policies that considered the specific needs of women, including the design of PPE that fit properly and provided adequate protection. Gender-based discrimination was also a significant challenge in the manufacturing sector. A female respondent from Central Africa noted that women were often assigned to less desirable tasks, which could expose them to higher risks. She explained that this discrimination was rooted in traditional gender roles, which viewed women as less capable of handling certain types of work. The respondent emphasized the need for policies that promoted gender equality in the workplace, including fair task allocation and protections against discrimination.

The respondents' recommendations highlighted the importance of creating a more inclusive and equitable workplace environment. By addressing the unique safety challenges faced by women, it was possible to promote greater gender equality and improve overall workplace safety. Below are some of the views voiced out by respondents:

"In the construction sector, women often face additional risks due to inadequate PPE designed for male bodies. This not only compromises their safety but also discourages women from entering the field." **Respondent 7**

"Gender-based discrimination is also a significant challenge. Women in manufacturing are often assigned to less desirable tasks, which can expose them to higher risks." **Respondent 9**

"To address these challenges, we need to develop gender-sensitive safety policies that take into account the specific needs of women, including proper PPE, fair task allocation, and protections against discrimination." **Respondent 14**

4.1.3.11 Effective Intervention Measures to Promote Compliance

The respondents were asked to suggest intervention measures that would be most effective in promoting compliance with safety standards. Their recommendations focused on strengthening enforcement, increasing worker involvement, and providing financial incentives. One of the most effective measures, according to a male respondent from West Africa's agriculture sector, was to increase the frequency and rigor of inspections. He explained that when companies knew they were being watched, they were more likely to comply with safety standards. Regular inspections, coupled with strict penalties for non-compliance, would create a strong deterrent against cutting corners on safety. Involving workers in the development and implementation of safety protocols was another effective measure. A female respondent from West Africa's agriculture sector noted that when workers felt they had a say in safety measures, they were more likely to adhere to them. She explained that

involving workers in safety discussions not only increased their awareness of potential hazards but also empowered them to take ownership of their safety. Providing financial incentives for companies that demonstrated a strong safety record was also seen as a potential intervention measure. A male respondent from North Africa's extractives sector suggested that offering tax breaks or other economic benefits to companies with a good safety record could encourage more businesses to invest in safety measures. This approach, he explained, would not only reward companies for their efforts but also create a culture where safety was valued as a key component of business success.

These intervention measures highlighted the importance of both external enforcement and internal engagement in promoting compliance with safety standards. By combining regular inspections, worker involvement, and financial incentives, it was possible to create a stronger safety culture in African workplaces. Below are some of the views voiced out by respondents:

“One of the most effective measures would be to increase the frequency and rigor of inspections. When companies know they are being watched, they are more likely to comply with safety standards.” **Respondent 1**

“Involving workers in the development and implementation of safety protocols can also promote compliance. When workers feel that they have a say in safety measures, they are more likely to adhere to them.” **Respondent 6**

“Providing financial incentives for companies that demonstrate a strong safety record could also encourage compliance. This could include tax breaks or other economic benefits.” **Respondent 10**

4.1.3.12 Practical Strategies to Mitigate Hazards

The respondents provided practical strategies for mitigating physical, chemical, biological, ergonomic, and psychosocial hazards in African workplaces. These strategies emphasized the need for tailored approaches to address the unique challenges of each sector. In the healthcare sector, a female respondent from South Africa stressed the importance of providing adequate PPE and training on its proper use to mitigate biological hazards. She explained that healthcare workers were often exposed to infectious diseases, and proper PPE was essential for protecting both workers and patients. Regular monitoring of workplace conditions was also crucial for identifying and addressing potential risks, in high-stress environments like hospitals. In the manufacturing sector, improving ventilation and using safer chemicals were key strategies for reducing chemical hazards. A male respondent from Central Africa explained that many manufacturing plants were poorly ventilated, which increased workers' exposure to harmful chemicals. By improving ventilation and switching to less toxic substances, it was possible to reduce the risk of chemical-related illnesses. Ergonomic assessments were also important for identifying and addressing risks associated with repetitive tasks, which could lead to long-term musculoskeletal disorders.

For ergonomic and psychosocial hazards, a female respondent from Central Africa's manufacturing sector recommended providing regular breaks, rotating tasks, and offering mental health support. She explained that these measures could help reduce the risk of injury and stress, predominantly in industries where workers were required to perform repetitive or physically demanding tasks. The respondent emphasized the importance of creating a supportive work environment where workers felt valued and cared for.

These strategies underscored the need for sector-specific approaches to hazard mitigation. By tailoring safety measures to the unique challenges of each industry, it was possible to create safer and healthier workplaces across Africa. Below are some of the views voiced out by respondents:

“In healthcare, providing adequate PPE and training on its proper use is essential for mitigating biological hazards. Regular monitoring of workplace conditions is also crucial for identifying and addressing potential risks.”

Respondent 3

“In manufacturing, improving ventilation and using safer chemicals can significantly reduce chemical hazards. Ergonomic assessments can also help to identify and address risks associated with repetitive tasks.”

Respondent 15

“For ergonomic and psychosocial hazards, providing regular breaks, rotating tasks, and offering mental health support can go a long way in reducing the risk of injury and stress.”

Respondent 9

4.1.3.13 Measures to Improve Safety Training, Awareness, and Organisational Culture

Finally, the respondents discussed measures that could be deployed to improve safety training, awareness, and the organisational culture of safety and health at work. They highlighted the need for ongoing education and leadership commitment as key components of a strong safety culture. Safety training needs to be an ongoing process, not just a one-time event. A male respondent from East Africa's construction sector explained that regular refresher courses and updates on new safety standards were crucial for keeping workers informed and prepared. He emphasized that safety training should be a continuous effort, with workers receiving regular updates on best practices and emerging risks. Leadership commitment was also essential for building a strong safety culture. A male respondent from East Africa's construction sector noted that when management prioritized safety and led by example, it set the tone for the entire organisation. He explained that leadership commitment to safety was a powerful motivator for workers, who were more likely to take safety seriously when they saw their managers doing the same.

Increasing awareness through campaigns and workshops was another effective measure for improving organisational culture. A female respondent from South Africa's healthcare sector described how engaging workers at all levels in safety efforts could foster a culture of shared responsibility. She emphasized that safety was everyone's responsibility and that creating a culture of awareness and engagement was key to reducing workplace accidents and injuries.

The respondents' insights underscored the importance of ongoing education, leadership commitment, and worker engagement in improving safety training, awareness, and organisational culture. By fostering a culture of safety, it was possible to create a work environment where everyone was committed to protecting themselves and their colleagues. Below are some of the views voiced out by respondents:

“Safety training needs to be an ongoing process, not just a one-time event. Regular refresher courses and updates on new safety standards are crucial for keeping workers informed and prepared.” **Respondent 13**

“Leadership commitment is key to building a strong safety culture. When management prioritizes safety and leads by example, it sets the tone for the entire organisation.” **Respondent 2**

“Increasing awareness through campaigns and workshops can also help to reinforce the importance of safety. Engaging workers at all levels in these efforts can foster a culture of shared responsibility.” **Respondent 12**

4.1.3.14 Prioritizing OSH in Political and Development Agendas

Occupational Safety and Health (OSH) is crucial to protecting workers' welfare and ensuring sustainable economic growth. However, in many African regions, OSH remains sidelined, especially in the informal economy, which poses significant risks due to lack of regulation. The International Labour Organisation (ILO) has highlighted these concerns, stressing the need for stronger enforcement of safety regulations and political will to prioritize OSH. This essay focuses on the findings from Delphi expert interviews, connecting them with real-world OSH challenges as cited by workers, regulatory bodies, and international organisations like the ILO.

A major concern raised by Respondent 10 in the Delphi study is the absence of adequate OSH policies in the informal sector, where most workers in low- and middle-income countries are employed. He emphasized that, “OSH cannot be treated as an isolated issue; it must be part of the national development strategy to ensure sustainable economic growth.” The informal sector, while contributing significantly to national economies, lacks adequate regulation, leaving workers exposed to numerous hazards. This observation reflects the reality in many African countries, where informal miners, street vendors, and agricultural labourers work in conditions with minimal safety oversight. For

example, in countries like Zimbabwe, informal mining has resulted in tragic incidents such as mine collapses, where dozens of miners have been trapped due to inadequate safety measures and unregulated operations. Moreover, this lack of oversight extends beyond the informal economy to formal sectors where regulations are not strictly enforced. The ILO reports that many African countries struggle to enforce OSH policies due to limited resources and understaffed regulatory bodies. Workers in sectors like construction and agriculture, continue to face high risks of accidents and occupational diseases.

Respondent 15 highlighted the role of political commitment in driving OSH forward, stating, “Without strong political commitment, OSH will remain on the fringes of policy agendas.” This lack of political will is evident in countries like South Africa, where mining disasters have drawn attention to weak enforcement of OSH policies despite the existence of comprehensive legislation. Labour unions in South Africa have long fought for improved safety conditions in mines, yet accidents continue to occur, often with catastrophic consequences. The Marikana massacre, although primarily a labour dispute, underscores the connection between inadequate working conditions and broader social unrest. Political leaders often promise reforms, but these are rarely sustained beyond initial crises, leaving OSH concerns to be deprioritized once media attention fades. This issue is not limited to South Africa. Across the continent, political instability, corruption, and shifting government priorities have resulted in weak enforcement of OSH standards. In Botswana and Lesotho, for example, outdated legislation and limited regulatory capacity have left many workers vulnerable to preventable accidents and diseases. Without a concerted effort from political leaders, OSH will continue to be viewed as an optional rather than essential part of governance.

International collaboration is essential in addressing OSH gaps, as underscored by Respondent 9, who stated that, “regional and international partnerships are essential for building capacity and sharing best practices in OSH.” This call for collaboration is exemplified by initiatives like the Global Fund’s tuberculosis (TB) project in mines, which addresses the high rates of TB among Southern African miners. Mining communities in countries like Zambia and Malawi, have long suffered from poor health outcomes due to exposure to dust and other hazardous conditions underground. International efforts to provide better healthcare and improve working conditions in these mines have led to some positive outcomes, but much work remains to be done.

However, these initiatives need to be expanded and sustained. Without continuous support, projects like these, risk becoming temporary solutions rather than long-term strategies for improving OSH. The ILO has also emphasized the importance of strengthening regulatory frameworks and ensuring that international OSH standards are adapted to the specific contexts of different countries. For instance, countries with large informal sectors, such as Kenya and Tanzania, must develop targeted strategies to

ensure that even the most vulnerable workers are protected.

The practical challenges identified by the Delphi respondents align closely with ongoing struggles reported by labour movements and the media. Workers across Africa have increasingly called for better enforcement of OSH laws and greater accountability for employers who violate safety regulations. For instance, in Ghana, construction workers frequently operate without proper safety equipment, leading to high rates of accidents and fatalities on building sites. Despite existing regulations, enforcement remains weak due to corruption and a lack of political will, echoing Respondent 15's assertion that, "advocacy is key to mobilizing political support and ensuring that OSH is given the attention it deserves". Another example comes from the manufacturing sector in Nigeria, where factory workers often face hazardous conditions with little to no safety training. Reports of chemical exposures and accidents in textile factories highlight the pressing need for stronger regulatory oversight and better safety practices. As Respondent 10 suggested, OSH must be integrated into national development strategies to ensure that both formal and informal workers are adequately protected.

4.1.3.15 Promoting a Culture of Safety and Health at Work

Promoting a culture of safety and health at work is crucial for organisations seeking to enhance employee well-being and productivity. Occupational Safety and Health (OSH) must be integrated into the core values of any company to reduce workplace accidents and foster a sense of shared responsibility. While this is an ideal approach, many countries, especially in Africa, face practical challenges in translating this concept into reality. This essay draws on expert insights from the Delphi study and real-world examples to explore how to foster a safety culture in workplaces and address the gaps that hinder its success.

Leadership plays a critical role in cultivating a safety culture. As noted by Respondent 1, a senior safety manager in the construction industry, "*A culture of safety is not just about having the right equipment or procedures in place; it's about creating an environment where every employee feels responsible for their own safety and the safety of others.*" This highlights a key issue: safety is not merely the responsibility of managers or safety officers but must be embraced by every worker, from the ground level up. In practical terms, many industries such as construction and manufacturing, have struggled to instil this shared responsibility. For example, in Ghana's construction sector, workers often face hazardous conditions with little to no protection, despite regulations requiring safety protocols. Many employees are unaware of safety standards, and some employers do not enforce them due to costs, leaving workers vulnerable. This reflects the broader challenge of embedding safety into the organisational fabric when leadership is either absent or indifferent to safety concerns.

Training is a cornerstone of fostering a strong safety culture, as it equips employees with the knowledge to identify and mitigate risks. Respondent 2, who participated in the Delphi study, emphasized, “Continuous education and training are the backbone of a strong safety culture. Employees must be equipped with the knowledge and skills to identify and mitigate risks.” Unfortunately, many countries and sectors fail to prioritize this continuous education due to financial constraints and other logistical issues. In South Africa, for example, mining accidents remain a persistent issue despite existing safety regulations. Miners often lack proper training in identifying hazards or using protective equipment, leading to tragic accidents like the Lily Mine collapse in 2016, where three miners were trapped underground for months. Unions have consistently called for better training and safety measures, but progress has been exceptionally slow among smaller mines where resources are scarce. The failure to provide regular, practical training has been a recurring theme in OSH breaches in mining, construction, and manufacturing.

Effective communication is another pillar of a robust safety culture. It involves clearly conveying safety policies and providing feedback on safety performance. Respondent 8, a safety consultant with over 15 years of experience, stressed that, “transparent and regular communication about safety issues is essential. It ensures that everyone is on the same page and fosters a sense of trust and accountability”. Unfortunately, this is often lacking in many sectors. In Kenya’s manufacturing industry, for instance, accidents are often attributed to poor communication about safety procedures. Workers in factories have reported a lack of clear guidelines on how to handle dangerous machinery, resulting in frequent accidents and injuries. In one case reported by a local media outlet, a worker lost his hand while operating a machine without proper training or warning from his supervisors. The absence of clear communication about risks and safety measures reflects the broader issues that plague many industries.

Despite the recognition of the importance of a safety culture, there is still a lack of consensus on what it entails. Respondent 6 from the Delphi study pointed out, “Without a clear understanding of what a safety culture entails, it is difficult to implement and measure its success. Organisations need a structured approach that is adaptable to their specific context”. This is notably relevant in countries where safety regulations are outdated or inconsistently enforced. For example, in Nigeria’s oil and gas industry, which has faced several catastrophic accidents, the lack of a structured safety framework has made it difficult to enforce safety standards consistently. In 2010, the explosion of an oil pipeline in Lagos killed over 200 people, an incident largely blamed on inadequate safety measures and the absence of a clear safety culture. This incident underscored the urgent need for a comprehensive and adaptable safety framework that can be applied across sectors to prevent such disasters.

4.1.4 Insights on OSH Challenges and Best Practices

The cross-sectional survey design was used to collect quantitative data from 151 respondents who were conveniently sampled from the agriculture, mining, oil and gas, construction, manufacturing, and health sectors across Africa from July to August of 2024. The respondents who consented to participate in this study were asked to complete an online survey. The questionnaire contained items on the demographic details of participants and the state, practice, and challenges of OSH in their sector of operations. The questionnaire was developed based on this study's aims and a thorough literature review. The data collected from participants was analysed using the Statistical Package for the Social Sciences (SPSS) version 26 and the demographic details of the studied participants are displayed in Table 4.

Table 4. Demographic details of studied participants			
		Frequency	Percentage (%)
Gender	Female	53	35.1
	Male	98	64.9
Current Job Position	Lower Manager	26	17.2
	Middle Manager	32	21.2
	Non-managerial	80	53.0
	Top Manager	13	8.6
Country of Practice	Central Africa	11	7.3
	North Africa	9	6.0
	South Africa	18	11.9
	East Africa	9	6.0
	West Africa	104	68.9
Sector of Practice	Agriculture	21	13.9
	Construction	23	15.2
	Health	27	17.9
	Manufacturing	36	23.8
	Mining	16	10.6
	Oil and Gas	28	18.5
Tenure	1-5years	46	30.5
	10+years	58	38.4
	6-10years	47	31.1

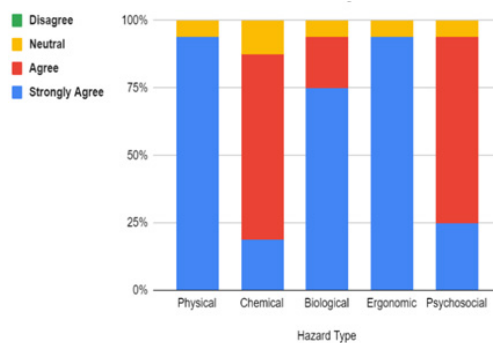
4.1.4.1 Prevalence of Hazards

The survey assessed the prevalence of physical, chemical, biological, ergonomic and psychosocial hazards across the mining, oil and gas, construction, health, agriculture, and manufacturing sectors on a 5-point Likert scale ranging from strongly disagree (1), disagree (2), not sure (3), agree (4), to strongly agree (5).

4.1.4.1.1 Prevalence of hazards in the mining sector

The survey data highlights a strong consensus among mining sector workers in Africa regarding the prevalence of physical, biological, ergonomic, and psychosocial risks. The survey data suggests that there is a strong need for targeted interventions in the mining sector to address the significant risks associated with physical, ergonomic, biological, and psychosocial hazards (see Figure 4).

Figure 4. Prevalence of hazards in the mining sector

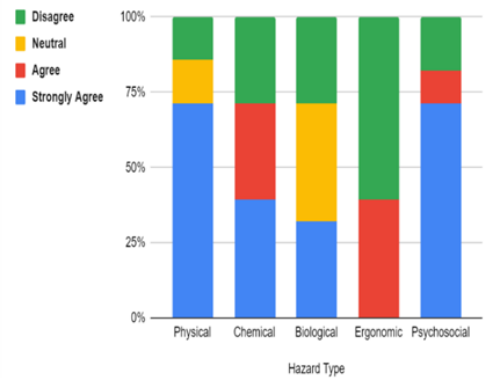


4.1.4.1.2 Prevalence of hazards in the oil and gas sector

The data showed that physical and psychosocial hazards are exceptionally pronounced concerns among workers in the oil and gas sector, although chemical, biological, and ergonomic risks are also widely acknowledged. The survey results suggest that workers in the oil and gas sector view physical and psychosocial

hazards as significant concerns, indicating a need for focused safety and mental health interventions (see Figure 5). The mixed perceptions of chemical, biological, and ergonomic hazards point to gaps in awareness and possibly inconsistent hazard management practices.

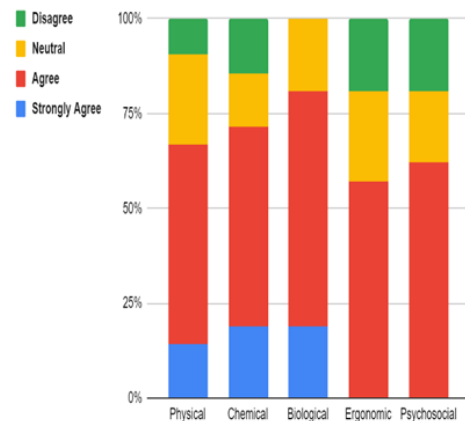
Figure 5. Prevalence of hazards in the oil and gas sector



4.1.4.1.3 Prevalence of hazards in the agricultural sector

Furthermore, it was found that workers widely recognize the prevalence of various hazards, especially chemical and biological risks. In addition, the data showed that physical, chemical, biological, ergonomic, and psychosocial hazards are all recognized as key elements within the sector (see Figure 6).

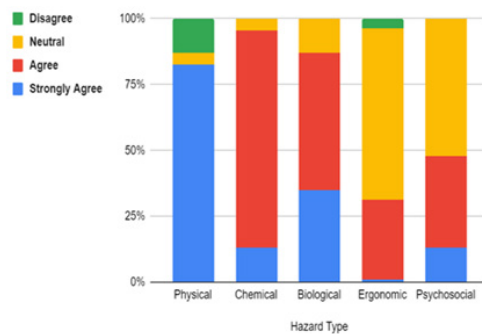
Figure 6. Prevalence of hazards in the agriculture sector



4.1.4.1.4 Prevalence of hazards in the construction sector

The results also showed substantial recognition of various hazards among construction sector workers, with physical, chemical, ergonomic, and psychosocial risks being notably acknowledged (see Figure 7).

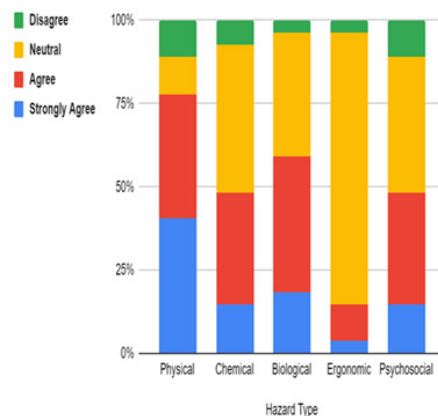
Figure 7. Prevalence of hazards in the construction sector



4.1.4.1.5 Prevalence of hazards in the health sector

The survey reveals distinct perceptions of various hazards among health sector workers, highlighting both widespread concerns and areas of variability. The data showed that many of the participants strongly agreed and agreed to the existence of physical, chemical, biological, and psychosocial factors hazards in the health sector (see Figure 8).

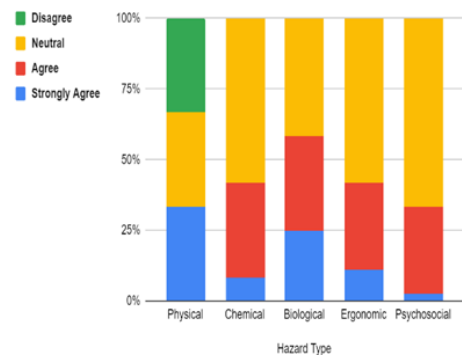
Figure 8. Prevalence of hazards in the health sector



4.1.4.1.6 Prevalence of hazards in the Manufacturing sector

The data showed varied perceptions of different types of hazards within the manufacturing sector, with notable trends in recognition and severity. The survey data indicates that physical hazards are the most widely recognized in the manufacturing sector, with a significant portion of respondents strongly agreeing or agreeing on their prevalence. Biological hazards also raised concern, with over half of the respondents acknowledging their presence. Chemical and psychosocial hazards received a mix of agreement and neutrality, reflecting a moderate level of concern. Ergonomic hazards, however, had a high level of neutral responses, indicating a possible lack of awareness or less perceived significance among workers (see Figure 9).

Figure 9. Prevalence of hazards in the manufacturing sector



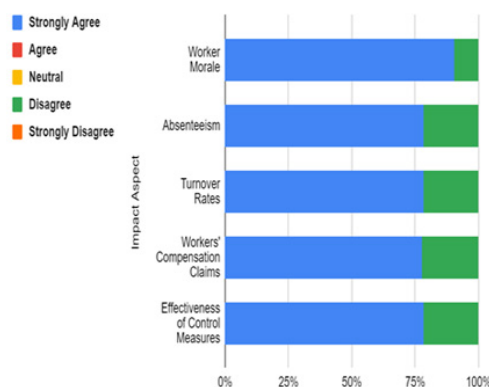
4.1.4.2 The Overall Impact of Hazards

The study also analysed the impact of workplace hazards based on survey data collected from 151 respondents focusing on five key aspects: worker morale, absenteeism, turnover rates, workers' compensation claims, and

the effectiveness of hazard control measures. The survey highlights significant concerns among workers regarding the impact of workplace hazards on various aspects of their health. Figure 10 captures the percentage of respondents who rated each aspect of the impact of workplace hazards. The survey results reveal a strong consensus on the negative impact of workplace hazards on workers' well-being, indicating several practical needs. With 80.8% of respondents linking hazards to decreased worker morale and 72.2% associating them with increased absenteeism, there is a clear need for effective hazard management strategies to boost morale and reduce absenteeism. Additionally, the high percentage (76.8%) of respondents who view hazards as a major factor in worker turnover underscores the importance of addressing safety issues to retain staff (see Figure 10).

The frequent association of workers' compensation claims with workplace hazards further emphasizes the necessity for robust hazard control measures. Overall, the data reiterates that enhancing hazard management not only improves safety and productivity but also positively impacts worker morale and retention.

Figure 10. The overall impact of hazards



4.1.4.3 Effectiveness of Safety Training and Awareness Programs

The survey also assessed perceptions on the effectiveness of safety training and awareness. Data indicates mixed perceptions regarding whether safety-training programs are tailored to address specific sector risks and hazards. The figure below shows percentages of participant agreement, disagreement, and uncertainty levels for each aspect of safety training and awareness.

The survey results highlight the pressing need to tailor training to sector-specific risks, as nearly half of the respondents feel current programs are not adequately customized (see Figure 11)

4.2.2.4 Implementation of Health and Safety Policies

The results highlight several critical areas for improvement in health and safety policy implementation. Effective communication of policies is a significant concern, with 43.7% of respondents feeling that policies are not well communicated to workers, suggesting a need for clearer and more widespread dissemination of safety information (see Figure 12)

4.1.4.5 Comprehensiveness and Adequacy of OSH Legislation and Regulations

The survey results highlight the need for more comprehensive and regularly updated regulations in addressing the varied perceptions of hazard coverage and alignment with international standards (see Figure 13).

Figure 11. Effectiveness of safety and awareness programs

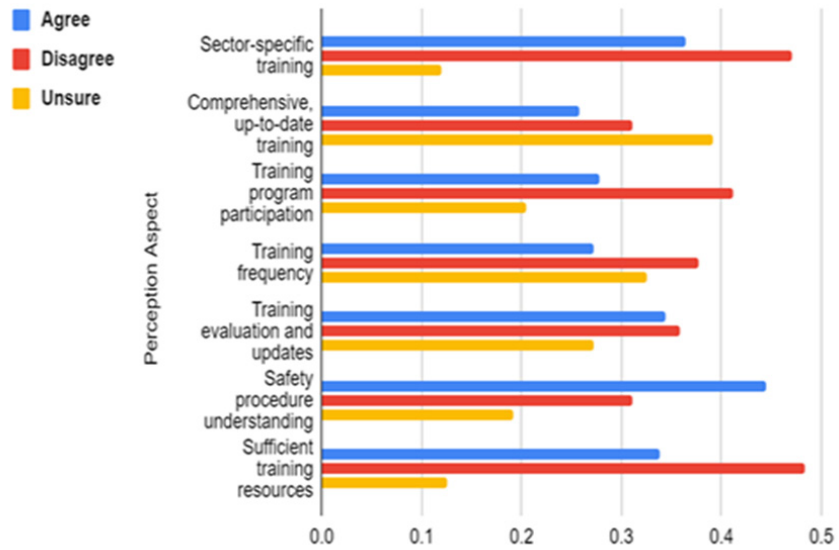


Figure 12. Implementation of health and safety policies

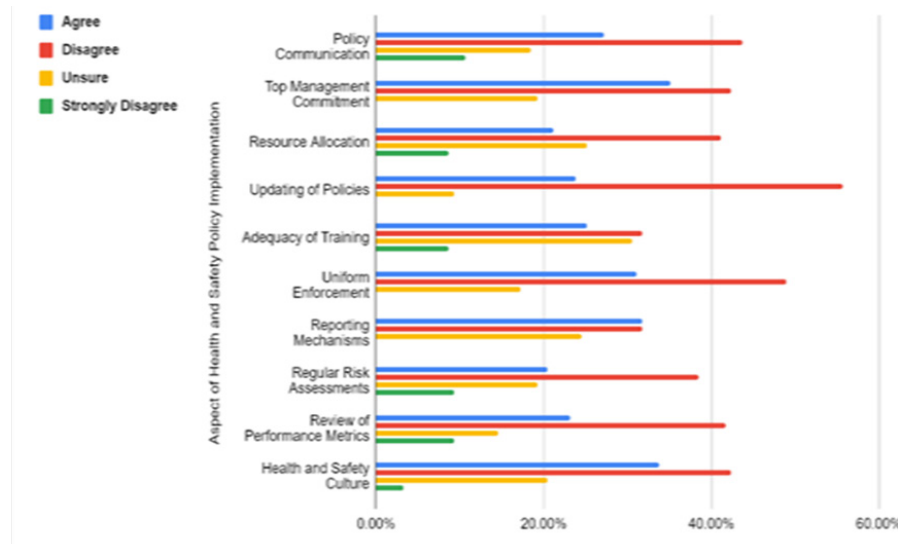
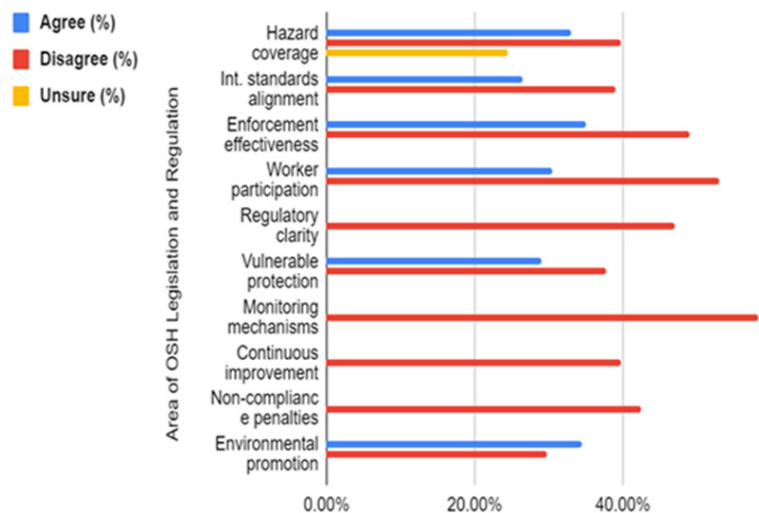


Figure 13. Comprehensiveness and adequacy of OSH legislation and regulations



5.1 Best Practices Case Studies

5.1.1 Agriculture Sector Best Practices Case Study

Côte d'Ivoire, the world's largest cocoa producer, faces several occupational hazards in cocoa farming, necessitating robust OSH frameworks. The Labour Code serves as the primary legislation governing OSH in the agricultural sector, with specific provisions to ensure the safety and health of workers (Ministry of Employment and Social Protection, 2022). Côte d'Ivoire has also ratified various ILO conventions related to OSH, demonstrating its commitment to international standards (ILO, 2021; World Bank, 2018).

Côte d'Ivoire's safety regulations address a range of workplace hazards, including physical, chemical, biological, ergonomic, and psychosocial risks (Rivermate, 2024). Good Agricultural Practices (GAP) have been crucial in promoting safe pesticide use, proper tool handling, and better sanitation, which have not only improved worker safety but also boosted agricultural yields (World Bank, 2019; Barry Callebaut, 2023). Certification programs like Fairtrade and Rainforest Alliance enforce stringent OSH standards for cocoa producers, ensuring that safety protocols are followed, such as the proper use of protective equipment, regular safety training, and prohibitions on hazardous child labour (Rainforest Alliance, 2021).

The National Agency for Rural Development (ANADER) provides farmers with regular training on safe farming practices, agrochemical use, and first aid (ANADER, 2022). International collaborations with organisations like the Food and Agriculture Organisation (FAO) have also helped develop tailored training programs for cocoa farmers (World Bank, 2018). Furthermore, technological innovations, including mobile technology for real-time safety information, mechanized tools to reduce physical strain, and bio-pesticides to minimize chemical exposure, have enhanced worker safety and contributed to a safer working environment (Suri & Udry, 2022; Ardjouman, 2014).

The dividends of Côte d'Ivoire's robust OSH frameworks in the cocoa farming sector are seen in improved worker safety, reduced exposure to physical and chemical hazards, and enhanced agricultural productivity. The lessons learned include the importance of continuous safety training, international collaboration, and technological innovations in reducing occupational hazards. Trade unions can benefit by advocating for stricter enforcement of OSH standards, expanding worker education, and promoting the use of mechanized tools to reduce physical strain. More can be done by enhancing the reach of GAP initiatives, ensuring smallholder farmers are included, and developing more affordable, accessible safety equipment for all workers.

5.1.2 Healthcare Sector Best Practices Case Study

The Occupational Safety and Health Act (OSHA) of 2007, which mandates that employers ensure the health, safety, and welfare of their employees, establishes Kenya's OSH regulatory framework. This act outlines the responsibilities of both employers and employees in maintaining a safe working environment, including conducting regular risk assessments and implementing necessary safety measures. The Ministry of Health in Kenya supports these regulations through policies that focus on infection control, safe handling of hazardous materials, and the provision of personal protective equipment (PPE) to healthcare workers (Buyela et al., 2017; ILO, 2013).

The Directorate of Occupational Safety and Health Services (DOSHS) is responsible for enforcing OSH regulations in Kenya. This involves conducting regular inspections, audits, and investigations of workplace incidents to ensure compliance with safety standards and the prompt implementation of corrective measures (Nyariki & Chirchir, 2019). Additionally, occupational health services in Kenya include regular health screenings, risk assessments, counselling, and medical care for work-related injuries and illnesses, which are vital components of maintaining workplace safety (Ngoga et al., 2023).

In Kenyan hospitals and clinics, rigorous infection control programs have been implemented to protect healthcare workers. These programs include hand hygiene protocols, mandatory PPE use, sterilization techniques, and the isolation of patients with contagious diseases to prevent the spread of infections and exposure to hazardous substances (Infection Prevention Network (IPNET) Kenya, 2021). Regular health and safety training programs are also conducted to educate healthcare workers on equipment use, emergency procedures, hazard identification, and safety protocols. These programs, which include safety drills, ergonomic assessments, and health monitoring, aim to reduce accident rates and improve worker well-being (Ngoga et al., 2023; Njogu et al., 2019).

5.1.3 Construction Sector Best Practices Case Study

The Occupational Safety and Health Act (OSHA) of 1993 and the Construction Regulations of 2014 govern South Africa's OSH regulatory environment. The OSHA requires employers to ensure a safe workplace by conducting risk assessments, implementing safety measures, and keeping detailed safety records. The Construction Regulations complement the OSHA by providing industry-specific guidelines, such as the appointment of safety officers, adherence to safety plans, and regular site inspections. On large construction projects, the establishment of a Health and Safety Committee is mandated to oversee safety compliance (Kunodzia et al., 2024; Department of Labour, 2014).

Bodies like the South African Bureau of Standards (SABS) and the National Institute uphold high safety standards in South Africa's construction industry for Occupational Health (NIOH). Key standards such as SANS 10085, for structural steelwork, and SANS 1200, for civil engineering, ensure that safety and quality are maintained throughout construction projects (Department of Trade and Industry, 2011). The Zero Harm initiative, which seeks to eliminate workplace fatalities and injuries, demonstrates the industry's commitment to safety. This initiative includes proactive risk management, rigorous risk assessments, safety audits, and the use of safety management systems (MHSC, 2024).

Training and technological innovations are vital to South Africa's construction safety strategy. The Construction Education and Training Authority (CETA) and NIOH offer specialized programs for safety officers and construction managers, focusing on hazard identification, emergency response, and safe equipment operation (CETA, 2023; NIOH, 2021). Technological advancements like Building Information Modeling (BIM) aid in identifying safety hazards before construction begins, while real-time safety monitoring systems, including wearable technology and drone inspections, help detect hazards and improve safety management on-site (Ahmed, 2018; Kekana et al., 2015; Moghayedi et al., 2022; Xu et al., 2022).

Improved worker safety, reduced fatalities, hazard detection and a more proactive approach to risk management are major dividends of the comprehensive frameworks and initiatives. Trade unions can benefit by advocating for greater enforcement of these safety measures, increasing worker participation in safety committees, and promoting training programs for hazard identification and emergency response. To further improve worker safety, expanding the use of innovative safety technologies and strengthening collaboration between regulatory bodies and unions will be crucial.

5.1.4 Extractives Sector Best Practices Case Study

5.1.4.1 Oil and gas

The oil and gas sector is a pivotal industry for many African nations, driving economic growth and development through energy production and resource extraction. However, the sector poses significant OSH risks, including exposure to hazardous substances, high-pressure environments, and the potential for severe accidents. Ensuring the safety and health of workers in this high-risk industry is essential for maintaining operational efficiency, protecting human lives, and supporting sustainable industry practices (Liu et al., 2020; ILO, 2022). Nigeria, a key player in Africa's oil and gas sector, has set benchmarks for exemplary OSH practices and established robust frameworks to manage the complexities and risks associated with operations in the oil and gas sector (ILO, 2017; ILO, 2016; Obiorah et al., 2019; Olawuyi

& Tubodenyefa, 2018). Nigeria's oil and gas sector is regulated by the Department of Petroleum Resources (DPR), which enforces safety standards through frameworks like the Oil and Gas Industry Service Permit (OGISP). These regulations, along with the Factories Act of 1987, require companies to maintain safe working conditions, provide regular safety training, and ensure the use of protective equipment (DPR, 2017; Edem et al., 2021; Benson, 2021; Olawuyi & Tubodenyefa, 2018; Umeokafor et al., 2014). The Nigerian National Petroleum Corporation (NNPC) also aligns its OSH practices with international standards such as ISO 45001; adopting Safety Case Guidelines to manage industry risks effectively (Dzięgielewska et al., 2022).

Training and awareness programs are a key part of Nigeria's OSH framework, with the DPR mandating regular safety training for employees. These programs focus on hazard identification, risk assessment, and emergency response, supported by drills and simulations to enhance accident preparedness (Oyewole et al., 2024). Furthermore, technological innovations, such as real-time monitoring systems, remote sensing, and predictive analytics, have improved the sector's ability to detect and mitigate risks, providing early warnings for timely interventions (Naija Scholar, 2024; Oyewole et al., 2024).

Despite these advancements, challenges such as regulatory enforcement, corruption, and insufficient funding persist (Donwa et al., 2015). However, by strengthening existing frameworks, adhering to international best practices, and addressing these issues, Nigeria can further improve the safety and well-being of workers in its oil and gas industry. Nigeria's robust safety frameworks for the oil and gas sector have enhanced hazard detection and risk management leading to safer working conditions, and has contributed to better health outcomes, increased job security and reduced injury risks for workers in the sector. Lessons learned highlight the importance of stringent regulatory enforcement, comprehensive training programs, and the integration of advanced technology to manage industry risks effectively. Trade unions can benefit by advocating for stronger regulatory frameworks, improved training, and better funding for safety initiatives. To build on these successes, further efforts could include addressing challenges such as regulatory enforcement and corruption, enhancing transparency, and ensuring adequate funding for safety programs. By continuing to strengthen these areas, the safety and well-being of workers in the oil and gas sector can be further improved.

5.1.4.2 Mining

The mining sector is a cornerstone of Africa's development, contributing to economic growth, revenue generation, and job creation. By providing essential raw materials for various industries globally, mining fosters industrialization and economic diversification (African Union, 2021). It also stimulates infrastructure development—such as roads, power supplies, and water systems—and attracts foreign direct investment (FDI), which supports

technological advancements and skill development, thereby enhancing productivity and economic resilience (World Bank, 2020). However, the sector faces significant challenges, including environmental degradation and OSH risks such as exposure to hazardous substances, machinery-related accidents, and unsafe working conditions in underground environments. Effective OSH practices are crucial for protecting worker health, improving operational efficiency, and ensuring sustainable mining practices (African Development Bank, 2020). South Africa stands out in Africa for their advanced OSH frameworks in mining. South Africa has established stringent safety regulations and practices, setting high standards for the industry (Competence Centre, Mineral Resources, 2018). Angola has also made notable progress in enhancing safety and health measures to address the unique challenges of its mining operations.

South Africa's mining sector has developed comprehensive frameworks and implemented specific practices to mitigate risks and enhance the safety and health of mine workers. South Africa's mining sector is primarily regulated by the Department of Mineral Resources and Energy (DMRE), with the Mine Health and Safety Act (MHSA) of 1996 serving as the foundational legislative framework. The MHSA mandates the implementation of safety management systems, regular inspections, and incident reporting to ensure safe mining operations. Complementing the MHSA, the OSHA of 1993 provides broader health and safety regulations across industries (Hermanus et al., 2015). In 2011, the Chamber of Mines commissioned the Centre for Sustainability in Mining and Industry (CSMI) to assess the effectiveness of the Mine Occupational Safety and Health Leading Practice Adoption System (MOSHLPAS), an initiative aimed at improving safety practices in the mining sector (Hermanus et al., 2015).

International best practices have also been integrated into South Africa's mining safety standards, including the Zero Harm Initiative, which focuses on eliminating fatalities and injuries through rigorous risk assessments, continuous monitoring, and strict safety protocols (Mine Health and Safety Council, 2024; Chamber of Mines, 2021). The adoption of ISO 45001 has provided a structured framework for identifying workplace hazards, improving safety management systems, and ensuring continuous safety performance improvement (Smit, 2020). Additionally, the MHSA requires regular safety training, hazard identification, and emergency response preparation to equip workers with the skills needed to maintain a safe working environment (Angwe, 2014).

The Mining Qualifications Authority (MQA) plays a crucial role in accrediting training programs that address mining-specific risks, ensuring that training meets industry standards (Ledwaba & Mutemeri, 2018). Technological innovations have further advanced safety practices in the sector, with real-time monitoring systems, autonomous mining equipment, and predictive analytics being adopted to identify and mitigate risks (Khan, Gupta & Gupta, 2020). For instance, real-time gas monitoring systems detect hazardous gases

like methane, while autonomous equipment minimizes human exposure to dangerous conditions, reducing accident risks (Kwiri, 2018).

The sector's adoption of international best practices, coupled with the technological innovations have advanced safety by detecting hazards and reducing human exposure to dangerous conditions with the MQA supporting these efforts by accrediting training programs that address mining-specific risks have improved worker safety and health, offering valuable lessons in integrating best practices and technology for other industries to follow. Trade unions can continue to advocate for improved oversight and stricter penalties for non-compliance with safety regulations, ensuring that safety standards are not only established but rigorously enforced. Strengthening collaboration with international organisations to implement global best practices could also further enhance worker protection in the mining sector.

5.1.5 Manufacturing Sector Best Practices Case Study

In Morocco, considerable progress has been made in advancing OSH practices, bolstered by comprehensive regulatory frameworks, enforcement mechanisms, and targeted industry initiatives. The core of Morocco's OSH regulations is the Labor Code of 2003, which obliges employers to ensure employee health and safety by maintaining safe working conditions, conducting regular risk assessments, and establishing safety committees to oversee compliance and address safety concerns (Ministry of Labor, 2017).

The National Institute for Working Conditions (INCVT) plays a crucial role in enhancing OSH standards in Morocco. It provides training, conducts research, and offers consultancy services to help employers improve workplace safety. INCVT also collaborates with various industries to develop tailored OSH programs (Ministry of Labor, 2017). The Ministry of Labor and Professional Integration enforces these regulations through regular inspections, audits, and support for various employment policies, aiming to ensure compliance and improve overall workplace safety (World Bank, 2021).

Moroccan manufacturers are increasingly adopting advanced safety technologies, such as automated safety systems, real-time monitoring, and robotics to reduce human error and enhance safety and productivity (Auktor, 2022). The automotive sector, exemplified by companies like Renault and PSA Peugeot Citroën, showcases best practices with comprehensive safety protocols, including regular safety drills, ergonomic assessments, and health monitoring programs to reduce accidents and improve worker well-being (Haddach et al., 2017). Regular safety training programs, often developed in collaboration with INCVT, educate workers on equipment use, emergency procedures, and hazard identification, ensuring adherence to industry standards (Salhi et al., 2024).

6.1 Recommendations for Improving OSH in Africa

6.1.1 Strategies to Mitigate Hazards in African Workplaces

The findings from the study show that workers in the construction, extractives, health, manufacturing, and agriculture sectors are exposed to multiple hazards at work. It is therefore imperative that significant steps are undertaken to mitigate the exposure and impact of these hazards on workers.

Broadly across all the studied sectors, hazards can be mitigated through:

- Efficient and effective hazard identification system since unrecognized hazards are unmanageable risks. Therefore, regardless of sector, enormous effort must be deployed to identify all hazards in the workplace.
- The implementation of appropriate mitigation plans to prevent or control them through the deployment of prevention or precautionary measures.

Specifically, hazards in the extractive sector can be mitigated by:

- Safe working methods and the use of protective equipment.
- Removing or covering flammable materials with fire retardant blanket.
- Developing and implementing safe and effective work schedules that considers adequate rest for workers.
- Keeping workers away from hazardous chemicals.

In the manufacturing sector, hazards can be mitigated by:

- Implementing effective safety protocols.
- Implementing OSHMS that encourage swift reporting of hazards, incidents, near misses, and accidents.
- Using appropriate PPEs.
- Safety awareness and training.
- Using technology to inspect and monitor work behaviours and equipment without putting workers at risk.

The hazards in the health sector can be mitigated by:

- Developing and implementing psychosocial risk management excellence framework
- Using appropriate PPEs
- Using appropriate equipment for all work-related activities

The hazards in the construction sector can be mitigated by:

- Identifying and evaluating hazards on project sites
- Implementing safety protocols for work activities
- Using appropriate PPEs
- Educating and training stakeholders on OSH.
- Creating awareness and providing information on existing hazards.

In the agriculture sector, the hazards can be mitigated by:

- Using protective clothing and appropriate tools for work
- Using technology to inspect and monitor work behaviours and equipment without putting workers at risk.
- Communicate the hazards, and training workers.

6.1.2 Strengthening Legal and Regulatory Frameworks

To ensure workers safety and promote their right to decent work, it is imperative that the legal and regulatory frameworks governing OSH in Africa are strengthened. It is therefore recommended that:

- Outdated incomplete regulations relative to OSH must be revised to reflect best practices, standards, and contemporary issues at the workplace. This revision will lead to the creation of robust legal and regulatory frameworks that address for example, the diverse and evolving hazards faced by worker.
- All OSH regulations deliver on the key functions of any regulation (i.e., standard setting, compliance promotion, monitoring and enforcement). Thus, OSH regulations must identify clear goals, values, problems, promote compliance, ensure inspection and feedback, ensure adherence to established standards.
- The legal and regulatory framework for health and safety should be developed with contributions from a wide range of stakeholders. This consultative process enhances the scope of these regulations, which consequently facilitate the realisation of workers safety.

6.1.3 Enhancing Safety Training, Awareness, and Organisational Culture

Many workers in Africa continue to perceive their jobs as a significant threat to health, safety, and wellbeing. Furthermore, with the rate of workplace accidents, diseases, inquiries, and loss of life on the rise it is imperative that:

- Organisations pursue risk prevention strategies and engage in activities that enhances health and safety at work.
- Organisations build sustainable preventive cultures anchored on OSH

education and training, leadership/managerial commitment to OSH, effective health and safety risk assessments and controls to mitigate impact of hazards, systems for monitoring equipment, processes and procedures and the prompt rectification of any defects, and swift investigation into all incidents and accidents.

- Safety awareness and training are prioritized in workplaces across Africa since building a culture of safety consciousness enable OSH stakeholders to be proactive about safety. This can be achieved through implementing OSH standards, active participation by all stakeholders on OSH matters, communication and education on all OSH related issues.
- Workers must be educated and trained in OSH. The training of workers must focus on specific skills and competencies relevant to working safely.

6.1.4 Aligning and Adapting International OSH Standards

With fragmented OSH policies, poor compliance with OSH standards, weak legal and regulatory OSH frameworks on the continent it is recommended that:

- African Agency for OSH is set up with the aim of making workplaces healthier and safer for workers in all African Member States. The agency should collect, examine, and share information on OSH for the whole of Africa. The agency must also focus on identifying and sharing best practices to develop prevention cultures across Africa and guarantee workers' health and safety.
- Countries in Africa ratify and effectively implement the ILO's Occupational Safety and Health Conventions, 1981 (No. 155) and 2006 (No. 187).
- African countries ensure strict adherence to ILO's obligation to Member States to respect, promote and realize the fundamental tenets of the right to safe and health working environment for all workers.
- The adaptation of international OSH standards in Africa is guided by the local regulatory, cultural, and economic environment. This adaptation involves assessing local industry practices, existing legislation, and common hazards to modify international standards accordingly.

6.1.5 OSH and other Labour-Related Issues

Going forward, it is imperative that OSH stakeholders (e.g., governments, unions, employees, employers, and civil society) deploy effective strategies to deal with emerging labour-related issues and OSH.

6.1.5.1 Recommendations for Governments

- Governments should update and enforce comprehensive OSH regulations aligned with international standards, ensuring they are adaptable to local contexts and sector-specific risks. This includes implementing strict penalties for negligence, corruption, and interference with labour organisations to uphold the integrity of OSH practices.
- Allocate sufficient resources to OSH programs, including safety inspections, worker training, and modern safety technologies to protect workers, especially in high-risk sectors. Governments must also ensure transparent management of these funds to prevent corruption and misallocation, fostering accountability in OSH implementation.
- Extend OSH protections to informal workers, ensuring they have access to safety training, protective equipment, and regulatory coverage. Addressing the specific challenges faced by this sector requires proactive measures to eliminate coercion and intimidation from employers, thereby encouraging compliance with safety standards.
- Promote public-private partnerships by fostering collaboration between public institutions and private industries to enhance OSH practices through joint training programs, safety innovations, and regulatory enforcement. Additionally, governments should actively protect labour organisations from interference and coercion, ensuring they can operate freely to advocate for worker safety and rights.

6.1.5.2 Recommendations for Trade Unions and Worker Groups

- Trade unions and worker organisations in Africa can advocate for stronger OSH legislation by collaborating with policymakers to ensure laws are aligned with international standards and tailored to local contexts. By pushing for regular updates and enforcement of sector-specific regulations, especially in high-risk industries, they can help improve worker protection.
- Unions can enhance worker education through frequent, localized OSH training sessions that incorporate cultural and linguistic factors. By integrating training into union membership benefits, unions raise awareness and ensure workers are informed about workplace hazards, safety protocols, and best practices.
- Unions should use collective bargaining power to negotiate for regular safety inspections, PPE provisions, and employer accountability in maintaining safe work environments. Ensuring clear channels for reporting unsafe conditions and protecting whistleblowers are crucial in promoting a transparent safety culture.
- Technology can empower unions to enhance OSH monitoring through mobile reporting tools and digital platforms. These platforms provide workers with access to OSH resources and guidelines, helping them stay informed and proactively mitigate risks.

- Regular safety audits, conducted independently or in collaboration with safety bodies, can ensure compliance with national and international standards. Partnering with global organisations like the ILO will also provide unions access to technical support, training, and best practices.
- Unions should focus on protecting vulnerable and informal workers by advocating for the extension of OSH standards. Addressing the specific needs of women, migrant workers, and other vulnerable groups ensures comprehensive safety protections.
- Unions must campaign for increased investment in modern safety technologies and public awareness about the importance of worker safety for economic stability. By promoting employer investments and government incentives, unions can drive improvements in OSH standards across Africa.

6.1.5.3 Recommendations for OSH Civil Society Groups

- Raise Awareness and Advocacy by leading awareness campaigns to educate workers and communities about their OSH rights, and advocate for stronger safety measures across industries.
- Act as watchdogs by monitoring compliance with OSH regulations and reporting unsafe conditions to relevant authorities for prompt action through monitoring and reporting.
- Collaborate with Unions and Employers: Work alongside trade unions and businesses to create platforms for dialogue, share best practices, and develop community-driven safety initiatives.
- Provide training and resources through the organisation of workshops and provision of educational materials to empower workers, especially in rural or underserved areas, to recognize and address workplace hazards.

6.1.5.4 Recommendations for Employers

- Employers should establish and implement robust OSH policies that comply with national regulations and align with international standards. These policies should be tailored to address specific workplace hazards and risks associated with their industry.
- Employers should invest in training and education through the regular provision of comprehensive training programs for all employees, focusing on hazard recognition, safe work practices, and emergency procedures. Training should be practical, sector-specific, and adapted to the language and cultural context of the workforce.
- Employers must supply appropriate PPE to all workers at no cost, ensuring regular maintenance and replacement as needed. Clear guidelines should be provided on the proper use and care of PPE.

- Employers should implement routine safety audits and inspections to identify potential hazards and ensure compliance with safety standards. Involve workers in these audits to enhance hazard identification and promote a culture of safety.
- Employers must encourage worker participation by fostering an inclusive workplace culture by involving employees in safety committees and decision-making processes regarding OSH matters. Encourage open communication about safety concerns and establish clear channels for reporting hazards without fear of retaliation.
- Employers must implement emergency preparedness plans through the development and regular update of emergency response plans tailored to potential workplace emergencies. Conduct drills to ensure that all employees are familiar with procedures and can respond effectively in a crisis.
- Employers must promote a safety-first culture by prioritising safety at all organisational levels, demonstrating commitment from management and integrating OSH into daily operations. Recognize and reward safe practices to encourage continuous improvement in workplace safety.
- Employers must invest in modern safety technologies, such as real-time monitoring systems and mobile reporting tools, to enhance safety oversight and facilitate prompt reporting of hazards.
- Employers must regularly evaluate OSH policies and practices, using feedback from workers and safety data to make necessary improvements. Stay informed about emerging best practices and innovations in occupational safety.
- Employers must recognize the importance of mental health in overall worker safety. Provide resources and support systems for mental health, ensuring that employees feel valued and supported in their work environment.

6.5.1.5 Recommendations for Workers

- Actively engage in all safety training programs provided by employers, ensuring you understand workplace hazards and safety protocols. Advocate for regular refresher courses to stay updated on best practices.
- Always use the provided PPE appropriately and consistently. Report any deficiencies in PPE or safety equipment to your supervisor immediately; and take the initiative to report any unsafe conditions or hazards in the workplace to management or safety committees using established channels.
- Engage in Safety Committees: Join workplace safety committees if available. Contributing your insights can help create a safer work environment and strengthen communication between workers and management.
- Educate yourself about your rights regarding occupational safety and health, including protections against unsafe working conditions and the right to refuse work that poses an imminent danger.

- Encourage colleagues to prioritize safety in all tasks. Support a workplace culture where safety is everyone's responsibility, fostering an environment of collective care.
- Implement ergonomic practices in your daily work routines to reduce the risk of musculoskeletal injuries. Adjust workstations and use proper lifting techniques whenever possible.
- Recognize the importance of mental health in your overall well-being. Utilize any available mental health resources or programs offered by your employer.

6.1.6 Mitigating the Impact of Climate Change

With the devastating impact of climate change on workers' health on the rise, it is imperative that:

- OSH legislations are revised or formulated to include the protection of workers in risks associated to climate change, the responsibility of employers to conduct risk assessments and adopt tailored measures to prevent exposure or combat the impact of exposure.
- National policies are developed to address workers safety relative to climate change. These policies must foster the creation of decent, green, and sustainable jobs. The policies must also create awareness of the impact of climate change, strengthen employers to enhance OSH measures, and strengthen compliance relative to OSH requirements.
- Integrate OSH initiatives in public health programs and campaigns. This programs and campaigns must educate people on risks associated to climate change, preventive measures and how to mitigate the impact of exposure.
- The risk management policies of organisations must address risks resulting from climate change and effective control strategies that minimize or eliminate exposure to these hazards.
- Smart PPEs are used by workers so that their conditions (e.g., body heat) regularly.

6.1.7 Policy and Legislative Recommendations

To address the deficiencies in OSH legislation across Africa, it is crucial to update and expand existing laws to address contemporary risks. Specifically,

- The legal and regulatory frameworks must emphasize acceptable global standards on hazards such as dust, noise, vibrations, and heat in terms exposure limits. The scope of such laws must include superior preventive measures in the hierarchy of controls such as elimination, substitution, and engineering
- The laws governing OSH in African countries must contain hazard profiling, audits, and risk assessments and be legally binding on employers to submit

such reports to regulatory authorities.

- OSH laws must also emphasize the setting up of functional OSH committees in organisations.
- OSH laws must be gender sensitive since a lot of women have joined the world of work over the last few decades.
- OSH laws must be harmonized, possibly under a one regulatory authority, to ensure efficiency and effectiveness. This is because the fragmentation of these laws leads to duplication of roles, overlaps, and contradictions.

6.1.8 Implementation of Effective Interventions

The effectiveness of OSH interventions is crucial in any intervention development therefore it is important that OSH interventions are not conceptualized as black boxes but focused on essential factors that influence them. Contextual factors therefore are imperative in all the phases of the design, implementation, and evaluation of interventions. It is therefore recommended that:

- All OSH interventions assess and manage all the contextual factors necessary to their success.
- OSH interventions must harmonize the social, environmental, and human implications with economic and financial factors.
- OSH interventions are sustainable. They must not cease, must be institutionalized within settings, and must have built capacity to support their delivery.
- OSH interventions mirror the Value-Sensitive Design (VSD). VSDs ensures that developers and designers of interventions consider the values of stakeholders.

REFERENCES

- Abera, A., Friberg, J., Isaxon, C., Jerrett, M., Malmqvist, E., Sjöström, C., ... & Vargas, A. M. (2021). Air quality in Africa: Public health implications. *Annual review of public health*, 42(1), 193-210.
- Abdelrahim, R. A., Omer, F., & Otitolaiye, V. O. (2021). Current Status and Future Outlook on Occupational Health and Safety Research in Sudan: A Concise Review. *Current Journal of Applied Science and Technology*, 79–88. <https://doi.org/10.9734/cjast/2021/v40i2131472>
- Adams, S., Ehrlich, R., Quail, Z., Jeebhay, M. F., & Ismail, N. (2012). Occupational health challenges facing the Department of Health: protecting employees against tuberculosis and caring for former mineworkers with occupational health disease. *South African Health Review*, 2012(1), 67-82.
- Adel, M., Elnawawy, O., Othman, A. A. E., & Badawy, M. (2022). Causes and impacts of site accidents in the Egyptian construction industry. *Architectural Engineering*, 145. Retrieved from https://buescholar.bue.edu.eg/arch_eng/145.
- Adu-Amankwah, K., & Otoo, K. N. (2022). Unity and revitalization of trade unions in Africa. *International Journal of Labour Research*, 11(1-2). file:///C:/Users/USER/Downloads/wcms_875930.pdf
- Afolabi, F. J., de Beer, P., & Haafkens, J. A. (2021). Can occupational safety and health problems be prevented or not? Exploring the perception of informal automobile artisans in Nigeria. *Safety Science*, 135, 105097.
- African Development Bank (2018). African Economic Outlook 2018. Retrieved from https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/African_Economic_Outlook_2018_-_EN.pdf
- African Union (2021). Africa Mining Vision: Ensuring Transparent, Equitable and Optimal Exploitation of Mineral Resources. Retrieved from <https://au.int/en/articles/african-mining-vision>
- African Union Commission. (2015). Agenda 2063: The Africa We Want. Retrieved from https://au.int/sites/default/files/documents/33126-doc-framework_document_book.pdf on 23rd July 2024.
- Agence nationale d'appui au développement rural, ANADER (National Rural Development Support Agency, 2022).
- Ahmed, S. (2018). Barriers to implementation of building information modeling (BIM) to the construction industry: a review. *Journal of civil engineering and construction*, 7(2), 107-113.
- Ajzen, I., & Sheikh, S. (2013). Action versus inaction: Anticipated affect in the theory of planned behavior. *Journal of Applied Social Psychology*, 43(1), 155-162.
- Akoni, O., Adelaja, B., & Ejoh, E. (2020, October). Black Thursday in Lagos: 13 dead, others critically injured in Baruwa gas explosion. *Vanguard*. Retrieved on September 13, 2024, from <https://www.vanguardngr.com/2020/10/black-thursday-in-lagos-13-dead-others-critically-injured-in-baruwa-gas-explosion/>

Alli, B. O. (2008). *Fundamental Principles of occupational health and Safety* Second edition. Geneva, International Labour Organisation, 15.

Amoah, C., & Mlenzana, L. (2022). Emerging Contractors' Challenges with the Compliance of Occupational Health and Safety Standards in South Africa. In *Sustainable Education and Development—Making Cities and Human Settlements Inclusive, Safe, Resilient, and Sustainable: Proceedings of the Applied Research Conference in Africa (ARCA), 2021 10* (pp. 140-154). Springer International Publishing.

Amponsah-Tawiah, K., Jain, A., Leka, S., Hollis, D., & Cox, T. (2013). Examining psychosocial and physical hazards in the Ghanaian mining industry and their implications for employees' safety experience. *Journal of Safety Research*, 45, 75–84. <https://doi.org/10.1016/j.jsr.2013.01.003>

Amponsah-Tawiah, K., Leka, S., Jain, A., Hollis, D., & Cox, T. (2014). The impact of physical and psychosocial risks on employee well-being and quality of life: The case of the mining industry in Ghana. *Safety Science*, 65, 28–35. <https://doi.org/10.1016/j.ssci.2013.12.002>

Amponsah-Tawiah, K., & Dartey-Baah, K. (2011). Occupational health and safety: key issues and concerns in Ghana. *International Journal of Business and Social Science*, 2(14).

Amponsah-Tawiah, K., Ntow, M. A. O., & Mensah, J. (2016). Occupational health and safety management and turnover intention in the Ghanaian mining sector. *Safety and health at work*, 7(1), 12-17.

Amponsah-Tawiah, K. (2013). Occupational health and safety and sustainable development in Ghana. *International Journal of Business Administration*, 4(2), 74-78.

Andrade-Rivas, F., & Rother, H. A. (2015). Chemical exposure reduction: Factors impacting on South African herbicide sprayers' personal protective equipment compliance and high risk work practices. *Environmental Research*, 142, 34-45.

Ansah, E. W., Ankomah-Appiah, E., Amoadu, M., & Sarfo, J. O. (2021). Climate change, health and safety of workers in developing economies: A scoping review. *Journal of Climate Change and Health*, 3, 100034. <https://doi.org/10.1016/j.jocl.2021.100034>

Atsegwasi, G. (2020). Oil and Gas Operations in Nigeria: The Need for Well Head Safety. *Asia Pacific Law Review*, 6 (ISSN: 2581-4095), 236-253.

Atusingwize, E., Musinguzi, G., Ndejjo, R., Buregyeya, E., Kayongo, B., Mubeezi, R., ... & Ssempebwa, J. C. (2019). OSH regulations and implementation challenges in Uganda. *Archives of environmental & occupational health*, 74(1-2), 58-65.

Ávila-Gutiérrez, M. J., Suarez-Fernandez de Miranda, S., & Aguayo-González, F. (2022). Occupational safety and health 5.0—A model for multilevel strategic deployment aligned with the sustainable development goals of Agenda 2030. *Sustainability*, 14(11), 6741.

Aytac, S. (2015). The Sources of Stress, The Symptoms of Stress and Anger Styles as a Psychosocial Risk at Occupational Health and Safety: A Case Study

on Turkish Police Officers. *Procedia Manufacturing*, 3, 6421–6428. <https://doi.org/10.1016/j.promfg.2015.07.915>

Amine, S., & Antar, G. (2017). Discerner les risques qui méritent d'être poursuivis en entreprise; mémoire de master en hygiène et sécurité industrielle de l'Université des frères mentouri Constantine. *Journal of Materials Chemistry B*, London.

Angwe, R. L. (2014). Energy efficiency: the regulatory framework for SADC and South Africa (Doctoral dissertation).

Ardjouman, D. (2014). Factors influencing small and medium enterprises (SMEs) in adoption and use of technology in Cote D'Ivoire. *International Journal of Business and Management*, 9(8), 179.

Asiedu, E. A., Appiagyei, J. N., Amfo-Otu, R., Parku, K., & Obuobisa-Darko, T. (2023). Occupational health and safety, cost reduction in accident and employee task performance: perspectives of selected service organisations. *Journal of Public Health*, 1-12.

Asumeng, A. M. (2015). Addressing Psychosocial Hazards and Improving Employee Psychological Wellbeing in the Ghanaian Banking Industry: Application of Organisation Development Intervention Using Action Research Model. *American Journal of Applied Psychology*, 4(5), 120. <https://doi.org/10.11648/j.ajap.20150405.12>

Auktor, G. V. (2022). The opportunities and challenges of Industry 4.0 for industrial development: A case study of Morocco's automotive and garment sectors (No. 2/2022). Discussion Paper.

Barin, N. E., & Özmen, A. (2015). The Effect of Occupational Health and Safety Applications on the Corporate Image Perception of Employees. *Proceeding Book*, 44.

Barry Callebaut (2023). Farmer yield and income in Côte d'Ivoire: An analysis of Farmer Field Books (FFBs). Retrieved at https://www.barry-callebaut.com/system/files/2023-05/Barry%20Callebaut_Agrilogic%20White%20Paper_2023_0.pdf

Benjamin, O. (2001). Fundamental principles of occupational health and safety. *ILO*, 13(2), 1-59.

Benson, C., Dimopoulos, C., Argyropoulos, C. D., Mikellidou, C. V., & Boustras, G. (2021). Assessing the common occupational health hazards and their health risks among oil and gas workers. *Safety science*, 140, 105284.

Bidahor, M. D., & Kheni, N. A. (2022). A study of barriers hindering contractor's compliance with H&S standards in Ghana. *International Journal of Management & Entrepreneurship Research*, 4(7), 334-347. DOI: 10.51594/ijmer.v4i7.358.

Boadu, E. F., Wang, C. C., & Sunindijo, R. Y. (2021). Challenges for occupational health and safety enforcement in the construction industry in Ghana. *Construction Economics and Building*, 21(1), 1-21.

Boateng, K. O., Dankyi, E., Amponsah, I. K., Awudzi, G. K., Amponsah, E., & Darko, G. (2023). Knowledge, perception, and pesticide application practices

among smallholder cocoa farmers in four Ghanaian cocoa-growing regions. *Toxicology Reports*, 10, 46-55.

Bosompem, M., & Mensah, E. (2012). Occupational Hazards among Cocoa Farmers in the Birim South District in the Eastern Region of Ghana. *ARNP Journal of Agricultural and Biological Science*, 7(12). www.arpnjournals.com

Botha, D., & Cronjé, F. (2015). Occupational health and safety considerations for women employed in core mining positions. *SA Journal of Human Resource Management/SA Tydskrif vir Menslikehulpbronbestuur*, 13(1), Art. 652, 12 pages. <http://dx.doi.org/10.4102/sajhrm.v13i1.652>.

Buyela, C. W., Mburu, C., & Njogu, P. (2017). Occupational Safety and Health Practices In Agricultural and Livestock Research Organisations, Western Kenya Region. *International Journal of Environmental and Agriculture Research*, 3(8), 09-15.

Construction Education and Training Authority (CETA, 2023). Annual Performance Plan for 2023/24 Financial Year. Retrieved from https://static.pmg.org.za/CETA_APP_2023_24-signed.pdf

Chamber of Mines. (2021). Elimination of Fall of Ground (Fog) Fatalities Action Plan July 2021. Johannesburg: Chamber of Mines. <https://www.mineralscouncil.org.za/industry-news/publications/position-papers/send/37-position-papers/1683-elimination-of-fog-fatalities-action-plan>

Chen, H., Hou, C., Zhang, L., & Li, S. (2020). Comparative study on the strands of research on the governance model of international occupational safety and health issues. *Safety science*, 122, 104513.

Chersich, M. F., Gray, G., Fairlie, L., Eichbaum, Q., Mayhew, S., Allwood, B., & Rees, H. (2020). COVID-19 in Africa: care and protection for frontline healthcare workers. *Globalization and health*, 16, 1-6.

Cioca, L. I., Ivascu, L., & Rus, S. (2014). Integrating corporate social responsibility and occupational health and safety to facilitate the development of the organisations. *Proceedings of the 4th Review of Management and Economic Engineering, The Management Between Profit and Social Responsibility*, 2-7.

Competence Centre, Mineral Resources (2018). Health and Safety in South African Mines: A Best Practice Report 2018. Southern African–German Chamber of Commerce and Industry.

Conradie, C. S., Van Der, E., Smit, M., & Malan, D. P. (2016). Corporate Health and Wellness and the Financial Bottom Line. *Journal of Occupational and Environmental Medicine*, 58(2), 45–53. <https://doi.org/10.2307/48500822>

Darimaani, C., Akoogo, M. A., Ahiale, S. K., & Kheni, N. A. (2024). Critical Factors Contributing to Under-Reporting of Occupational Accidents in the Construction Industry in Ghana. *African Journal of Applied Research*, 10(1), 1-26.

Debela, M. B., Azage, M., & Begosaw, A. M. (2021). Prevalence of Occupational Injury among Workers in the Construction, Manufacturing, and Mining Industries in Africa: A Systematic Review and Meta-analysis. *Journal of Occupational Health and Epidemiology*, 10(2), 113-124.

Debela, M. B., Azage, M., & Motbainor, A. (2021). Prevalence and Causes of Occupational Injuries and Diseases. DOI: 10.1234/doi.

Debela, M. B., Azage, M., Begosaw, A. M., & Kabeta, N. D. (2022). Factors contributing to occupational injuries among workers in the construction, manufacturing, and mining industries in Africa: a systematic review and meta-analysis. *Journal of Public Health Policy*, 43(4), 487-502.

Department of Labour (2014). Construction Regulations 2014. Retrieved from https://www.labour.gov.za/DocumentCenter/Regulations%20and%20Notices/Regulations/Occupational%20Health%20and%20Safety/ConstructionRegulation_2014part1.pdf.

Department of Petroleum Resources (DPR, 2023). Guidelines and Standards for Safety and Health in the Oil and Gas Industry. Abuja: DPR Publications.

Department of Trade and Industry (2011). Standards Act, 2008, Standards Matters. Retrieved from https://www.gov.za/sites/default/files/gcis_document/201409/34107gon230.pdf

Dodoo, J. E., & Al-Samarraie, H. (2020). A systematic review of factors leading to occupational injuries and fatalities. *Journal of Public Health: From Theory to Practice*. DOI: 10.1007/s10389-020-01427-4.

Donwa, P. A., Mgbame, C. O., & Julius, O. M. (2015). Corruption in the oil and gas industry: Implication for economic growth. *European Scientific Journal*, 11(22).

Dzięgielewska, P., Konarkowska, O., & Górny, A. (2022). Adapting an OSH management system to ISO 45001 requirements: ensuring system management effectiveness. *European Research Studies Journal*, 25(1), 809-819.

Edem, M., Nwankwo, O., Muku, J., Usman, F., & Ike, C. (2021, August). Reducing accidents through the implementation of the minimum industry safety training for downstream operations MISTDO in the Nigerian Oil and Gas Industry. In *SPE Nigeria Annual International Conference and Exhibition* (p. D021S004R002). SPE.

Eladly, A. M., Abou-Ali, M. G., Sheta, A. M., & El-Ghlomy, S. H. (2020). A flexible ergonomic redesign of the sewing machine workstation. *Research Journal of Textile and Apparel*, 24(3), 245-265.

Esterhuyzen, E. (2019). Small business barriers to occupational health and safety compliance. *Southern African Journal of Entrepreneurship and Small Business Management*, 11(1), a233. <https://doi.org/10.4102/sajesbm.v11i1.233>.

European Agency for Safety and Health at Work (2023). Occupational safety and health in Europe: state and trends 2023.

European Agency for Safety and Health at Work (2007). Expert forecast on emerging psychosocial risks related to occupational safety and health. Office for Official Publications of the European Communities.

European Agency for Safety and Health at Work (2003). Gender issues in safety and health at work — A review. Luxembourg: Office for Official Publications

of the European Communities. Retrieved from https://osha.europa.eu/sites/default/files/TE5103786ENC_-_Gender_issues_in_safety_and_health_at_work.pdf

European Parliamentary Research Service (EPRS, 2017). Briefing; How the EU budget is spent. Retrieved from [https://www.europarl.europa.eu/RegData/etudes/BRIE/2017/608727/EPRS_BRI\(2017\)608727_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2017/608727/EPRS_BRI(2017)608727_EN.pdf)

Eyiah, A. K., Kheni, N. A., & Quartey, P. D. (2019). An assessment of occupational health and safety regulations in Ghana: a study of the construction industry. *Journal of Building Construction and Planning Research*, 7(2), 11-31.

Famakin, I. O., & Fawehinmi, O. S. (2012). Quantity Surveyors' Perception of Construction Health & Safety Regulations in Nigeria. *Journal of Building Performance*, 3(1).

Floyde, A., Lawson, G., Shalloe, S., Eastgate, R., & D'Cruz, M. (2013). The design and implementation of knowledge management systems and e-learning for improved occupational health and safety in small to medium sized enterprises. *Safety Science*, 60, 69-76.

Food and Agriculture Organisation. (2023). The State of Food and Agriculture 2023. Retrieved from <https://www.fao.org/publications/home/fao-flagship-publications/the-state-of-food-and-agriculture/2020/en>

Fulele, C., & Kadama, F. R. K. (2016). Compliance with occupational health and safety in the construction industry in a selected district. *Journal of Contemporary Management*, 13(1), 506-530.

Garrigou, A., Laurent, C., Berthet, A., Colosio, C., Jas, N., Daubas-Letourneux, V., & Judon, N. (2020). Critical review of the role of PPE in the prevention of risks related to agricultural pesticide use. *Safety Science*, 123, 104527.

Gervas, A., Kinyondo, G., Torm, N., & Anasel, M. G. (2022). Occupational health and safety in Tanzanian construction sector: non-compliance, informality, and power relations. *PanAfrican Journal of Governance and Development (PJGD)*, 3(1), 186-215.

Gervas, A., Torm, N., & Kinyondo, G. (2023). Health and Safety Compliance in Tanzania: Regulatory Impediments in the Construction Sector. *African Studies Quarterly*, 21(4), 30-41. <https://asq.africa.ufl.edu/files/V21i4a3.pdf>

Goetsch, D. L. (2014). *Occupational safety and health for technologists, engineers, and managers*. Pearson.

Gopinadh, A., Devi, K. N. N., Chiramana, S., Manne, P., Sampath, A., & Babu, M. S. (2013). Ergonomics and musculoskeletal disorder: As an occupational hazard in dentistry. *Journal of Contemporary Dental Practice*, 14(2), 299-303. <https://doi.org/10.5005/jp-journals-10024-1317>

Government of Ghana. (2013, 2015). Ghana National Climate Change Policy. Retrieved from <https://www.clientearth.org/media/p13faarf/national-climate-change-policy-ext-en.pdf>

Guadix, J., Carrillo-Castrillo, J., Onieva, L., & Lucena, D. (2015). Strategies for psychosocial risk management in manufacturing. *Journal of Business Research*, 68(7), 1475-1480. <https://doi.org/10.1016/j.jbusres.2015.01.037>

Haddach, A., Allal, L. B., Laglaoui, A., & Ammari, M. (2017). Moroccan automotive industry: Opportunities and perspectives. *American Journal of Engineering Research (AJER)*, 6(8), 75-82. e-ISSN: 2320-0847, p-ISSN: 2320-0936.

Handford, C. E., Elliott, C. T., & Campbell, K. (2015). A review of the global pesticide legislation and the scale of challenge in reaching the global harmonization of food safety standards. *Integrated environmental assessment and management*, 11(4), 525-536.

Hayter, S., & Pons-Vignon, N. (2018). Industrial relations and inclusive development in South Africa: A dream deferred? In *Industrial Relations in Emerging Economies* (pp. 69-114). Edward Elgar Publishing.

Haywood, L. K., & Wright, C. Y. (2019). Private sector contribution to SDG 3: Health and Well-being—a South African case study. *South African Journal of Science*, 115(9-10), 1-3.

Holdren, N. (2020). *Injury impoverished Workplace accidents, capitalism, and law in the progressive era*. Cambridge University Press.

Hermanus, M., Coulson, N., & Pillay, N. (2015). Mine Occupational Safety and Health Leading Practice Adoption System (MOSH) examined—the promise and pitfalls of this employer-led initiative to improve health and safety in South African Mines. *Journal of the Southern African Institute of Mining and Metallurgy*, 115(8), 717-727.

Iden, E., & Oluranti S. (2022). Occupational health and safety challenges in workplace improvement in Africa. *Occupational Health Southern Africa*, 28(4), 154-155.

Industrial Global Union (2024, April). Mental health – an important part of health and safety. Retrieved from <https://www.industriall-union.org/mental-health-an-important-part-of-health-and-safety> on 15th September, 2024.

Industriall Global Union (2018). South Africa: Six Workers Die In Underground Fire At Copper Mine. Retrieved from <https://www.industriall-union.org/south-africa-six-workers-die-in-underground-fire-at-copper-mine> on 13th September, 2024.

Infection Prevention Network (IPNET) Kenya. (2021). Kenya National Infection Prevention and Control Strategic Plan for Health Care Services 2021–2025. Retrieved from http://guidelines.health.go.ke:8000/media/Kenya_National_IPC_Strategic_Plan_for_Health_Care_Services_2021_-_2025.pdf

Integrated African Health Observatory (iAHO) (2024). Climate change is impacting health in Africa. https://files.aho.afro.who.int/afahobckpcontainer/production/files/iAHO_Climate_change_in_health_Fact_Sheet-April_2024.pdf

International Fund for Agricultural Development (IFAD) (2019). 2019 Rural Development Report 2019: Creating Opportunities for Rural Youth. Retrieved from https://www.ifad.org/documents/38714170/41190221/RDR2019_Overview_e_W.pdf/699560f2-d02e-16b8-4281-596d4c9be25a

International Labour Conference & International Labour Office. Committee of Experts on the Application of Conventions (2010). Report of the Committee of Experts on the Application of Conventions and Recommendations (articles 19, 22 and 35 of the Constitution): Third Item on the Agenda: Information and Reports on the Application of Conventions and Recommendations (Vol. 93). International Labour Organisation.

International Labour Organisation (2011). OSH Management System: A Tool for Continual Improvement. ISBN 978-92-2-124740-1 (web pdf). Retrieved at file:///C:/Users/USER/Downloads/wcms_153930.pdf.

International Labour Organisation (2013). National Pro-file on Occupational Safety and Health-Kenya. ILO Publications, International Labour Office, CH-1211 Geneva 22, Switzerland.

International Labour Organisation (2016). Nigeria Country Profile on Occupational Safety and Health 2016. Retrieved at file:///C:/Users/USER/Downloads/wcms_552748%20(1).pdf

International Labour Organisation (2017). Occupational safety and health in the oil and gas industry in selected sub-Saharan African countries. Sectoral Policies Department, Geneva. ISBN 978-92-2-130880-5 (Web pdf) retrieved from file:///C:/Users/USER/Downloads/wcms_554798.pdf.

International Labour Organisation (2021). World Employment and Social Outlook: Trends 2021

ISBN 978-92-2-031959-8 (web PDF). International Labour Office – Geneva: ILO, 2021.

International Labour Organisation (2022). The future of work in the oil and gas industry. Sectoral Policies Department, Geneva. ISBN 978-92-2-037558-7 (Web pdf) retrieved at file:///C:/Users/USER/Downloads/wcms_859846.pdf

International Labour Organisation (2020). ILO Guide to International Labour Standards on Occupational Safety and Health. Retrieved from file:///C:/Users/USER/Downloads/wcms_819781.pdf

International Labour Organisation (2024). Occupational Safety and Health Statistics (OSH) database, ILOSTAT. Retrieved at <https://ilostat.ilo.org/topics/safety-and-health-at-work/> on 17th July, 2024.

International Trade Union Confederation African Regional Organisation (ITUC-Africa, 2012). ZCTU-Zambia: Message to mark Zimbabwe's 43rd independence day. Retrieved from <https://www.ituc-africa.org/ZCTU-ZAMBIA-MESSAGE-TO-MARK-ZIMBABWE-S-43rd-INDEPENDENCE-DAY.html>.

International Trade Union Confederation African Regional Organisation (ITUC-Africa, 2012). Strategic Plan 2012–2015. Retrieved from https://www.ituc-africa.org/IMG/pdf/ITUC-Africa_Strategic_Document_2012_-_2015.pdf.

International Trade Union Confederation African Regional Organisation (ITUC-Africa, 2022, April, 28). ITUC-Africa statement on International Workers Memorial Day 2022: Acting together to build a positive safety and

health culture in Africa. ITUC-Africa. Retrieved from https://www.ituc-africa.org/IMG/pdf/statement_iwmd22.pdf on 15th September, 2024.

International Trade Union Confederation African Regional Organisation (ITUC-Africa, 2022). COSATU National Strike 2020. Retrieved from <https://www.ituc-africa.org/COSATU-NATIONAL-STRIKE-2020.html> on 15th September 2024

International Union of Food, Agricultural, Hotel, Restaurant, Catering, Tobacco, and Allied Workers' Associations (IUF, 2020). Safe farms, safe workers, safe communities: Improving occupational health, safety and environmental standards on plantations and farms in Africa. Retrieved from <https://www.iuf.org/wp-content/uploads/2020/12/2015-Safe-Farms-Safe-Workers.pdf>.

Jepson, P. C., Guzy, M., Blaustein, K., Sow, M., Sarr, M., Mineau, P., & Kegley, S. (2014). Measuring pesticide ecological and health risks in West African agriculture to establish an enabling environment for sustainable intensification. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 369(1639), 20130491.

Jimenez, P., & Dunkl, A. (2017). Assessment of Psychosocial Risks and Mental Stress at Work: The Development of the Instrument OrgFit. *Journal of Ergonomics*, 07(02). <https://doi.org/10.4172/2165-7556.1000188>

Johanson, U., Aboagye, E., & Yao, J. (2022). Integrating the business model for sustainability and performance management to promote occupational health and safety—A discussion of value. *Frontiers in Sustainability*, 3, 950847.

Jones, C. M., Wilson, A. L., Stanton, M. C., Stothard, J. R., Guglielmo, F., Chirombo, J., ... & Mzilahowa, T. (2023). Integrating vector control within an emerging agricultural system in a region of climate vulnerability in southern Malawi: A focus on malaria, schistosomiasis, and arboviral diseases. *Current Research in Parasitology & Vector-Borne Diseases*, 100133.

Kamoli, A., Hamid, R. A., & Mahmud, S. H. (2021). Barriers To The Development Of Occupational Health And Safety Management Systems In The Nigerian Construction Industry. *Journal of Information System and Technology Management*, 6(24), 90-99. DOI: 10.35631/JISTM.624009.

Kaudzu, C. (2023, April 25). Urgent need to integrate vector control in irrigation schemes in Malawi to reduce malaria and other vector-borne diseases. Retrieved from <https://afidep.org/urgent-need-to-integrate-vector-control-in-irrigation-schemes-in-malawi-to-reduce-malaria-and-other-vector-borne-diseases/>

Kekana, G., Aigbavboa, C., & Thwala, W. (2015). Understanding building information modelling in the South Africa construction industry. *Proceedings of the Organisation, Technology and Management in Construction (OTMC)*, Primošten, Croatia, 2-6.

Khan, A., Gupta, S., & Gupta, S. K. (2020). Multi-hazard disaster studies: Monitoring, detection, recovery, and management, based on emerging technologies and optimal techniques. *International journal of disaster risk reduction*, 47, 101642.

- Khoza, N. (2020). Regional collaborative initiatives to strengthen occupational health and safety training programmes in southern Africa. *Occupational Health Southern Africa*, 26(3), 126-127.
- Kipkoech, B. H., Wanjohi, A., & Makau, I. (2024). Safety and Health Risk Management in Selected Kenya Tea Development Agency Factories in Bomet County, Kenya. *Asian Journal of Research in Infectious Diseases*, 15(4), 24-34.
- Kistnasamy, B., Yassi, A., Yu, J., Spiegel, S. J., Fourie, A., Barker, S., & Spiegel, J. M. (2018). Tackling injustices of occupational lung disease acquired in South African mines: recent developments and ongoing challenges. *Globalization and Health*, 14, 1-14.
- Kitronza, J. P. L., Masumbuko, J. L., & Mairiaux, P. (2021). Workers' perceptions of occupational safety and health in a textile industry in the democratic republic of congo. *Saudi Journal of Medicine*, 6(11), 359-366.
- Kunodzia, R., Bikitsha, L. S., & Haldenwang, R. (2024). Perceived factors affecting the implementation of occupational health and safety management systems in the South African construction industry. *Safety*, 10(1), 5.
- Kwiri, J. (2018). Concept development of a smart rock engineering system for real-time decision-making and risk minimization in deep level hard rock mines: a digital mining approach (Doctoral dissertation).
- Ledwaba, P. F., & Mutemeri, N. (2018). Institutional gaps and challenges in artisanal and small-scale mining in South Africa. *Resources Policy*, 56, 141-148.
- Liu, S., Nkrumah, E. N. K., Akoto, L. S., Gyabeng, E., & Nkrumah, E. (2020). The State of Occupational Health and Safety Management Frameworks (OSHMF) and Occupational Injuries and Accidents in the Ghanaian Oil and Gas Industry: Assessing the Mediating Role of Safety Knowledge. *BioMed Research International*, 2020. <https://doi.org/10.1155/2020/6354895>
- Liu, S., Gyabeng, E., Joshua Atteh Sewu, G., Nkrumah, N. K., & Dartey, B. (2019). Occupational health and safety and turnover intention in the Ghanaian power industry: The mediating effect of organisational commitment. *BioMed Research International*, 2019(1), 3273045.
- Loewenson, R. (2021). Rethinking the paradigm and practice of occupational health in a world without Decent work: a perspective from East and southern Africa. *NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy*, 31(2), 107-112.
- Lund, F. (2012). Work-related social protection for informal workers. *International Social Security Review*, 65(4), 9-19.
- Lund, F., Alfors, L., & Santana, V. (2016). Towards an inclusive occupational health and safety for informal workers. *New Solutions*, 26(2), 190-207. <https://doi.org/10.1177/1048291116652177>
- Magadze, T. A., Nkhwashu, T. E., Moloko, S. M., & Chetty, D. (2022). The impediments of implementing infection prevention control in public hospitals: Nurses' perspectives. *Health SA Gesondheid (Online)*, 27, 1-8.

- Magnavita, N., & Chirico, F. (2020). New and emerging risk factors in occupational health. *Applied Sciences (Switzerland)*, 10(24), 1–7 MDPI AG. <https://doi.org/10.3390/app10248906>
- Magoro, F. M. (2012). Knowledge, attitude and practices regarding personal protective equipment amongst Stevens Lumber Mills employees in the Capricorn District of Limpopo Province, South Africa (Doctoral dissertation, University of Limpopo (Turfloop Campus)).
- Marete, G. M., Lalah, J. O., Mputhia, J., & Wekesa, V. W. (2021). Pesticide usage practices as sources of occupational exposure and health impacts on horticultural farmers in Meru County, Kenya. *Heliyon*, 7(2).
- Mariam, A. T., Olalusi, O. B., & Haupt, T. C. (2021). A scientometric review and meta-analysis of the health and safety of women in construction: structure and research trends. *Journal of Engineering, Design and Technology*, 19(2), 446-466.
- Marhavilas, P.K., Pliaki, F., & Koulouriotis, D. (2022). International Management System Standards Related to Occupational Safety and Health: An Updated Literature Survey. *Sustainability*, 14(13282). <https://doi.org/10.3390/su142013282>.
- Mashwama, N., Aigbavboa, C., & Thwala, W. (2019). Occupational health and safety challenges among small and medium sized enterprise contractors in South Africa. In R. H. M. Goossens (Ed.), *AHFE 2018, AISC 792* (pp. 68–76). Springer International Publishing AG. https://doi.org/10.1007/978-3-319-94000-7_7.
- Masike, R., Mwanza, B., & Masiyazi, L. (2014). A gender sensitive framework to safety and health at work. *European Scientific Journal*, 10(11), 155-168.
- Mine Health and Safety Council (MHSC, 2024). *The Pursuit of Zero Harm Continues*. ISBN: 978-0-620-96849-2. https://mhsc.org.za/wp-content/uploads/2024/04/MHSC_The-Pursuit-of-Zero-Harm-Continues.pdf.
- Ministry of Labor (2017). *Occupational Safety and Health in Morocco*. Retrieved from file:///C:/Users/USER/Downloads/MOROCCO_2017.pdf
- Ministry of Mineral Resources and Petroleum (MIREMPET). (2023). *Guidelines and Standards for Safety and Health in Angola's Oil and Gas Industry*. <https://mirempet.gov.ao/ao/>
- Moghayedi, A., Massyn, M., Le Jeune, K., & Michell, K. (2022). Evaluating the Awareness, Barriers, and Level of Adoption of Innovative Digital Technologies in the Health and Safety of High-Rise Construction in South Africa. *The Twelfth International Conference on Construction in the 21st Century (CITC-12)*. Amman, Jordan
- Mojapelo, J., Mafini, C., & Dhurup, M. (2016). Employee perceptions of occupational health and safety standards in the steel industry. *International Journal of Social Sciences and Humanity Studies*, 8(2), 106-121.
- Mojapelo, P., & Kok, J. (2017). Occupational health and safety: The implications for human resource development in South Africa. *Journal of Contemporary Management*, 14(1), 51-58.

- Mossburg, S., Agore, A., Nkimbeng, M., & Commodore-Mensah, Y. (2019). Occupational Hazards among Healthcare Workers in Africa: A Systematic Review. *Annals of Global Health*, 85(1), 78, 1–13. DOI: [<https://doi.org/10.5334/aogh.2434>].
- Moyo, L. (2021). Occupational health and safety factors influencing absenteeism among construction workers in Johannesburg, South Africa. University of Johannesburg (South Africa).
- Moyo, D., Zungu, M., Erick, P., Tumoyagae, T., Mwansa, C., Muteti, S, & Maribe, K. (2017). Occupational health and safety in the Southern African Development Community. *Occupational Medicine*, 67(8), 590-592.
- Moyo, D., Zungu, M., Kgalamono, S., & Mwila, C. D. (2015). Review of occupational health and safety organisation in expanding economies: the case of Southern Africa. *Annals of global health*, 81(4), 495-502.
- Mutegi, T. M., Joshua, P. M., & Kinyua, J. M. (2023). Workplace Safety and Employee Productivity of Manufacturing Firms in Kenya. *Cogent Business & Management*, 10(2), 2215569.
- Mutwale-Ziko, J., Lushinga, N., & Akakandelwa, I. (2017). An evaluation of the effectiveness of health and safety induction practices in the Zambian construction industry. *International Journal of Health and Medical Engineering*, 11(3), 614-618.
- Naija Scholar (2024). The Role of Technology in Nigeria's Oil and Gas Industry. Retrieved at <https://disciplines.ng/role-of-technology-in-oil-and-gas-industry/#:~:text=Technological%20Innovations%20in%20Nigeria's%20Oil%20and%20Gas%20Industry&text=Drones%20equipped%20with%20cameras%20and,learning%20algorithms%20for%20predictive%20maintenance>.
- Nana, D., & Ewur, E.-S. (2021). Risk and Operational Management Practices of Manufacturing Companies in Ghana. *International Journal of Innovative Science and Research Technology*, 6. www.ijisrt.com
- Ncongwane, K. P., Botai, J. O., Sivakumar, V., & Botai, C. M. (2021). A literature review of the impacts of heat stress on human health across Africa. *Sustainability*, 13(9), 5312.
- Ncube, F., & Kanda, A. (2018). Current status and the future of occupational safety and health legislation in low-and middle-income countries. *Safety and health at work*, 9(4), 365-371.
- Nelson-Wong, E., Gallagher, K., Johnson, E., Antonioli, C., Ferguson, A., Harris, S., Johnson, H., & Miller, J. B. (2020). Increasing standing tolerance in office workers with standing-induced back pain. *Ergonomics*, 63(7), 804–817. <https://doi.org/10.1080/00140139.2020.1761034>
- Ngowi, A., Mrema, E., & Kishinhi, S. (2016). Pesticide health and safety challenges facing informal sector workers: A case of small-scale agricultural workers in Tanzania. *New Solutions*, 26(2), 220–240. <https://doi.org/10.1177/1048291116650262>
- Nikolaou, I. E. (2016). Occupational health and safety within corporate social responsibility context: a balanced scorecard dynamic decision-making

model. *International Journal of Decision Support Systems*, 2(1-3), 54-70.

Nkolimwa, D., Jani, D., & Dominic, T. (2020). Management Practices on Occupational Health and Safety in the Tanzanian's Small Scale Mining Firms: Does Compliance Cost Matter? *Business Management Review*, 22(2), 155-170.

Onwona Kwakye, M., Mengistie, B., Ofosu-Anim, J., Nuer, A. T. K., & Van den Brink, P. J. (2019). Pesticide registration, distribution and use practices in Ghana. *Environment, Development and Sustainability*, 21(6), 2667-2691.

Ngoga, E. O., Muiruri, L., & Ouma, O. J. (2023). Healthcare Workers Training and Implementation of Occupational Health and Safety (OSH) Measures at Kitale County Referral Hospital, Kenya. *American Journal of Health, Medicine and Nursing Practice*, 9(1), 20-34. ISSN 2520-4017 (Online).

Njogu, P. K., Mburu, C., & Karanja, B. (2019). Role of safety and health awareness in occupational safety and health performance in public health facilities in Machakos County, Kenya. *Journal of Health and Environmental Research*, 5(1), 1-7.

Nyariki, K. C., & Chirchir, K. M. (2019). Adoption of Occupational Safety and Health Practices Among Health Care Workers in Kenyan Public Referral Hospitals. *American Journal of Health, Medicine and Nursing Practice*, 4(1), 1-17.

National Occupational Safety Association NOSA. (2024). Occupational Safety Services. Retrieved from <https://www.nosa.co.za> on 31st July, 2024

Nunfam, V. F., Van Etten, E. J., Oosthuizen, J., Adusei-Asante, K., & Frimpong, K. (2019). Climate change and occupational heat stress risks and adaptation strategies of mining workers: Perspectives of supervisors and other stakeholders in Ghana. *Environmental Research*, 169, 147-155. <https://doi.org/10.1016/j.envres.2018.11.004>.

Nyariki, K. C., & Chirchir, K. M. (2019). Adoption of Occupational Safety and Health Practices Among Health Care Workers in Kenyan Public Referral Hospitals. *American Journal of Health, Medicine and Nursing Practice*, 4(1), 1-17.

Obiorah, C. A. R., Oyegun, C. U., & Ugbebor, J. N. (2019). Safety Practices in the Oil and Gas Industries of the Nigerian Petroleum Sector. *International Journal of Innovative Research and Development*, 8(6). <https://doi.org/10.24940/ijird/2019/v8/i6/jun19079>

Ochieng, C. A. (2018). Implementing occupational health and safety management systems: an analysis of employee capacity gaps at a wind energy establishment in Kenya faculty of arts (Doctoral dissertation, University of Nairobi).

Okoye, P. U., & Okolie, K. C. (2014). Exploratory study of the cost of health and safety performance of building contractors in South-East Nigeria. *British journal of Environmental sciences*, 2(1), 21-33.

Olawuyi, D. S., & Tubodenyefa, Z. (2018). Review of the environmental guidelines and standards for the petroleum industry in Nigeria (EGASPIN). OGEES Institute.

Onwona K. M., Mengistie, B., Ofosu-Anim, J., Nuer, A. T. K., & Van den Brink, P. J. (2019). Pesticide registration, distribution and use practices in Ghana. *Environment, Development and Sustainability*, 21(6), 2667-2691.

Othman, J. (2012). Barriers to Occupational Health and Safety compliance in small and medium enterprises in Malaysia. *Jurnal Teknologi*, 59(190), 189-196.

Quedraogo, M. (2021). Impact of New Mining Technologies on Large-Scale and Artisanal Mining in Burkina Faso. *Policy Commons*. <https://policycommons.net/artifacts/2047096/impact-of-new-mining-technologies-on-large-scale-and-artisanal-mining-in-burkina-faso/2800202/>

Oyewole, A. T., Okoye, C. C., Ofodile, O. C., Odeyemi, O., Adeoye, O. B., Addy, W. A., & Ololade, Y. J. (2024). Human resource management strategies for safety and risk mitigation in the oil and gas industry: a review. *International Journal of Management & Entrepreneurship Research*, 6(3), 623-633.

Partner Africa (PA, 2021). AIM Booklet 2021: Identifying Salient Health and Safety Risks within African Supply Chains. Retrieved from https://aim-progress.com/wp-content/uploads/2024/06/PA_AIM_Booklet_2021-NL.pdf

Petrick, J. A., & Rinefort, F. C. (2012). The Challenge of Managing Safety in Africa. *International Journal of Business and Social Science*, 3(2), 15-23. Retrieved from <https://corescholar.libraries.wright.edu/management/17>

Pillay, M. (2020). Chemicals, noise and occupational hearing health in South Africa: A mapping study. *South African Journal of Communication Disorders*, 67(2). <https://doi.org/10.4102/sajcd.v67i2.693>

Puplampu, B. B., & Quartey, S. H. (2012). Key Issues on Occupational Health and Safety Practices in Ghana: A Review. *International Journal of Business and Social Science*, 3(19). www.ijbssnet.com

Raheem, A. A., & Hinze, J. W. (2014). Disparity between construction safety standards: A global analysis. *Safety science*, 70, 276-287.

Rainforest Alliance (2021). Instructions for Cocoa Groups in Ghana, Côte D'Ivoire, Cameroon, and Nigeria on National Identification Requirements version 3. Retrieved at https://www.rainforest-alliance.org/wp-content/uploads/2021/06/SA-CP-AF-1-V3-Instructions-for-Cocoa-Groups-Ghana-Cote-dIvoire-Cameroon_Nigeria-on-National-Identification-Requirements.pdf

Republic of South Africa (RSA, 2012). Our Future - Make It Work National Planning Commission National Development Plan 2030. Retrieved from https://www.gov.za/sites/default/files/gcis_document/201409/ndp-2030-our-future-make-it-workr.pdf.

Rikhotso, O., Morodi, T. J., & Masekameni, D. M. (2022). The extent of occupational health hazard impact on workers: Documentary evidence from national occupational disease statistics and selected South African companies' voluntary corporate social responsibility disclosures. *Sustainability*, 14(17), 10464.

Rikhotso, O., Morodi, T. J., & Masekamani, D. M. (2022). Occupational health and safety statistics as an indicator of worker physical health in South African industry. *International journal of environmental research and public health*, 19(3), 1690.

Riisgaard, L., Mitullah, W. V., & Torm, N. (2022). Social protection and informal workers in sub-Saharan Africa: Lived realities and associational experiences from Tanzania and Kenya (p. 274). Taylor & Francis.

Rivermate (2024). Cote d'Ivoire Health and Safety Standards. Retrieved at <https://www.rivermate.com/guides/cote-divoire/health-and-safety>

Salhi, M., Chater, Y., & Maurady, A. (2024). The impact of safety culture dimensions on workplace accidents: an application in the Moroccan automotive industry. *International Journal of Occupational Safety and Health*, 14(1), 107-116.

Sabarwal, A., Kumar, K., & Singh, R. P. (2018). Hazardous effects of chemical pesticides on human health—Cancer and other associated disorders. *Environmental toxicology and pharmacology*, 63, 103-114.

Schlünssen, V., & Jones, R. M. (2023). Gender aspects in occupational exposure and health studies. *Annals of work exposures and health*, 67(9), 1023-1026.

Shabani, T., Jerie, S., & Shabani, T. (2023). The impact of occupational safety and health programs on employee productivity and organisational performance in Zimbabwe. *Safety in Extreme Environments*, 5(4), 293–304. Springer International Publishing. <https://doi.org/10.1007/s42797-023-00083-7>

State House. (2018, October 21). Abia State community pipeline explosion: President Buhari expresses regret over loss of lives and property. Retrieved from <https://statehouse.gov.ng/news/abia-state-community-pipeline-explosion-president-buhari-expresses-regret-over-loss-of-lives-and-property/>

Stergiou-Kita, M., Mansfield, E., Bezo, R., Colantonio, A., Garritano, E., Lafrance, M., Lewko, J., Mantis, S., Moody, J., Power, N., Theberge, N., Westwood, E., & Travers, K. (2015). Danger zone: Men, masculinity and occupational health and safety in high risk occupations. *Safety Science*, 80, 213–220. Elsevier. <https://doi.org/10.1016/j.ssci.2015.07.029>

Stuckler, D., Steele, S., Lurie, M., & Basu, S. (2013). Introduction: 'Dying for gold': The effects of mineral mining on HIV, tuberculosis, silicosis, and occupational diseases in southern Africa. *International Journal of Health Services*, 43(4), 639-649.

Smit, N. P. (2020). Environmental legal compliance through self-regulation in the petrochemical industry in South Africa (Doctoral dissertation, North-West University (South Africa)).

Suri, T., & Udry, C. (2022). Agricultural technology in Africa. *Journal of Economic Perspectives*, 36(1), 33-56.

Tagoe, T., & Amponsah-Tawiah, K. (2020). Psychosocial hazards and work engagement in the Ghanaian banking sector: The moderating role of

psychosocial safety climate. *International Journal of Bank Marketing*, 38(2), 310–331. <https://doi.org/10.1108/IJBM-04-2019-0136>

Takala, J., Hämäläinen, P., Sauni, R., Nygård, C. H., Gagliardi, D., & Neupane, S. (2024). Global-, regional-and country-level estimates of the work-related burden of diseases and accidents in 2019. *Scandinavian journal of work, environment & health*, 50(2), 73.

Takala, J., Hämäläinen, P., & Saarela, K. L. (2014). Global estimates of the burden of injury and illness at work in 2012. *Journal of Occupational and Environmental Hygiene*, 11, 326–337.

Takala, J., & Urrutia, M. (2009). Safety and health at work: a European perspective. *Saúde ocup*, (snúmero especial 25 ANOS).

Tawiah, T., Opoku, A., Frimpong, A., & Hafiz, B. (2022). An assessment of knowledge among healthcare professionals on occupational health hazards at New Abirem government Hospital, Ghana. *Asian Journal of Medicine and Health*, 20(10), 153-171.

Thiede, I., & Thiede, M. (2015). Quantifying the costs and benefits of occupational health and safety interventions at a Bangladesh shipbuilding company. *International Journal of Occupational and Environmental Health*, 21(2), 127–136. <https://doi.org/10.1179/2049396714Y.0000000100>

TUC (2017). Personal protective equipment and women. Available at: <https://www.tuc.org.uk/sites/default/files/PPEandwomenguidance.pdf>.

Van Dijk, F. J., Bubas, M., & Smits, P. B. (2015). Evaluation studies on education in occupational safety and health: inspiration for developing economies. *Annals of global health*, 81(4), 548-560.

van Heerden, J. H. F., Musonda, I., & Okoro, C. S. (2018). Health and safety implementation motivators in the South African construction industry. *Cogent Engineering*, 5(1). <https://doi.org/10.1080/23311916.2018.1446253>

van Niekerk, D., & Nemaconde, L. D. (2017). Natural hazards and their governance in Sub-Saharan Africa. In *Oxford research encyclopedia of natural hazard science*.

Umar, T., Egbu, C., Honnurvali, M. S., Saidani, M., & Al-Bayati, A. J. (2019). Briefing: Status of occupational safety and health in GCC construction. *Proceedings of the institution of civil engineers-management, procurement and law*, 172(4), 137-141.

Umeokafor, N., Isaac, D., Jones, K., & Umeadi, B. (2014). Enforcement of occupational safety and health regulations in Nigeria: An exploration. *European Scientific Journal*, 3, 93-104.

United Nations (2020). The 2030 Agenda for Sustainable Development's 17 Sustainable Development Goals (SDGs); 4th SDG Youth Summer Camp – SDG Resource Document. Retrieved from https://sdgs.un.org/sites/default/files/2020-09/SDG%20Resource%20Document_Targets%20Overview.pdf

Vonesch, N., D'Ovidio, M. C., Melis, P., Remoli, M. E., Grazia Ciufolini, M., & Tomao, P. (2016). Climate change, vector-borne diseases and working population. *Annali dell'Istituto superiore di sanita*, 52(3), 397-405.

Wekoye, S. A., Moturi, W. N., & Makindi, S. (2020). Factors contributing to

non-compliance with occupational safety and health practices in the informal non-food manufacturing sector in Kampala, Uganda. *Current Journal of Applied Science and Technology*, 38(6), 1-12.

Wekoye, S. A., Moturi, W. N., & Makindi, S. (2019). Factors Influencing Non-compliance to OSH Practices in the Informal Non-food Manufacturing Sector in Kampala City, Uganda. *Current Journal of Applied Science and Technology*, 38(6), 1-12. DOI: 10.9734/CJAST/2019/v38i630468.

Willig, C., 2013. *Introducing Qualitative Research in Psychology*, 3rd. Edition. Open University Press, Maidenhead

Work Injury Benefits Act (WIBA, 2007). Retrieved at <https://www.treasury.go.ke/wp-content/uploads/2020/11/WIBA-2007.pdf>

World Bank (2020). 2020 State of the Artisanal and Small-scale Mining Sector. Washington, D.C.: World Bank. <https://documents1.worldbank.org/curated/en/884541630559615834/pdf/Delve-2020-State-of-the-Artisanal-and-Small-Scale-Mining-Sector.pdf>

World Bank Group (2022). Angola Country Climate and Development Report on Eastern and Southern Africa. <https://documents1.worldbank.org/curated/en/099150012022242096/pdf/P1769170f457c3010098d30b375aadd937.pdf>

World Bank (2019). Republic Of Cote D'Ivoire: Agricultural Sector Update. Retrieved at <https://documents1.worldbank.org/curated/en/452631564064496467/pdf/Cote-d-Ivoire-Agricultural-Sector-Update.pdf>

World Bank (2018). International Development Association Project Appraisal Document On A Proposed Credit In The Amount Of 56.8 Million Euros (Us\$70 Million Equivalent) To The Republic Of Côte D'ivoire For An E-Agriculture Project. <https://documents1.worldbank.org/curated/en/900251527478271533/pdf/COTE-DIVOIRE-PADnew-05082018.pdf>

World Bank (2021). Labour regulation and social protection for workers in Morocco. Retrieved from <https://documents1.worldbank.org/curated/en/099062123061575432/P16829201d26560b0b65304a38f1d593b2.docx>

World Health Organisation (2023). *World Health Statistics 2023: Monitoring health for the SDGs Sustainable Development Goals*. Geneva: World Health Organisation. License: CC BY-NC-SA 3.0 IGO. Retrieved from https://cdn.who.int/media/docs/default-source/gho-documents/world-health-statistic-reports/2023/world-health-statistics-2023_20230519_.pdf

Xu, M., Nie, X., Li, H., Cheng, J. C., & Mei, Z. (2022). Smart construction sites: A promising approach to improving on-site HSE management performance. *Journal of Building Engineering*, 49, 104007.

Yoroba, F., Kouadio, K., Kouassi, B. K., Doumbia, M., Diawara, A., Bernard, K. D., ... & Tiemoko, D. T. (2023). Evaluating the Impacts of Climate Variability on Cocoa Production in the Western Centre of Cote d'Ivoire during 1979-2010. *Atmospheric and Climate Sciences*, 13(2), 201-224.

Zondo, R. W. (2021). Assessing the effectiveness of an occupational health and safety system in a selected automotive assembly organisation in South Africa. *South African Journal of Economic and Management Sciences*, 24(1), 3553.

alrei
alrei.org
twitter:alrei_iaero



alrei.