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Legal Measures for Combating Safety Violations at Construction and Mining Sites in Kazakhstan

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Abstract: Occupational safety in construction and mining requires coordination between preventive, supervisory, organisational, and enforcement mechanisms. This study examined the legal and institutional framework governing occupational safety in Kazakhstan's construction and mining sectors and compared it with selected international approaches through a risk-governance perspective. A comparative legal analysis was conducted using seven common dimensions: employer duties, risk assessment and prevention, worker participation and training, internal monitoring and audit, state inspection and specialised supervision, accident and incident reporting, and enforcement and sanctions. The legal analysis was supplemented by descriptive official statistics on occupational injuries and labour inspection. Kazakhstan combines employer duties, internal occupational safety control, worker participation, state labour inspection, industrial-safety supervision, administrative and criminal liability, and civil compensation. National statistics showed that the number of persons affected by work-related accidents increased from 2,449 in 2022 to 2,670 in 2023 and then decreased to 2,471 in 2024 and 2,328 in 2025. In 2023, mining and quarrying accounted for 20.5% of affected persons and construction for 14.1%. In 2024, state labour inspectors conducted 5,577 inspections and identified 8,122 labour-law violations, including 1,835 occupational safety and health violations. The findings support selective adaptation of international practices, particularly stronger supervisory coordination, internal risk assessment and audit, worker participation and training, and improved digital reporting. Aggregated data do not permit causal attribution of injury trends to individual enforcement measures.

Keywords: Occupational Safety and Health; Industrial Risk Management; Accidents; Safety Violations; Injuries

1. Introduction

Construction and mining are among the industries associated with high occupational risks, as workers in these sectors may be exposed to hazards affecting their health and safety. The prevention of occupational injuries and accidents therefore remains an important issue for enterprises and regulatory authorities. In Kazakhstan, occupational safety and health (OSH) in these sectors is regulated through labour legislation, industrial-safety requirements, state supervision, internal workplace control, and different forms of legal responsibility. However, the existence of an extensive regulatory framework does not by itself indicate how its preventive, supervisory, and enforcement mechanisms operate in practice. This creates a need to examine not only individual legal provisions

but also the way in which different regulatory mechanisms are organised and how they relate to the broader system of occupational risk governance.

A substantial part of the existing legal literature addresses safety violations in construction and mining through the criminal-law and investigative dimensions. Bakishev [1] provides a detailed analysis of the elements of the offence stipulated in Article 277 of the Penal Code of the Republic of Kazakhstan, paying particular attention to qualifying features and difficulties in establishing a causal link between violations of safety rules and socially dangerous consequences. The author also distinguishes between technical and organisational violations. Lakbaev and Nurgaliev [2] examine problems associated with detecting and investigating violations of safety rules resulting in death or grievous harm and identify difficulties in determining the persons responsible when regulatory requirements do not correspond to the actual organisation of work. Sadvakasova [3] considers investigative actions conducted under Article 277, including inspection of the accident scene, seizure of technical documentation, and questioning of specialists, and shows the importance of documenting technical conditions and compliance with established safety requirements. These studies provide detailed insight into post-incident legal response and the attribution of responsibility, but they give less attention to the interaction between preventive duties, internal control, state supervision, and other mechanisms operating before or independently of criminal proceedings.

A second group of studies concerns organisational, procedural, and behavioural aspects of safety compliance. Kirin et al. [4] examine procedures for managing the human factor in open-pit mines and show the importance of procedural control and documentation in compliance with safety requirements. García et al. [5] analyse the role of the OSH plan in construction and show that the existence of such documentation does not by itself ensure adequate preventive control unless it corresponds to the conditions of the particular construction site. Ni et al. [6], using grounded theory and system dynamics, investigate unsafe behaviour among a new generation of construction workers in China and identify interactions between management decisions, organisational conditions, individual characteristics, and compliance with safety requirements.

Institutional and enforcement conditions have also received attention. Adebowale and Agumba [7] examine the relationship between occupational safety regulation and actual production conditions and identify barriers associated with limited supervisory capacity, fragmented regulation, and weaknesses in enforcement. Wang et al. [8] analyse behavioural mechanisms leading to safety violations and show that unsafe actions are influenced by management practices, production demands, and characteristics of the work environment. This body of research indicates that safety violations cannot be reduced to a single legal or behavioural cause: compliance is shaped by the interaction of regulatory requirements, organisational arrangements, technical conditions, supervision, and worker behaviour.

Despite these contributions, the existing literature remains fragmented between criminal-law analysis, investigative practice, organisational safety management, and behavioural research. Less attention has been paid to how preventive employer duties, internal OSH mechanisms, worker participation, state labour control, industrial-safety supervision, legal liability, and compensatory mechanisms operate as parts of a broader regulatory structure in Kazakhstan. In addition, international occupational safety frameworks are often discussed separately, while fewer studies compare them using a common set of regulatory criteria and distinguish between practices that may be adapted to Kazakhstan and institutional arrangements that depend on a specific legal or

administrative context. This gap limits the possibility of assessing the structure of occupational safety governance without reducing the analysis either to individual sanctions or to isolated workplace factors.

To address this gap, the study applies a risk-governance perspective [9]. In this study, risk governance is used to examine how occupational risks are addressed through prevention, monitoring, participation, supervision, reporting, and enforcement rather than through sanctions alone. The framework is operationalised through seven analytical dimensions: employer duties and responsibilities; occupational risk assessment and prevention; worker information, participation, and training; internal monitoring and audit; state inspection and specialised supervision; accident and incident reporting; and enforcement and sanctions. These dimensions provide a common basis for comparing Kazakhstan with the European Union (EU), the International Labour Organization (ILO), the United States (US), and the International Organization for Standardization (ISO) frameworks while recognising that legislation, international conventions, regulatory regimes, and management-system standards have different legal status and institutional functions.

Accordingly, this study aimed to examine the legal and institutional mechanisms governing occupational safety in Kazakhstan's construction and mining sectors and to compare them with selected international regulatory approaches using a consistent analytical framework. The study also describes recent patterns in official occupational injury and labour-enforcement data and considers which elements of international practice may be relevant to the Kazakhstani context and which would require legal or institutional adaptation.

The study addressed the following research questions: (1) What legal and institutional mechanisms govern occupational safety in Kazakhstan's construction and mining sectors? (2) What recent patterns are observable in official occupational injury and labour-enforcement data? (3) Which elements of international occupational safety frameworks may be relevant to Kazakhstan, and what legal or institutional adaptation would their application require?

2. Materials and Methods

2.1. Research design and analytical framework

This study employed a comparative legal analysis supplemented by a descriptive analysis of official occupational safety data in Kazakhstan. The study focused on the legal and institutional mechanisms used to prevent and address occupational safety violations in the construction and mining sectors and compared these mechanisms with selected international regulatory and management frameworks. The empirical component was descriptive and focused on patterns in official occupational safety and enforcement data.

The comparative analysis was guided by the risk-governance perspective introduced in the theoretical framework [9]. For operational purposes, the regulatory systems were examined according to seven common analytical dimensions: (1) employer duties and allocation of occupational safety responsibilities; (2) occupational risk assessment and prevention; (3) worker information, participation, and training; (4) internal monitoring and audit; (5) state inspection and specialised supervision; (6) accident and incident reporting; and (7) enforcement mechanisms and sanctions. These dimensions were applied consistently to Kazakhstan and to the selected EU, ILO, ISO, and US frameworks. No numerical scoring or ranking of jurisdictions was performed.

2.2. National legal and policy sources

The national legal analysis was based on the current Labour Code of the Republic of Kazakhstan [10], the Code of the Republic of Kazakhstan No. 235-V “On Administrative Infractions” [11], the Penal Code of the Republic of Kazakhstan [12], and the Law of the Republic of Kazakhstan No. 188-V “On Civil Protection” [13].

The analysis focused on provisions concerning employer occupational safety obligations, occupational risk prevention and assessment, accident reporting and investigation, state inspection and supervision, industrial safety requirements, and administrative and criminal liability for non-compliance. Article 277 of the Penal Code was examined specifically in relation to violations of safety rules during mining or construction works [12].

The Concept of Safe Labour of the Republic of Kazakhstan for 2024-2030 was additionally examined as a national policy document reflecting the current development of risk-oriented occupational safety management, monitoring, prevention, and state control [14]. As a policy document, the Concept was analysed separately from binding statutory provisions.

2.3. International comparative sources

The international comparative component included Directive 89/391/EEC [15], which establishes the general EU framework for OSH, together with two sector-specific instruments: Directive 92/57/EEC on temporary or mobile construction sites and Directive 92/104/EEC on surface and underground mineral-extracting industries [16, 17].

Relevant ILO instruments included the Occupational Safety and Health Convention, 1981 (No. 155) [18], the Safety and Health in Construction Convention, 1988 (No. 167) [19], and the Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187) [20]. Their ratification status for Kazakhstan was verified through the ILO NORMLEX database [21]. The Safety and Health in Mines Convention, 1995 (No. 176) [22] was also examined because of its direct relevance to mining safety; however, as Kazakhstan has not ratified this Convention, it was used only as an external comparative benchmark and not as part of Kazakhstan’s binding international obligations.

ISO 45001:2018 [23] was included as an OSH management-system standard rather than as a legislative or enforcement instrument. Its provisions were considered in relation to occupational risk assessment, internal monitoring, worker participation, audit, and continual improvement.

For the US, construction and mining regulation were examined separately. Construction safety was represented by the Occupational Safety and Health Administration (OSHA) regulations under 29 CFR Part 1926 [24]. Mining-specific requirements were examined through the Mine Safety and Health Administration regulatory framework under Title 30 of the Code of Federal Regulations. The selected provisions covered miner training and retraining (Parts 46 and 48) [25, 26], accident notification and reporting (Part 50) [27], safety and health standards for surface and underground metal and non-metal mines (Parts 56 and 57) [28, 29], and mandatory safety standards for underground coal mines (Part 75) [30].

The selected international sources represent different types of regulatory instruments, including supranational legislation, international labour conventions, national sector-specific regulations, and a voluntary management-system standard. They were therefore compared in terms of regulatory mechanisms and functions rather than treated as directly equivalent legal systems.

2.4. Coding framework for safety violations

A four-category framework was used to organise the types of safety violations identified in the legal documents and supporting literature: technical, technological, organisational, and behavioural violations [6, 10, 31, 32].

Technical violations were defined as deficiencies relating to the condition, conformity, maintenance, or safe use of equipment, machinery, protective systems, or personal protective equipment. Technological violations referred to deviations from prescribed production processes, operating procedures, or established work methods. Organisational violations included deficiencies in supervision, training, staffing, documentation, work organisation, or internal safety management. Behavioural violations referred to individual non-compliance with established safety procedures or unsafe actions during work activities.

The four categories were used as a qualitative analytical framework for organising examples identified in legal and documentary sources. They were not used to estimate national prevalence rates because the available official statistics do not provide incident-level data classified consistently according to these four categories.

2.5. Data compilation

The descriptive empirical component was based exclusively on publicly available aggregated official statistics. Data on work-related accidents were obtained from publications of the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan for 2023, 2024, and 2025 [33, 34, 35].

These publications were used to compile the annual national number of persons affected by work-related accidents for 2022-2025. The 2023 publication was additionally used to obtain the reported sectoral shares for mining and quarrying and construction.

Labour-inspection and enforcement data were obtained from the Ministry of Labour and Social Protection of Population of the Republic of Kazakhstan [36]. The selected 2024 indicators comprised the number of inspections conducted, labour-law violations detected, OSH violations identified, orders issued to employers, and administrative fines imposed.

For data extraction, each indicator was recorded together with its reporting year, institutional source, unit of measurement, and population coverage. National occupational injury statistics and labour-inspection indicators were treated as separate datasets because they differ in coverage and do not provide a common enterprise- or incident-level identifier.

2.6. Analytical procedures

The empirical data were analysed descriptively. Annual counts were used to characterise changes in the national number of persons affected by work-related accidents from 2022 to 2025. Sectoral percentages were reported as published by the Bureau of National Statistics and were used to contextualise the contribution of mining and construction to the national occupational injury profile.

Labour-inspection indicators were reported as absolute counts. Orders issued to employers and administrative fines imposed were treated as separate reported indicators and were not converted into proportions of inspections or violations because the official source does not establish that these categories are mutually exclusive.

The empirical analysis was descriptive; no correlation, regression, or other inferential modelling was applied. Changes in occupational injury counts were therefore interpreted as temporal patterns rather than as effects of inspection frequency, sanctions, or other individual enforcement measures.

The comparative legal analysis was qualitative and document-based. Each national and international framework was examined using the common analytical dimensions specified in Section 2.1. The analysis identified similarities and differences in regulatory design and mechanisms relevant to risk prevention, monitoring, reporting, enforcement, and organisational safety management. Questions of the practical transferability of international approaches to Kazakhstan were considered in the Discussion rather than treated as empirical effects.

2.7. Analytical scope and methodological constraints

The empirical component was based on aggregated official statistics and was therefore interpreted at the national descriptive level. The occupational injury and labour-inspection datasets do not provide enterprise-level linkage between individual inspections, enforcement measures, and subsequent injury outcomes. In addition, the labour-inspection indicators cover national enforcement activity across economic sectors and were used as contextual indicators rather than as construction- or mining-specific measures. Accordingly, the analysis focused on descriptive patterns and did not seek to estimate causal effects of individual enforcement measures.

3. Results

3.1. Comparative characteristics of occupational safety regulatory frameworks

For the purposes of this study, safety violations were considered as instances of non-compliance with legal, regulatory, procedural, or organisational requirements intended to protect workers from occupational risks. In accordance with the coding framework described in Section 2.4, such violations were organised into four analytical categories: technical, technological, organisational, and behavioural (Figure 1) [6, 10, 31, 32].

Examples of construction-related violations identified in the regulatory and supporting literature include improper use of personal protective equipment, non-compliance with requirements for work at height, unsafe operation of machinery and lifting equipment, insufficient instruction, and inadequate supervision [10, 31]. In the mining context, relevant examples include non-compliance with requirements relating to ventilation, mine atmosphere monitoring, machinery and equipment, ground or support conditions, work procedures, and the handling of hazardous materials [22, 25, 26, 27, 28, 29, 30]. These examples illustrate the analytical categories used in the study and should not be interpreted as estimates of their national prevalence.

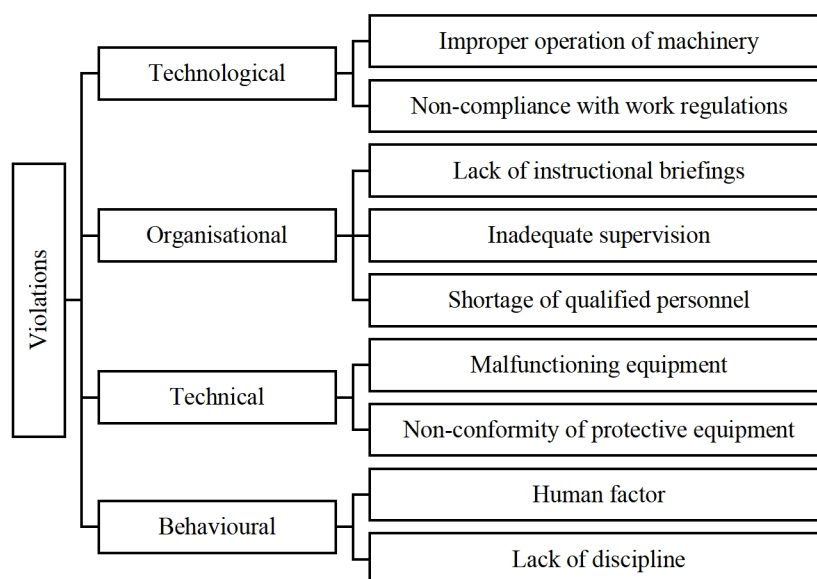


Figure 1. Classification of safety rule violations at construction and mining sites.

Source: compiled by the authors based on Labour Code of the Republic of Kazakhstan [10], Safety and Health in Mines Convention [22], Safety and Health in Construction Convention [19], Kang and Ryu [31], Rafindadi et al. [32].

The four categories distinguish different sources of non-compliance relevant to occupational safety governance. Technical violations concern the condition or safe use of equipment and protective systems; technological violations concern deviations from prescribed work processes and operating procedures; organisational violations concern deficiencies in supervision, training, staffing, documentation, or internal safety management; and behavioural violations concern individual non-compliance with established safety procedures. The categories therefore provide a common structure for examining how different regulatory frameworks address occupational risks.

The comparative legal analysis showed that the selected frameworks address broadly similar areas of occupational safety governance but do so through different legal and institutional arrangements. In Kazakhstan, the Labour Code places duties on employers to assess occupational risks, implement preventive measures, train employees, and provide appropriate protective measures [10]. It also provides for internal occupational safety control and employee participation in workplace safety arrangements. The Concept of Safe Labour for 2024-2030 further identifies the development of risk-oriented occupational safety management and monitoring as a national policy direction [14]. Importantly, these policy objectives were distinguished from requirements already established in binding legislation.

Within the EU, Directive 89/391/EEC establishes general principles of prevention, employer responsibility for occupational risk assessment, worker information and training, and worker consultation and participation [15]. These general principles are supplemented by sector-specific requirements. Directive 92/57/EEC addresses temporary and mobile construction sites, including coordination of safety responsibilities and safety and health planning, whereas Directive 92/104/EEC establishes specific minimum requirements for surface and underground mineral-extracting industries [16, 17].

The US framework was considered separately for construction and mining because these sectors are subject to different federal regulatory structures. OSHA regulations under 29 CFR Part 1926 establish construction-specific requirements concerning employer safety programmes, workplace

hazards, training, equipment, and job-site safety measures [24]. Mining is regulated through the MSHA framework under Title 30 CFR, including mandatory requirements for miner training, accident notification and reporting, and safety standards for different types of mines [25, 26, 27, 28, 29, 30]. This distinction avoids treating OSHA construction regulation and MSHA mining regulation as a single regulatory system.

ISO 45001:2018 differs from the statutory frameworks because it is an OSH management-system standard rather than a state enforcement regime [23]. It structures organisational safety management around hazard identification, assessment of occupational risks, worker participation, operational controls, internal audit, incident review, and continual improvement. It therefore provides an organisational management benchmark rather than a system of public inspection or legal sanctions.

The ILO conventions were used as cross-cutting international benchmarks rather than as a separate jurisdiction in the comparison. Conventions No. 155, No. 167, and No. 187 provide reference points concerning national occupational safety policy, preventive responsibilities, construction safety, and systematic improvement of occupational safety governance [18, 19, 20]. Convention No. 176 was considered specifically as a mining-safety benchmark, while its non-ratified status in Kazakhstan was taken into account [22].

Table 1. Comparative characteristics of occupational safety regulatory frameworks.

Analytical criterion	Kazakhstan	EU	US construction (OSHA)	US mining (MSHA)	ISO 45001
Employer duties	Statutory duties to provide safe working conditions, assess occupational risks, train workers, and implement protective measures	General preventive duties under Directive 89/391/EEC, supplemented by sector-specific duties	Employer responsibility for compliance with construction safety requirements and maintenance of safety programmes	Mine-operator obligations under mandatory sector-specific safety standards	Organisational responsibilities defined through the OH&S management system
Risk assessment and prevention	Occupational risk assessment and preventive measures required by labour legislation; further risk-oriented development set out in the 2024–2030 Concept	Explicit risk assessment and general principles of prevention	Hazard-specific preventive requirements and regular job-site safety inspections	Mandatory technical and operational safety controls adapted to mining activities	Hazard identification, risk assessment, operational controls, and continual improvement
Worker participation and training	Mandatory training; employee participation through occupational safety mechanisms	Information, consultation, participation, and training required	Construction-specific safety instruction and training requirements	Mandatory miner training and retraining under Parts 46 and 48	Consultation and participation of workers form part of the management system

Analytical criterion	Kazakhstan	EU	US construction (OSHA)	US mining (MSHA)	ISO 45001
Internal monitoring and audit	Internal OSH control and workplace monitoring provided for in labour legislation	Employer documentation and preventive management within national implementation	Regular inspections of job sites, materials, and equipment by competent persons	Operational examinations, records, and sector-specific monitoring requirements	Internal audit, performance evaluation, management review, and corrective action
State inspection / external oversight	State labour control and specialised industrial-safety supervision	Implemented and supervised through competent authorities of Member States	Federal OSHA inspection and enforcement framework	Federal MSHA inspection and enforcement framework	No state inspection function; external certification is separate from regulatory enforcement
Accident / incident reporting	Statutory notification, investigation, recording, and reporting of work-related accidents	Accident records and reports required within the framework of EU and national implementation	OSHA recordkeeping and reporting framework applies alongside construction standards	Part 50 establishes mine accident notification, investigation, reporting, and recordkeeping requirements	Incident investigation and corrective action within the organisation; no statutory external reporting regime
Enforcement and sanctions	Administrative and criminal liability under national legislation, alongside corrective supervisory measures	Enforcement and sanctions operate through Member State legal systems	Regulatory inspections, citations, and penalties under the federal OSHA framework	Regulatory inspection and enforcement under the federal mine-safety framework	No public-law sanctions; conformity is addressed through organisational controls and, where applicable, certification

Source: compiled by the authors based on the Labour Code of the Republic of Kazakhstan [10], Law of the Republic of Kazakhstan “On Civil Protection” [13], Concept of Safe Labour of the Republic of Kazakhstan for 2024-2030 [14], Directives 89/391/EEC, 92/57/EEC, and 92/104/EEC [15, 16, 17], ISO 45001:2018 [23], 29 CFR Part 1926 [24], and 30 CFR Parts 46, 48, 50, 56, 57, and 75 [25, 26, 27, 28, 29, 30].

The comparison identifies several common elements across the selected frameworks. Employer responsibility, preventive measures, worker training, and mechanisms for monitoring compliance are present in all of them, although their legal form and institutional implementation differ. Kazakhstan combines statutory employer obligations, internal occupational safety control, public supervision, and an emerging policy emphasis on risk-oriented management. The EU framework combines general prevention principles with sector-specific requirements and formal worker participation. The US frameworks rely on separate sector-specific federal regulation for construction and mining, while ISO 45001 concentrates on the internal management cycle of an organisation rather than public enforcement.

The comparison also shows that direct equivalence between these frameworks would be inappropriate. ISO 45001 is a management-system standard, EU directives establish requirements to be implemented through Member State law, US construction and mining operate under distinct regulatory regimes, and Kazakhstan combines labour and industrial-safety legislation with national policy instruments. The findings therefore provide a structured basis for assessing specific regulatory mechanisms and their potential relevance to Kazakhstan.

3.2. Legal and institutional mechanisms of occupational safety enforcement in Kazakhstan

The legal and institutional framework for occupational safety in Kazakhstan combines state labour control, specialised industrial-safety supervision, internal occupational safety mechanisms, worker participation, and differentiated forms of legal responsibility. These mechanisms operate under different legal bases and address different aspects of compliance rather than constituting a single enforcement channel.

State control over compliance with labour legislation, including OSH requirements, is exercised by state labour inspectors under the Labour Code of the Republic of Kazakhstan [10]. Their functions include monitoring compliance with labour legislation and protecting employees' rights to safe working conditions. At the organisational level, the Labour Code also provides for internal occupational safety mechanisms and employee participation through occupational safety councils and technical inspectors, who may participate in workplace inspections and accident investigations [10].

Industrial safety at hazardous production facilities is subject to a separate supervisory framework under the Law of the Republic of Kazakhstan "On Civil Protection" [13]. This framework is particularly relevant to mining and other hazardous industries. State supervision in this area covers compliance with industrial-safety requirements at hazardous production facilities and applies risk-based inspection mechanisms. The separation between labour inspection and industrial-safety supervision reflects the different regulatory objects involved: labour inspectors focus on compliance with labour and occupational safety requirements, whereas industrial-safety authorities supervise technical and operational safety at hazardous production facilities.

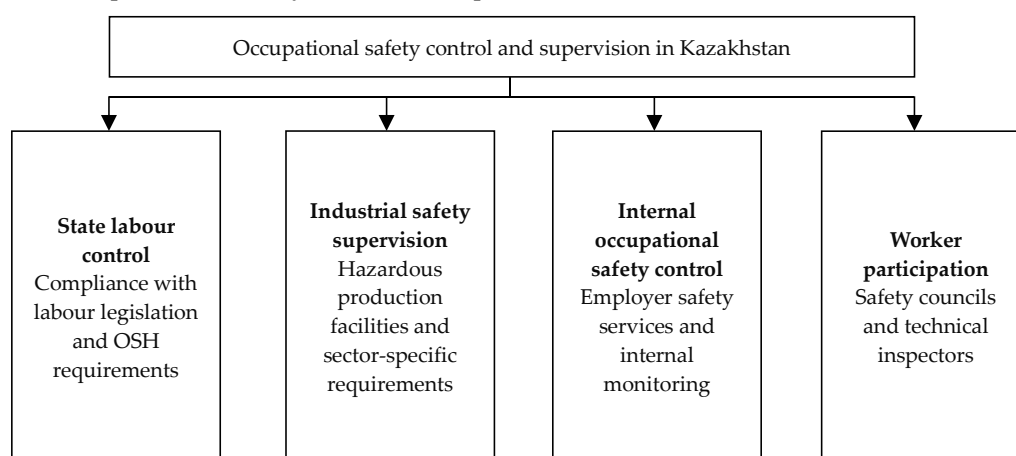


Figure 2. Main occupational safety control and supervision mechanisms in Kazakhstan.

Source: compiled by the authors based on the Labour Code of the Republic of Kazakhstan [10] and the Law of the Republic of Kazakhstan "On Civil Protection" [13].

The legal framework also provides several distinct mechanisms for responding to non-compliance (Table 2). Administrative liability applies to specified breaches of labour and occupational safety legislation. The Code on Administrative Infractions, for example, establishes liability for failures relating to occupational safety instruction and documentation, workplace certification, investigation of work-related accidents, and notification of such accidents [11]. These provisions primarily operate through monetary penalties and other administrative enforcement measures.

Criminal liability has a narrower scope and is linked to consequences expressly defined in criminal law. Article 277 of the Penal Code applies to violations of safety rules during mining or construction works that negligently result in grievous or medium-gravity harm to health, the death of a person or other grave consequences, or the death of two or more persons [12]. The severity of the criminal penalty therefore depends on the consequences specified in the Article rather than on a general distinction between “minor” and “serious” safety violations.

Civil-law compensation constitutes a separate remedial mechanism. The Civil Code provides for compensation where injury is caused to a person’s life or health, including harm sustained in the performance of contractual or official duties [37]. This mechanism concerns compensation for harm rather than regulatory punishment and should therefore be distinguished from administrative and criminal sanctions.

Table 2. Legal and enforcement mechanisms relevant to occupational safety violations in Kazakhstan.

Mechanism	Legal basis	Scope / trigger	Responsible authority or actor	Main legal response
State labour control	Labour Code of the Republic of Kazakhstan [10]	Compliance with labour legislation and occupational safety requirements	State labour inspectors	Inspection, preventive control, orders and other measures within statutory competence
Industrial-safety supervision	Law “On Civil Protection” [13]	Compliance with industrial-safety requirements at hazardous production facilities	Authorised industrial-safety bodies	Inspection and supervisory/corrective measures provided by industrial-safety legislation
Administrative liability	Code on Administrative Infractions [11]	Specified violations of labour and occupational safety requirements, including failures in instruction, documentation, accident investigation or reporting	Competent administrative authorities	Administrative fines and other measures established by the Code
Criminal liability	Penal Code, Article 277 [12]	Violation of mining or construction safety rules resulting in statutorily defined harm or grave consequences	Criminal justice authorities / courts	Fine, corrective or community work, restriction or deprivation of liberty, and possible restriction on holding certain positions or activities
Civil compensation	Civil Code of the Republic of Kazakhstan [37]	Harm to life or health, including harm arising in the performance of employment or other contractual duties	Employer / liable person, with disputes determined under civil law	Compensation for lost income and specified expenses resulting from injury
Internal and worker-participation mechanisms	Labour Code of the Republic of Kazakhstan [10]	Ongoing workplace occupational safety management and internal control	Employer, occupational safety services, occupational safety councils and technical inspectors	Internal monitoring, participation in inspections and accident investigation, proposals for corrective action

Source: compiled by the authors based on the Labour Code of the Republic of Kazakhstan [10], Code of the Republic of Kazakhstan No. 235-V “On Administrative Infractions” [11], Penal Code of the Republic of Kazakhstan [12], Law of the Republic of Kazakhstan No. 188-V “On Civil Protection” [13], and Civil Code of the Republic of Kazakhstan [37].

The comparison of these mechanisms shows that occupational safety governance in Kazakhstan operates through several legally distinct layers. Preventive and internal mechanisms address workplace risk management before or independently of formal liability, while state labour and industrial-safety supervision provide external control. Administrative and criminal liability address legally defined forms of non-compliance, whereas civil-law provisions provide compensation for harm. The Concept of Safe Labour for 2024-2030 adds a policy-level emphasis on risk-oriented management and monitoring but does not replace the binding statutory mechanisms described above [14].

Accordingly, the Kazakhstani framework combines prevention, internal monitoring, external supervision, enforcement, and compensation within separate legal and institutional mechanisms. These findings describe the structure of the regulatory framework; they do not, by themselves, establish the relative effectiveness of individual enforcement mechanisms.

3.3. Descriptive trends in occupational injuries and labour enforcement in Kazakhstan

Official statistics were used to describe recent trends in work-related injuries in Kazakhstan. According to the Bureau of National Statistics, the number of persons affected by work-related accidents increased from 2,449 in 2022 to 2,670 in 2023 and then decreased to 2,471 in 2024 and 2,328 in 2025 (Table 3) [34, 35]. These figures represent national data across economic activities and are therefore used to characterise the general occupational injury context rather than construction- and mining-specific totals.

Table 3. Number of persons affected by work-related accidents in Kazakhstan, 2022-2025.

Year	Number of persons affected
2022	2,449
2023	2,670
2024	2,471
2025	2,328

Source: compiled by the authors based on official data from the Bureau of National Statistics of the Republic of Kazakhstan [34, 35].

The sectoral distribution for 2023 shows that mining and quarrying accounted for 20.5% of persons affected by work-related accidents, while construction accounted for 14.1%. Both sectors therefore represented substantial shares of the national occupational injury burden during the reporting year [33].

Data from the state labour inspection system provide a separate indication of the scale of regulatory enforcement activity. In 2024, state labour inspectors conducted 5,577 inspections and identified 8,122 violations of labour legislation, including 1,835 violations related to OSH. Employers received 3,326 orders, and 3,548 administrative fines were imposed (Table 4) [36].

Table 4. Selected labour-inspection and enforcement indicators in Kazakhstan, 2024.

Indicator	Number
Inspections conducted	5,577
Violations detected	8,122

Indicator	Number
OSH violations	1,835
Orders issued to employers	3,326
Administrative fines imposed	3,548

Source: compiled by the authors based on official data from the Ministry of Labour and Social Protection of Population of the Republic of Kazakhstan [36].

The indicators in Table 4 refer to national labour-inspection activity and are not limited to the construction and mining sectors. The reported counts are presented separately and are not converted into proportions of inspections or violations. The injury statistics and inspection data describe the scale and recent dynamics of occupational injuries and regulatory enforcement in Kazakhstan. Because these data are aggregated and observational, they do not establish a causal relationship between inspection or enforcement activity and changes in occupational injury outcomes.

4. Discussion

The legal analysis indicates that occupational safety governance in Kazakhstan is based on several distinct mechanisms rather than on a single system of sanctions. Employer duties, internal occupational safety control, worker participation, state labour inspection, specialised industrial-safety supervision, administrative and criminal liability, and civil compensation perform different regulatory functions. Viewed through the risk-governance framework [9], these mechanisms relate to the prevention and identification of occupational risks, monitoring of compliance, regulatory response, and organisational adjustment. This perspective is more appropriate for the present analysis than evaluating the system primarily through the severity of penalties, because the legal framework addresses occupational safety both before and after a violation or accident occurs.

Previous studies support the need to consider enforcement together with preventive and organisational mechanisms. Buha et al. [38] examined the role and economic implications of regulatory authorities in construction and emphasised the importance of inspection and planning in controlling safety violations. Hong and Oh [39], in their analysis of the Serious Accidents Punishment Act in the construction sector, considered the relationship between legal liability, preventive management, internal corporate governance, and employee training. Fan et al. [40] similarly examined the interaction between regulatory enforcement, penalties, and voluntary safety management systems, indicating that formal enforcement operates alongside organisational safety-management mechanisms. A systematic review by Dyreborg et al. [41] further shows that occupational accident prevention involves a range of organisational, behavioural, and technical interventions rather than a single type of regulatory response. Al-Naser and Al-Tabtabai [42] approached safety violations from another perspective, showing that non-compliance may affect project schedules and costs as well as occupational safety. These studies indicate that formal liability is only one element of safety governance and that its practical significance depends on the preventive and organisational arrangements within which it operates.

The classification used in the present study also reflects the multidimensional nature of occupational safety violations. Technical, technological, organisational, and behavioural categories distinguish different forms of non-compliance, but they should not be regarded as isolated causes of accidents. Machfudiyanto et al. [43], using association rule mining in the construction sector, identified links between unsafe behaviour, the non-use of personal protective equipment, violations associated with work at height, and organisational shortcomings. Boadu et al. [44] likewise showed

that compliance with OSH requirements may be affected by inspection capacity, organisational practices, and staff training. This supports the use of a classification that incorporates both individual and organisational dimensions. At the same time, the official Kazakhstani data analysed in this study do not provide sufficient detail to determine the national prevalence of each category. The classification is therefore used as an analytical framework for examining regulatory coverage rather than as an empirical ranking of the causes of occupational accidents.

The descriptive statistics provide a separate view of the occupational safety context. National statistics show an increase in the number of persons affected by work-related accidents in 2023, followed by a decline in 2024 and 2025 [34, 35]. This change represents a temporal pattern in the national statistics, but the available data do not support attributing the decline after 2023 to inspections, administrative penalties, or any other individual enforcement measure. The substantial shares reported for mining and quarrying and for construction in 2023 further confirm the relevance of these sectors to occupational safety policy [33]. Both sectors therefore remain important areas for occupational safety regulation and preventive policy. The broader occupational consequences associated with mining work are also reflected in Erdesov [45], who examined disability and labour adaptation among workers in the mining industry.

The 2024 labour-inspection data similarly indicate substantial enforcement activity at the national level [36]. These figures demonstrate the scale and variety of enforcement activity, but they do not measure the effectiveness of particular sanctions. The available sources do not link individual inspections or enforcement measures with subsequent occupational injury outcomes, and the inspection indicators cover economic activities beyond construction and mining. The results therefore describe regulatory activity without establishing a causal relationship between enforcement intensity and changes in injury rates.

Evidence from other national settings reinforces the distinction between the existence of legal requirements and their implementation in practice. Li et al. [46], examining the development of coal-mine safety in China, emphasised the role of technical controls, inspection, employee training, and preventive management within a broader safety system. Chinweze et al. [47] showed, in the Nigerian context, that the existence of occupational safety legislation does not by itself ensure effective compliance when institutional oversight is insufficient. Ismail and Ramli [48] identified management support, training, and organisational safety culture as important components of workplace safety, while Liao and Hsieh [49] treated violations of technical and professional standards as problems that may have systemic rather than purely individual causes. The importance of organisational safety culture is also reflected in the Kazakhstani mining context by Ensebaeva et al. [50]. Claxton et al. [51], using a multiple-stakeholder perspective, likewise emphasised the organisational and stakeholder dimensions of OSH culture. These studies support an interpretation of occupational safety regulation in which legal provisions, organisational capacity, supervision, and workplace practices are closely connected.

The international comparison in the present study also suggests that foreign regulatory experience should be considered selectively rather than transferred as a complete institutional model. Liu et al. [52], comparing coal-mine safety regulation in China and Australia, emphasised integrated risk management, monitoring, and employee training. Similar functions are reflected in ISO 45001, the EU occupational safety framework, and sector-specific US regulation, although they operate under different legal and institutional arrangements [15, 16, 17, 23, 24, 25, 26, 27, 28, 29, 30]. The

management-system orientation of ISO 45001 is also discussed by Mušicki et al. [53], particularly in relation to the development of OSH management through the ISO 45000 series. Volynets et al. [54] provide a complementary legal perspective on occupational safety within the EU, while Kurmanov et al. [55] examine international approaches to occupational risk assessment specifically in mining facilities. These studies are relevant to the present comparison because they illustrate how preventive and risk-oriented mechanisms operate within different legal and sectoral settings. For Kazakhstan, the most readily adaptable elements are those that can operate within existing enterprise-level structures, including systematic risk assessment, internal audit, worker participation, structured training, incident and near-miss recording, and the use of monitoring results in preventive planning.

Other practices would require regulatory or institutional adaptation. More structured use of risk information in inspection planning, greater consistency in digital incident reporting, clearer information exchange between labour inspection and industrial-safety supervision, and formal feedback from inspection findings into preventive planning could be developed within Kazakhstan's existing regulatory framework. The Concept of Safe Labour for 2024-2030 already identifies risk-oriented occupational safety management and monitoring as national policy directions [14]. This provides a domestic policy basis for further development of these mechanisms rather than requiring the direct transplantation of foreign systems.

By contrast, the institutional division between OSHA and MSHA in the US, the multi-level implementation of occupational safety requirements within the EU, and foreign sanction structures are closely connected to their respective legal and administrative systems. Their direct replication in Kazakhstan would therefore be inappropriate. Their comparative value lies in identifying particular regulatory functions that may be adapted to national conditions. This distinction is important because transferability depends not only on the content of a regulatory measure but also on institutional competence, supervisory capacity, sector characteristics, and its compatibility with existing legislation.

The findings point to several practical directions for further development of occupational safety governance in Kazakhstan. Coordination between state labour control and specialised industrial-safety supervision could be strengthened through more systematic information exchange and the use of inspection findings in preventive planning. The need for effective inter-institutional coordination is also relevant in light of the interaction problems between investigators and state labour inspectors discussed by Kassenova [56] in relation to occupational safety violations. Internal occupational safety mechanisms could be reinforced through regular risk assessment, internal audit, worker participation, and competence-based training, particularly in high-risk enterprises. Regulatory practice could also benefit from clearer criteria for responding to repeated or serious non-compliance, so that corrective measures and formal legal responses are applied according to the nature and consequences of the violation rather than being treated as interchangeable instruments. Kazakhstan-focused legal analyses of labour regulation [57] and liability for offences in the construction sector [58] provide additional national context for considering how preventive obligations and formal legal responsibility are differentiated within the existing legal framework. The emphasis on prevention, organisational learning, and continuous safety improvement is also consistent with the zero-accident vision discussed by Zwetsloot et al. [59].

Digitalisation may support these measures, particularly in incident reporting, monitoring, training, and the analysis of inspection information. In the Kazakhstani mining context, Osipov and

Daumova [60] specifically consider digitalisation as a component of occupational safety development. Electronic incident registers may improve the traceability and availability of safety data, while equipment-monitoring systems and analytical tools may assist in identifying recurring technical or organisational risks. Training platforms may also support the recording and assessment of employee competence. These technologies should, however, be regarded as supporting instruments rather than as measures whose effects on accident rates have been established by the present study. Their practical value will depend on data quality, organisational capacity, and integration with existing supervisory and internal safety procedures.

4.1. Limitations and future research

Several limitations affect the interpretation of the findings. The empirical analysis is based on aggregated official statistics and does not provide enterprise-level linkage between inspections, identified violations, sanctions, and subsequent injury outcomes. The labour-inspection indicators represent national enforcement activity and are not restricted to the construction and mining sectors. Official statistics may also be affected by differences in reporting practices and possible underreporting of occupational incidents. The international comparison includes instruments with different legal status and institutional functions, including national legislation, EU directives, ILO conventions, sector-specific US regulations, and ISO 45001 as a management-system standard. The comparison therefore identifies functional similarities and differences but does not provide a ranking of the effectiveness of the respective regulatory systems.

Future research should examine construction and mining separately using sector-specific and, where available, enterprise-level longitudinal data. Linking inspection history, categories of violations, enforcement responses, and subsequent occupational safety outcomes would provide a stronger basis for assessing the effects of particular regulatory mechanisms. Near-miss data could complement official accident statistics, while interviews with inspectors, employers, occupational safety professionals, and workers could clarify how legal requirements operate in practice and where implementation difficulties occur. If sufficiently detailed longitudinal datasets become available, inferential statistical methods could then be used to test associations between inspection and enforcement patterns and occupational safety outcomes.

5. Conclusions

This study examined the legal and institutional mechanisms governing occupational safety in Kazakhstan's construction and mining sectors through a risk-governance perspective and a structured comparison with selected international frameworks. The analysis shows that occupational safety governance in Kazakhstan is organised through several legally distinct mechanisms, including employer preventive duties, internal occupational safety control, worker participation, state labour inspection, specialised industrial-safety supervision, administrative and criminal liability, and civil compensation. These mechanisms perform different functions and should not be treated as a single system of sanctions. The four-category classification of technical, technological, organisational, and behavioural violations provides a common analytical structure for examining regulatory coverage, but the available data do not support conclusions about the national prevalence of individual violation categories.

The descriptive data indicate that the number of persons affected by work-related accidents increased from 2,449 in 2022 to 2,670 in 2023 and subsequently decreased to 2,471 in 2024 and 2,328

in 2025. In 2023, mining and quarrying accounted for 20.5% of affected persons and construction for 14.1%, confirming the continuing relevance of both sectors to occupational safety policy. Labour-inspection data for 2024 also show substantial enforcement activity, including 5,577 inspections, 8,122 detected labour-law violations, 1,835 OSH violations, 3,326 orders, and 3,548 administrative fines. These indicators describe the scale of occupational injuries and regulatory activity but do not establish that particular inspections or sanctions caused subsequent changes in injury outcomes.

The international comparison indicates that foreign regulatory approaches are most useful when considered at the level of specific functions rather than as models for direct transplantation. Practices such as systematic risk assessment, internal audit, worker participation, structured training, incident and near-miss recording, and the use of monitoring results in preventive planning are compatible with the direction of Kazakhstan's existing occupational safety framework. Other mechanisms, including institutional arrangements used in the US or the multi-level regulatory structure of the EU, require adaptation to national legal and administrative conditions.

For further development of occupational safety governance in Kazakhstan, priority should be given to improving information exchange between state labour control and specialised industrial-safety supervision, strengthening enterprise-level risk assessment and internal audit, supporting worker participation and competence-based training, and establishing clearer criteria for responding to repeated or serious non-compliance. More consistent digital incident and inspection reporting may also improve data traceability and support risk-based preventive planning, provided that digital tools are integrated with existing supervisory and internal safety procedures.

Because the available empirical data are aggregated and do not link individual inspections, violations, enforcement measures, and later injury outcomes, the effectiveness of specific regulatory mechanisms cannot be established from the present analysis. Future research should therefore use sector-specific and enterprise-level longitudinal data to examine construction and mining separately and to assess associations between enforcement practices and occupational safety outcomes more directly.

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