

Analyzing Impacts of Illegal Stone Mining: A Comprehensive Approach to Accidents Prevention and Protocol Development

Dampuru VNS Pavan Kumar¹, Prof. Dr Kamal Kant Sharma²,
Dr. Inumula Satyanarayana³, P Rajender⁴

¹Research Scholar, Department of Mining Engineering, Sangam University, Rajasthan, India

²Professor, Department of Mining Engineering, Sangam University, Rajasthan, India

³Director, Director General of Mines Safety, Rajasthan, India

⁴Research Scholar, Department of Mining Engineering, Sangam University, Rajasthan, India

Abstract:

Accident in stone mining is a significant concern, concerning human lives and environmental degradation. This research explores the key objectives contributing to accidents and how illegal mining activities in stone mines are being a part of that and identifies the safety challenges posed by them. Through a detailed review of existing safety protocols and their effectiveness, current investigation proposes strategies for enhancing safety in stone mining operations, focusing on reducing accidents and enhancing overall safety practices. Research outcomes highlight significance of stricter enforcement of regulations, adoption of advanced technologies, and better stakeholder collaboration for ensuring well-being of workers and minimizing environmental damage.

Keywords: Illegal mining, stone mines, safety protocols, accident reduction, safety regulations, mining practices, environmental impact.

1. Introduction

Stone mining, an essential industry for infrastructure development, is often accompanied by safety hazards, especially in illegal mining operations. While legal mining follows established safety guidelines, illegal mining bypasses regulations, leading to a heightened risk of accidents. In many cases, these unregulated operations lack the necessary oversight, equipment, or skilled labor for ensuring safe working conditions. This research aims to examine the underlying objectives of illegal mining in stone quarries, assess the current safety protocols in the industry, and propose strategies for reducing accidents and ensuring better safety outcomes.

Mining sector, especially stone extraction, is among most dangerous industries worldwide. According to International Labour Organization (ILO), mining accidents, including fatalities, injuries, and environmental hazards, remain a major issue despite advances in safety technologies. This study also investigates the role of illegal mining in exacerbating safety concerns in stone mines.

In India, where illegal stone mining is prevalent, particularly in the states of Rajasthan, Haryana, and Uttar Pradesh, Tamil nadu, Karnataka, data from the **Indian Ministry of Labour and Employment**

highlights that over 1,000 mining-related fatalities are reported annually. A large percentage of these fatalities occur in informal mining operations, with stone quarries being one of the highest-risk sectors.

Review of Related Literature:

Impact of Unregulated Mining on Safety D.L. Bouwer & J.J. Kotzé (2019): This study explores the dangers of illegal mining in the African continent, noting that **illegal miners are 3-4 times more likely to be involved in accidents** compared to those working in regulated mines. The authors attribute this difference to lack of safety standards and enforcement of regulations in illegal mining operations.

“The Safety and Health of Illegal Mining” (ILO, 2020): The ILO provides data that shows illegal mining as a leading cause of fatalities in mining sector globally. Their report links the rise of informal and illegal mining activities to increased accidents, with stone quarries being one of the most dangerous sectors.

Health Hazards in Informal Stone Mining: The study "Health Hazards in Informal Mining" by **World Health Organization (WHO, 2018)** points out that workers in illegal stone quarries are frequently exposed to hazardous dust, leading to severe respiratory diseases, including **silicosis** and **asbestosis**. This is a long-term risk, though it's not immediately evident in accident statistics.

A study conducted by **Rathore et al. (2017)** in the state of Rajasthan, one of India's largest sources of stone for construction, showed a higher occurrence of accidents in illegal quarries compared to legally regulated sites. Over **40% of accidents** involved stone block collapses, and another 15% were due to improper blasting techniques.

Brazil and South America: According to research from **ICMM (International Council on Mining and Metals, 2018)**, illegal mining operations in South America, especially in countries like Brazil and Colombia, are heavily associated with accidents. These operations are associated with dangerous methods:

Methodology

The study evaluates impact of illegal mining on the occurrence of accidents in stone quarries. Field data was collected through several articles and magazines and investigations have been made for finding root causes of accidents and their mitigation strategies.

Data Collection:

Surveying stone quarry workers and industry professionals.

Analyzing accident reports obtained from government agencies.

Reviewing case studies pertaining to recent accidents that took place in illegal quarries.

Quantitative Analysis:

Statistical comparison of accident rates in legal vs. illegal quarries.

Risk factor analysis based on different mining techniques used in legal and illegal operations.

Qualitative Analysis:

Interviews or focus groups with workers to understand the safety challenges they face.

Expert opinions given by safety regulators and other scientists.

Results and Discussion

After investigating and analyzing accident statistics and various articles, it has been found that risk factors are higher in illegal stone quarries.

The primary objectives that drive illegal mining are economic gains due to avoidance of taxes, fees, royalties bypassing the regulations, weak enforcement of mining regulations, political influence and also lack of awareness.

The major Risk Factors for Accidents in Illegal stone Mines are Unregulated work environment, poor equipment and infrastructure, inadequate worker Protection, Inexperienced labor force.

Accident Data in Illegal Mining

According to a report by the **International Labour Organization (ILO)**, the informal and illegal mining sector accounts for a disproportionately high number of mining accidents

In India, illegal stone mining is prevalent, particularly in the states of Rajasthan, Haryana, and Uttar Pradesh, Tamil Nadu, Odisha, Madhya Pradesh. According to report from Indian Council of Forestry Research and Education, there are approximately 2,000 illegal stone quarries alone in Rajasthan. Central Pollution Control Board states that there are nearly 40,000 stone quarries in India with only 20% of them being legal. According to data obtained from the **Indian Ministry of Labor and Employment**, over 1,000 mining-related fatalities are reported annually. It observed that **over 30% of mining-related deaths** were associated with unregulated quarries.



Illegal stone quarry located in Tinurnelveli, Tamil Nadu operated at unregulated work environment

Case Studies and Examples

Rajasthan (India): In 2019, illegal stone mining resulted in massive accident where 5 workers lost their lives when a quarry wall collapsed. The lack of proper excavation techniques and the unstable nature of the quarry's structural integrity were identified as key causes of the disaster. This incident brought attention to the widespread dangers of illegal mining in India's stone quarry sector.

Bengaluru (India): In 2021, massive gelatine explosion took place in illegal stone quarry in shivamogga district and took the lives of 7 people. Unauthorized handling of explosives leads to this accident.

Tamilnadu: 2024 Accident happened due to some Sparks in the explosive storeroom inside the quarry in Kariyapatti in Virudhnagar district, three people were killed in this accident. Unauthorized storage of explosives in mines leads to this accident.

Karnataka: 2024- illegal stone quarry at Chikkballapur 07 people were killed due to fall of sides, improper benching of the quarry led to this accident.



Chikkballapur accident due to fall of sides



Shivmogga district accident due to un-authorized handling of explosives



Accident due to sliding of the huge mass at stone quarry in Chittoor District AP

Conclusion:

Based on the identified challenges, several sources point out the unpredictability of accidents in illegal quarries, where safety protocols are often completely ignored.

Regulation and Enforcement:

- Strengthen government regulation and monitoring of quarry operations.
- Implement regular inspections and audits to ensure safety compliance.
- Introduce penalties for illegal mining activities that may cause harm to workers.
- Communication and co-ordination between state and central government departments
- Mandatory risk management plan before obtaining mining lease. Comprehensive planning is necessary to mitigate these risks.
- Avoid granting temporary permit leases without obtaining Environmental Clearance.
- Mandatory to include role of mine safety department to obtaining statutory permissions.

Safety Training and Awareness:

- Offer mandatory safety training programs for all workers in both legal and illegal quarries. For instance, ILO's Safety and Health at Work Report (2019) suggests that up to 80% of mining accidents can be prevented with proper training
- Raise awareness about the dangers of illegal mining, and promote safe mining practices.
- Adequate education awareness Campaigns, seminars, and workshops, should be developed to sensitize employees on potential hazards posed by quarry activities.

Technological Solutions:

- Introduce safer and more efficient mining equipment, especially in areas where traditional strategies are being used.
- Use drones and other technologies to monitor quarry operations remotely.

Community Engagement:

- Promote collaboration between local communities, mining companies, and law enforcement to reduce illegal mining.
- Promote alternative livelihoods and economic activities to reduce dependence on illegal mining.

Improved Infrastructure:

Ensure that quarries have adequate safety infrastructure such as protective barriers, access roads, and first-aid stations.

Regulatory Inspections and Compliance: Regulatory agencies conduct regular inspections of mining operations for ensuring compliance with safety standards. These agencies may impose penalties for non-compliance to encourage adherence to safety protocols.

References:

1. International Labour Organization (ILO), 2020. "Safety and Health in Mining".
2. World Health Organization (WHO), 2018. "Health Hazards in Informal Mining".
3. D.L. Bower & J.J. Kotzé, 2019. "The Impact of Illegal Mining on Safety".

4. ICMM, 2018. "Safety in the Mining Industry: A Regional Perspective".
5. Rathore et al. (2017), "Illegal Mining and Safety in Rajasthan's Stone Quarries".
6. China Mining Association, 2019. "Safety Challenges in Illegal Mining".
7. Gupta, R., & Sharma, P. (2019). Review of Mining Safety Protocols in India. *Journal of Mining Safety and Technology*, 15(2), 105-118.
8. - Mishra, A., & Joshi, S. (2021). Challenges of Illegal Mining and Its Impact on Safety Regulations. *Environmental and Safety Journal*, 12(3), 65-77.
9. - Stone Mining Safety Protocols. (2022). *Mining Industry Safety Guidelines*, Ministry of Labor and Employment
10. *Journals on Mines Safety*
11. *GLS Law Journal*- Abhishek Kumar Gupta India's Battle against illegal stone mining.