

Safety in Gabon's and China's mining industry

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Abstract

This paper provides a comparative analysis of safety challenges and practices in the mining industries of Gabon and China, derived from Chapter 3 of my thesis. Both countries face significant safety issues in their mining sectors, albeit in different contexts due to operational, legal, and cultural differences. Gabon's mining industry, particularly in manganese production, struggles with inconsistent enforcement of safety regulations, inadequate infrastructure, and limited safety training, especially in small-scale operations. In contrast, China's mining sector, one of the largest in the world, has made strides in improving safety through technological advancements and stricter regulations, but still grapples with high accident rates, particularly in coal mining. The paper highlights the unique approaches each country has taken to address safety concerns, including international collaborations in Gabon and technological innovations in China. It concludes that continued efforts in enforcing safety laws, investing in training, and adopting sustainable practices are crucial for ensuring the safety and well-being of mining workers in both countries.

Keywords: Mining Safety; Gabon; China; Safety Regulations; Workplace Safety Culture; Technological Advancements; Mining Accidents; International Collaborations; Safety Training; Regulatory Frameworks

1. Introduction

This paper is derived from "Chapter 3" of my thesis, which focuses on the safety challenges and practices in the mining industries of Gabon and China. Mining is inherently hazardous, and both countries face significant safety issues, albeit in different contexts due to operational, legal, and cultural differences. This chapter provides a comparative analysis of the safety frameworks, challenges, and improvements in the mining sectors of Gabon and China, highlighting the unique approaches each country has taken to address safety concerns. The chapter also offers an overview of the mining sectors in both countries, emphasizing their economic impact, regulatory frameworks, and the opportunities and challenges they face. This paper aims to contribute to the broader discourse on mining safety by providing insights into the safety practices and regulatory environments in two distinct mining landscapes.

2. Safety in Gabon's Mining Industry

Gabon, a Central African nation, is a significant player in the global mining industry, particularly in manganese production. Despite its growing mining sector, safety remains a critical concern. The regulatory framework in Gabon, overseen by the ****National Agency for the Development of Mining (ANM)****, is aligned with international standards, but enforcement is inconsistent due to resource limitations, understaffing, and inadequate safety checks (Dartey et al., 2022). Smaller mining operations often fail to comply with safety regulations, exacerbating the risks.

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2.1. Challenges in Safety Practices

- **Workplace Safety Culture:** A weak safety culture, especially in small-scale mining operations, leads to insufficient safety equipment and inadequate training for workers (Siabi et al., 2022).
- **High-Risk Operations:** Underground mining, common in Gabon, poses significant risks such as rock falls, equipment failures, and exposure to hazardous substances (Joe-Asare et al., 2023).
- **Limited Safety Training:** Workers, particularly in remote areas, lack access to formal safety training programs (Nakua et al., 2019).
- **Resource Limitations:** Poor infrastructure and limited emergency services hinder effective responses to mining accidents (Stewart, 2020).

2.2. Safety Improvements

Gabon is working to enhance safety through collaborations with international organizations like the **International Labour Organization (ILO)** and by strengthening regulatory enforcement. Companies like **Nouvelle Gabon Mining (NGM)** are adopting global safety standards such as **ISO 45001** and implementing safety training programs (Dartey et al., 2022).

2.3. Safety in China's Mining Industry

China's mining industry is one of the largest and most complex in the world, with a long history of safety issues, particularly in coal mining. Despite recent improvements, safety remains a significant challenge due to overcrowded mines, outdated infrastructure, and illegal mining operations.

- **Regulatory Framework and Safety Standards:** China has established strict mining safety laws, including the "Work Safety Law" and the "Mining Safety Law", which outline safety precautions, equipment requirements, and emergency procedures. The "State Administration of Work Safety (SAWS)" oversees compliance, but enforcement has historically been inconsistent (Wang et al., 2021).

3. Challenges in Safety Practices

3.1. Overcrowded and Dangerous Mines

Poorly maintained and overcrowded mines increase the risk of accidents such as gas explosions, fires, and collapses (Zhang et al., 2020).

- **Illegal and Unregulated Mining:** Small-scale and illegal mining operations often operate without proper safety oversight (Liu et al., 2019).
- **High Accident Rates:** Despite improvements, China still experiences a high number of mining accidents, particularly in the coal sector (Chen et al., 2021).

3.2. Safety Improvements

China has made significant strides in improving mining safety through technological advancements such as drone inspections, automated mining systems, and real-time monitoring. The government has also implemented stricter safety regulations, including the closure of small mines, improved ventilation systems, and mandatory worker training programs (Wang et al., 2021).

Table 1 Comparative Overview: Gabon vs. China's Mining Safety

Aspect	Gabon	China
Regulatory Framework	Developing safety laws and regulations	Established laws, but inconsistent enforcement
Safety Culture	Emerging safety culture, especially in larger companies	Improved but still a challenge due to production pressures
Accident Rates	Relatively low but rising with mining growth	High accident rates in certain sectors (e.g., coal mining)

Technological Use	Limited use of advanced technologies	Increasing use of advanced technologies and automation
Workplace Safety Culture	Needs improvement, especially in small mines	Improving, with increasing focus on safety training
Government Initiatives	Active efforts through international partnerships	Strong government focus on enforcement and penalties

3.3. Overview of Gabon's Mining Sector

Gabon's mining sector is a cornerstone of its economy, driven primarily by manganese production, which accounts for "20% of global output" (Eramet, 2021). The country also has significant reserves of gold, iron ore, phosphates, and bauxite. The mining sector contributes "10-15% of Gabon's GDP" and provides substantial employment opportunities. However, the sector faces challenges such as inadequate infrastructure, regulatory inconsistencies, and environmental concerns.

3.4. Government Policies and Initiatives

The Gabonese government has implemented policies to attract foreign investment and promote sustainable mining practices. The Gabonese Mining Code, revised in 2015, offers tax incentives and aims to balance economic growth with environmental protection (Gabon Ministry of Mines, 2015).

3.5. Challenges and Opportunities

Infrastructure constraints, particularly in remote mining areas, hinder the sector's growth. However, opportunities exist in diversifying into gold, bauxite, and phosphate mining, as well as investing in sustainable mining practices (Dartey et al., 2022).

4. Overview of China's Mining Sector

China is the world's largest producer and consumer of minerals, including coal, iron ore, copper, gold, and rare earth elements. The mining sector is vital to China's industrialization, energy production, and global trade.

4.1. Key Minerals and Resources

- **Coal:** China produces over 50% of the world's coal, primarily used for power generation and steel production (Zhang et al., 2020).
- **Iron Ore:** Despite large domestic reserves, China is the world's largest importer of iron ore due to its steel industry's demands (Liu et al., 2019).
- **Gold:** China is both the largest producer and consumer of gold globally (Chen et al., 2021).
- **Rare Earth Elements:** China dominates global rare earth production, essential for high-tech industries (Wang et al., 2021).
- **Economic Impact:** The mining sector contributes significantly to China's GDP and employs millions of workers. However, the sector faces challenges such as environmental degradation, safety issues, and overcapacity in coal mining (Zhang et al., 2020).
- **Government Policies and Regulations:** The Chinese government has implemented reforms to modernize the mining sector, including consolidating small mines and enforcing stricter environmental regulations. Chinese mining companies are also expanding internationally to secure resource supplies (Liu et al., 2019).

4.2. Health and Safety Issues in Gabon's Mining Sector

Gabon's mining sector faces significant health and safety challenges, particularly in small-scale and artisanal mining operations. The use of cyanidation in gold extraction and the proximity of mining operations to communities introduce new risks (Joe-Asare et al., 2023). The government is working to improve safety through regulatory frameworks and international collaborations, but challenges such as inadequate training, poor infrastructure, and illegal mining persist (Dartey et al., 2022).

4.3. Worker Injury Statistics and Safety Regulations in Gabon

Accurate data on mining accidents in Gabon is scarce, making it difficult to assess the full extent of safety issues. However, the country has established a comprehensive regulatory framework to address health and safety concerns,

including the Minerals and Mining Act and the Workmen's Compensation Act. Mining companies are required to submit operational plans, emergency response plans, and regular reports to ensure compliance with safety standards (Gabon Ministry of Mines, 2015).

5. Conclusion

Both Gabon and China face significant safety challenges in their mining sectors, but their approaches to addressing these issues differ due to their unique operational, legal, and cultural contexts. Gabon is making progress in improving safety through international collaborations and regulatory reforms, while China has leveraged technological advancements and stricter government regulations to reduce accidents. Continued efforts in both countries to enforce safety laws, invest in training, and adopt sustainable practices will be crucial to ensuring the safety and well-being of mining workers.

This paper, derived from **Chapter 3** of my thesis, provides a comprehensive analysis of the safety challenges and practices in the mining industries of Gabon and China, offering valuable insights for policymakers, industry stakeholders, and researchers.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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