ENSURING WORKER SAFETY UNDER THE OCCUPATIONAL SAFETY, HEALTH AND WORKING CONDITIONS CODE, 2020: CHALLENGES IN INDIA'S CHEMICAL AND FIREWORKS INDUSTRIES

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ABSTRACT

Occupational safety and health play a crucial role in modern labour law, especially in high-risk sectors like chemical and fireworks manufacturing. Even though laws such as the Occupational Safety, Health, and Working Conditions Code, 2020 (OSHWC Code) have been introduced, the continued rise in industrial accidents in India shows a clear gap between what the law aims to achieve and how it is actually enforced. This paper examines the key challenges in applying the OSHWC Code within these industries and suggests the need for stronger, more practical, and industry-specific reforms to protect the safety and rights of workers.

The chemical and fireworks industries are naturally risky, as workers often deal with toxic chemicals, flammable materials, and high heat during production. The Occupational Safety, Health, and Working Conditions Code, 2020, was introduced to simplify and update existing labour laws and ensure uniform safety standards across all sectors. However, frequent workplace accidents show a clear gap between what the Code promises and how it is enforced in reality. This research is important not only because it reviews the law itself but also because it focuses on how weak enforcement in these high-risk industries can turn small mistakes into major disasters.

The year 2024 has once again been a grim period for workplace safety in India. Data collected by IndustriALL indicates that by December 10, there were at least 240 reported workplace accidents across the manufacturing, mining, and energy sectors, leading to over 400 deaths and more than 850 serious injuries.[1] The 2024 chemical plant explosion in Gujarat and the repeated accidents in Sivakasi, Tamil Nadu India's fireworks hub highlight deep-rooted weaknesses in workplace safety management. These events reveal a pattern of regulatory complacency, inadequate risk management, and a significant lack of accountability, underscoring the need for a thorough

[1] INDUSTRIAL GLOBAL UNION, *Over 400 Workers Killed in India Due to Workplace Safety Lapses* (Dec. 12, 2024).

legal examination. [2]

India's approach to occupational safety cannot be fully understood without considering the Bhopal Gas Tragedy of 1984. This industrial disaster, which caused the deaths of over 15,000 people and affected many more, shows the severe consequences that unregulated hazardous industries can have on human lives and the environment. Even though laws like the amended Factories Act, 1948 and the Environment (Protection) Act, 1986 were introduced afterward, the enforcement of safety measures has often been reactive, driven more by public outrage than by proactive prevention.

The Bhopal disaster still shapes the mindset of India's legal system, but it is clear that the OSHWC Code has not fully applied its lessons in practice. Although the Code requires regular risk assessments, safety audits, and the appointment of Inspector-cum-Facilitators, its enforcement is weak because there are no clear penalties for non-compliance. Additionally, the term "hazardous processes" is not clearly defined, leading to different interpretations and creating gaps in regulation.

India is a member state of the International Labour Organization (ILO) and has ratified several conventions that establish global benchmarks for workplace safety. Notably, Convention No. 155 (Occupational Safety and Health, 1981) and Convention No. 187 (Promotional Framework for Occupational Safety and Health, 2006) require states to formulate a clear national policy on occupational safety, coordinate enforcement mechanisms, and guarantee worker involvement in safety management.[3] However, India's enforcement of these standards has largely been superficial. This paper recommends specific amendments to the Code to address and rectify these shortcomings.

Keywords: Occupational Safety, OSHWC Code, Fireworks Industry, Chemical Industry, Labour Law, ILO Conventions, Industrial Accidents.

STATEMENT OF PURPOSE

The purpose of this study is to critically examine the implementation of the Occupational Safety, Health and Working Conditions Code, 2020, with specific reference to the chemical and fireworks industries. It evaluates the extent to which the Code achieves its objectives of ensuring workplace safety and preventing industrial accidents. The study highlights the gaps between legislative intent and enforcement realities, emphasizing the consequences of regulatory

[2] THE HINDU BUREAU, *Blast at a Fireworks Unit in Tamil Nadu's Sivakasi,* THE HINDU, May 9, 2024.
[3] *Promotional Framework for Occupational Safety and Health Convention,* ILO Convention No. 187, 45 I.L.M. 404 (2006).

complacency in high-risk sectors.

By analyzing recent industrial disasters, historical precedents such as the Bhopal Gas Tragedy, and international standards under ILO Conventions, the paper aims to identify the deficiencies in India's occupational safety framework and propose pragmatic reforms. The overarching purpose is to advocate for a robust, enforceable, and preventive regulatory system that protects workers' rights and ensures accountability in hazardous industries.

RESEARCH QUESTIONS

1. What are the key provisions of the Occupational Safety, Health and Working Conditions Code, 2020, related to hazardous industries, and how effective are they in practice?
2. What are the primary implementation challenges of the OSHWC Code in the chemical and fireworks sectors?
3. How have historical industrial disasters, such as the Bhopal Gas Tragedy, shaped India's occupational safety laws?
4. How does India's occupational safety framework compare with ILO standards and the regulatory mechanisms of other Asian countries, such as China and Thailand?
5. What legislative and policy reforms are necessary to ensure effective enforcement and worker protection in hazardous industries?

RESEARCH OBJECTIVES

- To closely examine the provisions of the OSHWC Code, 2020, specifically in the context of the chemical and fireworks industries.
- To identify gaps in how the Code is implemented using case studies and real-world data.
- To understand how past events, such as the Bhopal Gas Tragedy, have shaped changes in occupational safety laws.
- To compare India's occupational safety framework with ILO standards and best practices from other countries.
- To suggest legal and policy reforms that focus on stronger enforcement, preventive measures, and accountability.

RESEARCH METHODOLOGY

This study employs a doctrinal and comparative legal research methodology, focusing on

legislative analysis, judicial decisions, and international frameworks governing occupational safety.

1. Data Sources

Primary Sources:

- Occupational Safety, Health and Working Conditions Code, 2020
- Factories Act, 1948 (as amended)
- Environment (Protection) Act, 1986
- Relevant judicial decisions and government notifications

Secondary Sources:

- Research papers, law review articles, books, commentaries, government reports, and policy documents related to occupational safety and industrial regulation.

Comparative Sources:

- International Labour Organization conventions and reports.
- Comparative legal frameworks from countries like China and Thailand that regulate hazardous industries effectively.

2. Data Collection and Analysis

The study relies on secondary data collected from government publications, official ILO databases, legal journals, and verified online repositories. A doctrinal approach is applied to analyze statutory provisions, interpretative case law, and administrative practices. Comparative analysis is conducted to assess how India's enforcement structures differ from international models, particularly in the regulation of hazardous industries.

3. Justification of Method

Doctrinal Method: Appropriate because the research primarily examines legal provisions, statutory interpretation, and judicial reasoning regarding occupational safety regulation.

Comparative Method: Essential to evaluate how other jurisdictions with similar industrial structures address safety enforcement, enabling India to adopt contextually relevant best

practices.

4. Research Hypothesis

This paper hypothesizes that while the Occupational Safety, Health and Working Conditions Code, 2020 was enacted to modernize and unify India's fragmented labour laws, it remains ineffective in protecting workers in hazardous industries like chemical and fireworks manufacturing due to weak enforcement, vague definitions, and poor inter-agency coordination. Despite its progressive objectives, the Code's implementation is hindered by inspector shortages, inadequate training, and limited worker participation. The study assumes that unless the Code is supported by stronger monitoring systems, mandatory liability insurance, and technology-driven safety mechanisms, industrial accidents will persist. Therefore, the paper argues that only enforceable reforms and a preventive safety culture can translate the Code's intent into real workplace protection.

5. Expected Outcome

The research aims to contribute to policy discourse on strengthening occupational safety law in India. It seeks to recommend amendments ensuring preventive regulation, stringent enforcement, and accountability mechanisms consistent with ILO standards.

LEGAL AND HISTORICAL BACKGROUND IN INDIA

The evolution of Indian labour laws is deeply intertwined with the national vision of socio-economic justice and the protection of workers' rights. Since its independence in 1947, India has progressively developed its labour framework in response to industrialization and the changing needs of its workforce. Dr B.R. Ambedkar, as the principal architect of the Indian Constitution, laid the foundation for these legislations on the ideals of social justice and fair working conditions. The post-independence period witnessed the enactment of foundational statutes such as the Factories Act 1948[4], which set the tone for subsequent laws aimed at protecting workers' health, safety, and welfare. The Five-Year Plans that followed prioritized industrial expansion and employment creation, giving rise to several sector-specific legislations including the Plantation Labour Act 1951[5], the Mines Act 1952[6], the Beedi and Cigar Workers

[4] *The Factories Act, 1948,* No. 63 of 1948, GAZETTE OF INDIA.
[5] *The Plantation Labour Act, 1951,* No. 69 of 1951, GAZETTE OF INDIA.
[6] *The Mines Act, 1952,* No. 35 of 1952, GAZETTE OF INDIA.

(Conditions of Employment) Act 1966[7], the Dock Workers (Safety, Health, and Welfare) Act 1986[8], and the Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996.[9]

However, despite this robust statutory architecture, the practical outcomes often fell short due to infrastructural deficiencies, weak monitoring, and poor implementation. The Labour Investigation Committee Report (1946)[10] highlighted that several welfare provisions, including those for worker housing, failed to achieve their intended purpose due to systemic inefficiencies.

The Bhopal Gas Tragedy and Legal Transformation

The Bhopal Gas Tragedy of 1984 marked a watershed moment in India's occupational health and safety regime. The disaster, which claimed over 3,800 lives and injured thousands more, exposed glaring deficiencies in the nation's industrial safety framework. This prompted a comprehensive overhaul of existing laws and the introduction of new measures aimed at ensuring accountability and preparedness for hazardous industries. In response, Parliament enacted the Environment (Protection) Act 1986[11], a comprehensive statute empowering the Central Government to take necessary measures to protect and improve environmental safety, including regulating the handling and storage of hazardous substances.

In M.C. Mehta v Union of India[12], the Supreme Court evolved the doctrine of strict liability, holding that enterprises engaged in hazardous or inherently dangerous industries have an absolute duty to ensure community safety and are liable to compensate victims of any harm, irrespective of negligence. This landmark judgment filled crucial doctrinal gaps in occupational and environmental liability.

Subsequently, the Factories (Amendment) Act 1987[13] expanded the scope of the 1948 Act by incorporating a new chapter on hazardous processes. It mandated pre-employment and periodic medical examinations for employees in dangerous operations and required that a company director be designated as the "occupier," responsible for safety compliance. To further reinforce

[7] *The Beedi and Cigar Workers (Conditions of Employment) Act, 1966,* No. 32 of 1966, GAZETTE OF INDIA.
[8] *The Dock Workers (Safety, Health and Welfare) Act, 1986,* No. 54 of 1986, GAZETTE OF INDIA.
[9] *The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996,* No. 27 of 1996, GAZETTE OF INDIA.
[10] GOVERNMENT OF INDIA, *Report of the Labour Investigation Committee* (1946).
[11] *The Environment (Protection) Act, 1986,* No. 29 of 1986, GAZETTE OF INDIA.
[12] *M.C. Mehta v. Union of India,* (1987) 1 SCC 395 (Ind.).
[13] *The Factories (Amendment) Act, 1987,* No. 20 of 1987, GAZETTE OF INDIA.

regulatory safeguards, the Manufacture, Storage, and Import of Hazardous Chemical Rules 1989[14] were notified under the EPA, prescribing strict standards for the storage, labeling, and transportation of hazardous materials and mandating periodic safety audits and emergency preparedness plans. Another major legislative development was the Public Liability Insurance Act 1991 (PLIA)[15], which required owners of hazardous industries to procure insurance policies to provide immediate relief to victims of industrial accidents. The Act also established the Environmental Relief Fund (ERF) to facilitate compensation disbursement.

The Bhopal Gas Leak Disaster (Processing of Claims) Act 1985[16] enabled the Government of India to represent victims collectively, resulting in a Supreme Court-approved settlement of $470 million against Union Carbide Corporation. Although criticized for inadequacy, this case became a precedent for state intervention in mass torts. In Indian Council for Enviro-Legal Action v Union of India[17], the Supreme Court further developed the principle of absolute liability, strengthening the jurisprudential foundation for environmental and occupational safety, emphasizing that industries engaged in hazardous activities must bear the cost of preventing and remedying harm.

The Occupational Safety, Health and Working Conditions Code, 2020

The Occupational Safety, Health and Working Conditions Code 2020 (OSHWC Code)[18] represents a major reform in India's labour law landscape. It consolidates 13 existing central legislations into a single framework to ensure uniformity, simplicity, and enhanced compliance. The Code aims to align occupational safety standards with modern industrial realities while ensuring robust worker protection.

The Code moves beyond fragmented statutes like the Factories Act 1948 and the Mines Act 1952 by introducing a preventive and risk-based approach. It mandates employers to eliminate workplace hazards, provide safety training, and conduct free annual health checks for employees in specified sectors. Inspectors are empowered to ensure compliance and require prompt

[14] *Manufacture, Storage and Import of Hazardous Chemical Rules, 1989,* G.S.R. 193(E), Ministry of Environment & Forests Notification, GAZETTE OF INDIA.
[15] *The Public Liability Insurance Act, 1991,* No. 6 of 1991, GAZETTE OF INDIA.
[16] *The Bhopal Gas Leak Disaster (Processing of Claims) Act, 1985,* No. 21 of 1985, INDIA CODE.
[17] *Indian Council for Enviro-Legal Action v. Union of India,* (1996) 3 SCC 212 (Ind.).
[18] *The Occupational Safety, Health and Working Conditions Code, 2020,* No. 37 of 2020, GAZETTE OF INDIA.

reporting of occupational diseases and accidents.

From the Factories Act 1948 to the OSHWC Code 2020, India's occupational safety framework has evolved through crises, reform, and judicial intervention. Landmark judgments such as M.C. Mehta (1987) and Enviro-Legal Action (1996) transformed industrial liability principles from fault-based to absolute accountability, embedding safety as a non-negotiable aspect of industrial governance. Yet, despite legislative sophistication, enforcement gaps and bureaucratic inertia continue to hinder the realization of a truly safe and humane workplace environment.

A CRITICAL EXAMINATION OF THE OSHWC CODE, 2020

The Occupational Safety, Health and Working Conditions Code, 2020 (OSHWC Code), Act No. 37 of 2020, received the President's assent on September 28, 2020. The Code aims to combine and revise existing laws related to the safety, health, and working conditions of employees in various establishments, along with all related and incidental matters. This chapter provides a critical analysis of the key provisions of the Code, focusing particularly on its relevance to hazardous industries. It examines important definitions, the responsibilities of authorities, compliance mechanisms, and the penalties prescribed under the law.

The OSHWC Code seeks to establish a comprehensive framework for ensuring workplace safety by bringing together several earlier legislations under one law. According to Section 1(3), the Code "shall not apply to the offices of the Central Government, offices of the State Government, and any ship of war of any nationality." However, an exception applies to contract labor employed through a contractor in these offices, where the relevant government acts as the principal employer. Under the Act, an "establishment" refers to any building, or part of a building, where any industry, trade, business, manufacturing activity, or occupation is carried out.[19]

The terms "Hazardous Processes" and "Industrial Premises" lack precise definitions in the Code. Well-defined and specific meanings of these terms are crucial to effectively regulate and monitor high-risk industries:

Hazardous Process: According to Section 2(za), a "hazardous process" refers to any activity or process connected to the industries listed in the First Schedule of the Code, where, if proper care is not taken, the raw materials, finished or unfinished products, by-products, or wastes could

[19] *The Occupational Safety, Health and Working Conditions Code, 2020,* § 1(3) (No. 37 of 2020) (India).

cause serious harm to the health of workers or result in pollution of the surrounding environment.[20] Although Section 2(za) attempts to define the term "hazardous process," its dependence on subjective expressions like "special care" weakens the enforceability of the provision and leads to varied interpretations among states. Additionally, the absence of specific and measurable safety parameters conflicts with Article 16 of ILO Convention No. 155, which requires the establishment of clear national standards for managing occupational hazards. While Section 2(za) links "hazardous process" to industries listed in the First Schedule and emphasizes the potential for harm if "special care is not exercised," it fails to lay down concrete technical benchmarks or quantitative limits for determining "material impairment" or "pollution." This lack of precision results in ambiguity and uneven enforcement. Hazardous Substance: According to Section 2(zb), A "hazardous substance" means any substance, or any amount of it as specified by the government, that because of its chemical or physical properties or the way it is handled, can cause harm or pose health risks to people, other living beings, property, or the environment.[21] While Section 2(zb) gives a broad definition of "hazardous substance," the absence of a clear list of such substances or specific guidelines for assessing risks creates confusion and uncertainty in regulation, making it harder to ensure consistent compliance.

Industrial Premises: Section 2(zc) of the Code defines "industrial premises" as any place (except private homes) where activities like industry, trade, business, occupation, or manufacturing are generally carried out.[22] The definition of 'industrial premises' in Section 2(zc) is generic, and this vagueness undermines the Code's enforceability, particularly in high-risk sectors requiring nuanced safety distinctions.

The OSHWC Code outlines the duties of Inspector-cum-Facilitators, who are given the following powers under Sections 34 and 35:

A. To enter, inspect, and examine any workplace, machinery, or records.
B. To investigate accidents or hazardous incidents.
C. To ask for and review registers and documents.
D. To collect material samples, issue show-cause notices, and take legal action for violations.
E. To spread awareness and guide employers and employees about the provisions of the

[20] *The Occupational Safety, Health and Working Conditions Code, 2020,* § 2(za) (No. 37 of 2020) (India).
[21] *The Occupational Safety, Health and Working Conditions Code, 2020,* § 2(zb) (No. 37 of 2020) (India).
[22] *The Occupational Safety, Health and Working Conditions Code, 2020,* § 2(zc) (No. 37 of 2020) (India).

Code.

Section 2(k) defines a "Chief Inspector-cum-Facilitator" as an officer appointed under sub-section (5) of Section 34. This role combines both regulatory and advisory responsibilities to help ensure compliance and promote safety awareness. The Code further makes provision for the establishment of Central and State Advisory Boards to make recommendations to governments on issues related to occupational safety and health.[23]

The Code sets out several compliance measures to make sure that hazardous industries function within well-defined safety limits. To begin with, factories and industrial premises must get approval and a license from the designated authority before starting their operations.[24] For facilities engaged in hazardous processes, occupiers are required to disclose detailed information on dangers, health risks, and safety precautions to workers, local governments, and the public.[25] New factories involved in hazardous processes must first go through a site suitability check by a Site Appraisal Committee, which gives recommendations on the safety measures needed. Under Section 80, the occupier has certain duties, such as providing safety equipment, training workers, and ensuring regular medical checkups. Moreover, Section 88 requires State Governments to set maximum exposure limits for chemical and toxic substances used in manufacturing, creating clear and enforceable safety standards.[26]

To strengthen worker empowerment and enhance oversight, the Code gives employees the right to alert both employers and Inspector-cum-Facilitators about any impending danger (Section 84).[27] Furthermore, under Section 4, if an establishment employs 500 or more workers, or in any other situation the government considers appropriate, the employer may be required to form a Safety Committee. This committee should consist of representatives from both the employer and the employees.[28] Collectively, these provisions establish a multi-layered compliance framework that integrates licensing, transparency, proactive site inspections, defined responsibilities of occupiers, exposure control, worker participation, and cooperative safety management.

Although the OSHWC Code provides for penalties in cases of non-compliance, the specific

[23] *The Occupational Safety, Health and Working Conditions Code, 2020,* §§ 16–18 (No. 37 of 2020) (India).
[24] *The Occupational Safety, Health and Working Conditions Code, 2020,* § 74 (No. 37 of 2020) (India).
[25] *The Occupational Safety, Health and Working Conditions Code, 2020,* § 79 (No. 37 of 2020) (India).
[26] *The Occupational Safety, Health and Working Conditions Code, 2020,* § 88 (No. 37 of 2020) (India).
[27] *The Occupational Safety, Health and Working Conditions Code, 2020,* § 84 (No. 37 of 2020) (India).
[28] *The Occupational Safety, Health and Working Conditions Code, 2020,* § 4 (No. 37 of 2020) (India).

details of such penalties for various violations are not included in the sections reviewed here.

While the OSHWC Code, 2020 marks significant progress in unifying India's occupational safety legislation, its real impact will depend largely on the effectiveness and capacity of Inspector-cum-Facilitators. The Code's compliance mechanisms aim to empower workers and strengthen local governance, but their success requires greater awareness and safeguards against retaliation. Ultimately, the Code's effectiveness in high-risk sectors such as the chemical and fireworks industries will rely on robust enforcement, continuous training, and fostering a safety culture that goes beyond mere regulatory adherence. Additionally, Section 2(u) widens the meaning of "employer," covering more people who can be held responsible for non-compliance. It doesn't just include the occupier of a factory but also the owner, agent, or manager of a mine, as well as anyone who has overall control of the establishment's operations.[29]

IMPLEMENTATION GAPS

Despite the statutory consolidation provided by the Occupational Safety, Health and Working Conditions Code, 2020 (OSHWC Code), enforcement failures continue, driven by structural, institutional, and behavioral factors. In India, the chemical and fireworks industries continue to experience frequent accidents, highlighting significant gaps in compliance and the enforcement of safety standards. Even after the passage of the OSHWC Code, recent events highlight chronic failures to prevent disasters resulting from storage infractions, lax supervision, and operator mistakes.[30] A clear example of regulatory failure is the 2024 Tamil Nadu fireworks explosion in Virudhunagar district, where an explosion at the Thirumurugan Fireworks factory destroyed over 25 nearby homes and caused fires that raged for several hours. Official investigations confirmed that the unit was storing chemicals and fireworks in quantities exceeding safety limits. Residents reported illegal nighttime production and had previously petitioned authorities to halt operations, but enforcement remained weak.[31] The incident prompted a government inquiry and financial aid for the affected families, but no immediate preventive measures had been implemented before the disaster.

[29] *The Occupational Safety, Health and Working Conditions Code, 2020,* § 2(u) (No. 37 of 2020) (India).
[30] Kamala Thiagarajan, *'Invisible Suffering': Deadly Risks in India's Fireworks Factories*, GLOBAL HEALTH NOW (Apr. 14, 2025).
[31] Sanjay Kumar, *29 Dead in Explosions at Two Illegal Fireworks Factories in India*, [Publication Name] (Apr. 11, 2025).

For instance, the chemical plant explosion in Deesa, Gujarat, on April 1, 2024, resulted in the tragic deaths of 21 people, including children. Investigations revealed that the plant had been operating without a valid license, as its storage and production permits had expired and renewal applications had been rejected. The explosion was reportedly triggered by the ignition of powdered aluminum. Although the owners were subsequently taken into custody, the incident exposed serious regulatory lapses and a shortage of inspectors, which had allowed illegal operations to continue unchecked.[32]

Such incidents are not isolated. In Sivakasi, Tamil Nadu's major fireworks hub, a series of explosions in 2024 caused multiple fatalities, including one on May 9 that claimed the lives of 10 workers at Sri Sudharshan Fireworks. Investigations uncovered several violations, such as unauthorized sub-leasing of premises, the use of unlicensed chemicals, and the employment of workers beyond the permitted limit. In response, regulators established special inspection units to identify offenders, suspended licenses, and mandated safety training for both owners and workers. However, enforcement remains largely reactive rather than preventive, with authorities typically intervening only after tragedies occur.[33]

Statistics from the National Crime Records Bureau (NCRB) highlight the high risks in the chemical and fireworks industries. NCRB data on occupational accidents show that these industries frequently report deaths and injuries from explosions, poisonings, and improper handling of hazardous chemicals. Commonly cited causes include human error, inadequate training, and a weak safety culture. This suggests that most accidents could be avoided through stricter compliance with safety standards and stronger enforcement. In 2024 alone, at least 240 accidents resulted in over 400 deaths (IndustriALL, 2024).[34]

Experts and workers concur that human error is a leading cause of accidents in high-risk industries. Dr. V. Sriram, a fire safety specialist, states that approximately 99% of explosions in fireworks factories result from improper chemical handling or unsafe work practices. Most employees do not receive formal training in chemical handling, emergency protocols, or safe manufacturing techniques. This training gap is worsened by the employment of unskilled

[32] Sanjay Kumar, *29 Dead in Explosions at Two Illegal Fireworks Factories in India*, CNBC TV18 (Apr. 11, 2025).
[33] Harini M, *10 Workers Killed in Firecracker Unit Explosion in TN's Sivakasi*, THE NEW INDIAN EXPRESS (May 9, 2024).
[34] IndustriALL Global Union, *Over 400 Workers Killed in India Due to Workplace Safety Lapses* (Dec. 12, 2024).

workers, including children and women, particularly in informal units.[35]

Statements from employees collected by media outlets like BBC Tamil reveal a widespread culture of fear and silence. Workers are often hesitant to report safety violations because of threats of dismissal or retaliation. Many are unaware of their rights under the OSHWC Code, including the right to inform employers and authorities about imminent hazards. This lack of empowerment undermines the preventive intent of the Code and allows dangerous conditions to persist. Resistance from employers also poses a significant challenge. Safety is often compromised due to cost-cutting measures, such as overcrowding workplaces, improper storage of materials, and skipping mandatory training. Informal or unlicensed units frequently operate outside regulatory oversight, exploiting loopholes and weak enforcement.

Regulatory authorities face challenges including a shortage of inspectors, limited resources, and divided responsibilities between central and state governments. The Gujarat explosion highlighted how expired licenses and denied renewal applications failed to prevent illegal operations, reflecting enforcement inertia. Similarly, in Tamil Nadu, although special inspection teams were deployed following accidents, many units evade scrutiny by operating covertly or resuming activities shortly after temporary suspensions.

A persistent federal and structural problem is the overlap between central and state inspectorates, leading to confusion and slow responses. While the Central Labour Ministry governs code formulation and national reporting, state-level inspectorates handle on-ground inspections and prosecutions. This division often results in delayed communication, duplication of duties, and absence of coordinated emergency response systems, especially in high-risk sectors such as fireworks and chemicals.

The 2010 chlorine leak, analyzed in a PMC study, highlights shortcomings in emergency preparedness and response. Delays in containment, inadequate evacuation procedures, and poor communication worsened the impact on workers and nearby communities. Such gaps are particularly risky in the chemical and fireworks industries, where accidents can escalate rapidly.[36] The recurring disasters in India's chemical and fireworks industries reveal significant

[35] Faisel T. Illiyas & Shibu K. Mani, *Routine to Rare Risk – A Case Study of Firecracker Explosion Disaster in*, PLOS CURRENTS, vol. 10 (Sept. 2018).

[36] Rakesh Kumar Sharma *et al.*, *Chlorine Leak on Mumbai Port Trust's Sewri Yard: A Case Study*, J. PHARM. & BIOALLIED SCI., vol. 2, no. 3, 2010.

implementation gaps in occupational safety, despite the framework established by the OSHWC Code. Lapses in enforcement stem from inspector shortages, irregular licensing, and a regulatory approach that is reactive rather than preventive. Human errors and inadequate training increase risks, while workers' lack of awareness and fear of retaliation deter hazard reporting. Resistance from employers and the prevalence of unorganized sector operations further hinder compliance.

In the judicial context, the issue of state accountability for industrial accidents remains inadequately defined. The Supreme Court in State of M.P. v. Union Carbide Corp., (1989) 1 SCC 674, highlighted the limits of state capacity in managing industrial safety and compensation frameworks.[37] Similarly, in Occupational Safety & Health Association v. State of Tamil Nadu (Madras HC, 2023), the Court observed that statutory obligations under the OSHWC Code must translate into "functional accountability" through continuous inspection, not post-disaster intervention.[38]

RECOMMENDATIONS FOR REFORM

While the Occupational Safety, Health and Working Conditions Code, 2020 (OSHWC Code) reflects a progressive vision, the recurrence of industrial accidents and insights from global best practices underscore the urgent need for further reforms to ensure the safety of workers in high-risk industries. Drawing from comparative experiences in countries like China and Thailand, policy analysis by PRS Legislative Research, advancements in technology, and the compensation framework under the Public Liability Insurance Act, 1991, this chapter proposes a comprehensive strategy to address existing implementation gaps and enhance worker protection.

China's regulatory transformation of the fireworks industry in Liuyang offers valuable lessons for India. Following a series of fatal accidents, the Chinese government instituted strict licensing requirements, centralized storage for hazardous materials, and mandatory off-site safety training for all employees. The introduction of surprise inspections and electronic tracking systems for chemical inventories significantly reduced illegal operations and improved regulatory compliance. Moreover, the imposition of stringent penalties such as immediate closures and criminal prosecution served as strong deterrents. Together, these

[37] *State of M.P. v. Union Carbide Corp.*, (1989) 1 SCC 674 (India).
[38] *Occupational Safety & Health Association v. State of Tamil Nadu*, (Madras H.C. 2023).

reforms have significantly reduced the number and seriousness of fireworks-related accidents. India could adopt similar measures by enforcing centralized storage, implementing digital inventory tracking, and conducting regular, unannounced inspections of all hazardous manufacturing units, especially in high-risk areas like Sivakasi.[39]

Similarly, the 2023 fireworks factory explosion in Thailand revealed severe regulatory failures, including poor coordination between agencies and weak enforcement of zoning rules. Reuters reported that local authorities were not monitoring compliance in regulated areas, allowing unsafe operations to continue. In response, Thailand established a central safety regulatory body, reinforced zoning requirements, and launched community awareness programs. For India, this highlights the need for a dedicated, independent national monitoring body to oversee hazardous industries, ensure inter-departmental coordination, and promptly investigate violations. This body should have the authority to suspend operations, impose penalties, and mandate corrective actions without bureaucratic delays.[40]

PRS Legislative Research has pointed out key weaknesses in the OSHWC Code, such as its restricted coverage of firms with fewer than ten employees and the absence of clear, uniform minimum safety standards across states. To address these gaps, the Code should be amended to lower the coverage threshold, ensuring that micro and small enterprises, where most workplace accidents occur, are included. The legislation should also establish non-negotiable national minimum safety standards for high-risk industries to reduce ambiguity and prevent regulatory discrepancies between states. Additionally, the requirement for safety committees should extend to establishments with as few as 50 workers in hazardous occupations, thereby promoting broader worker participation and stronger monitoring.[41]

PRS further recommends enhancing the authority and resources of local governments and labor inspectors to enforce safety measures proactively. This involves increasing the number of inspectors, offering specialized training, and leveraging technology for real-time compliance monitoring. The Code should also require regular third-party safety audits, with results published publicly to ensure transparency and accountability.

[39] Lin Xiaoyi, *Liuyang Fireworks Paint World's Sky with Chinese Romance, Tradition and Modernity*, GLOBAL TIMES (Feb. 2, 2025).
[40] *An Explosion at a Fireworks Factory in Rural Thailand Kills about 20 People*, AP NEWS (Jan. 17, 2024).
[41] *The Occupational Safety, Health and Working Conditions Code, 2019*, PRS LEGISLATIVE RESEARCH, (Apr. 24, 2025).

Technological innovation is a key enabler of workplace safety. The *Journal of Safety Research* (2022) highlights the potential of Internet of Things (IoT) solutions for hazard detection in industrial settings. IoT sensors can continuously monitor temperature, humidity, toxic gas levels, and other risk factors, automatically alerting supervisors and workers to dangerous conditions. In the fireworks and chemical industries, such systems can give early alerts for chemical instability, overheating, or gas leaks, enabling quick action before accidents worsen. India should encourage the use of IoT-based safety systems through tax benefits, grants, or mandatory installation in high-risk units. Moreover, the government could set up a centralized digital portal for reporting and analyzing incidents, supporting data-driven policymaking and focused inspections.[42]

The Public Liability Insurance Act, 1991, provides a robust framework for compensating victims of industrial accidents. It mandates that owners of hazardous units obtain insurance to ensure immediate relief in the event of accidents involving hazardous substances, preventing victims from enduring prolonged litigation and promoting accountability among business owners. The Act also establishes an Environmental Relief Fund to address damages caused by hazardous substances. However, implementation and coverage remain inconsistent. The OSHWC Code should be amended to require all employers in hazardous industries to maintain comprehensive liability insurance, with stringent penalties for non-compliance. Establishing a dedicated compensation fund, managed by an autonomous body, would guarantee prompt payment to affected workers and their families. Furthermore, the Code should provide for legal aid and medical rehabilitation for victims, reducing litigation burdens and ensuring timely justice.

Beyond regulatory reforms, fostering a culture of safety is critical. Experiences from Thailand and China show that worker empowerment and community engagement are central to sustained compliance. The OSHWC Code should mandate regular safety training and certification for all workers in hazardous industries, focusing on practical skills and emergency response. Worker participation in safety committees must be meaningful, with whistle-blower protections to allow reporting of violations without fear of retaliation. Public awareness campaigns, supported by government and industry bodies, can further reinforce the importance of safety and shared responsibility. Collectively, these measures can transform the OSHWC Code from a

[42] *5 IoT Solutions for Industrial Safety*, IOT FOR ALL, (Apr. 24, 2025).

declaratory law into an enforceable framework that aligns with global best practices.

CONCLUSION

In conclusion, the Occupational Safety, Health and Working Conditions Code, 2020 marks an important step in unifying and modernizing India's labor safety laws. However, recurring accidents in the chemical and fireworks sectors highlight persistent implementation gaps and the pressing need for comprehensive reforms. Strengthening enforcement by enhancing the capacity of inspectors, leveraging advanced technologies such as IoT for real-time hazard monitoring, establishing uniform national safety standards, and creating robust compensation frameworks are vital to protecting workers. Drawing lessons from international best practices and cultivating a culture of safety and worker empowerment are essential for closing the gap between the law's intent and its practical implementation. The OSHWC Code's success will depend not merely on consolidating laws but on cultivating an institutional culture that prioritizes human life over industrial output, ensuring safer workplaces and safeguarding the rights and dignity of employees in hazardous industries.

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