RISK-ORIENTED APPROACH TO SOCIAL GUARANTEES FOR WORKERS IN HAZARDOUS CONDITIONS FOR SUSTAINABLE DEVELOPMENT

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Abstract

This article presents the development and pilot testing of a new model for providing social guarantees to employees engaged in hazardous and/or dangerous working conditions in the Republic of Kazakhstan, based on a risk-oriented approach. The study addresses the limitations of the current compensatory system and proposes a proactive mechanism for determining the types and volumes of guarantees according to the level of occupational risk.The research methodology included regulatory analysis, professional risk assessment, field measurements of harmful and dangerous workplace factors, and visual monitoring at ten enterprises across various regions of Kazakhstan. For the first time, a comprehensive classification of occupational hazards was applied to determine differentiated guarantees based on workplace-specific risk parameters. The model incorporates indicators such as individual occupational risk scores, historical data on workplace injuries and occupational diseases, and compliance with labor protection regulations. These indicators form a basis for calculating the degree of risk and corresponding guarantees for each professional group. The study used empirical data from over 2,400 occupations and included a comparative analysis of enterprises in the chemical, mining, and transportation industries. The results demonstrate a high prevalence of harmful exposures (ranging from 50% to 80% of working time), confirming the relevance of automation and preventive strategies. The model provides a structured mechanism for calculating social guarantees, including additional paid leave, reduced working hours, and financial compensation, adapted to the severity of working conditions. The proposed model aligns with the national Safe Labor Concept for 2024–2030 (Government of Kazakhstan, 2023) and reflects international labor standards, including ILO Conventions No. 155 and No. 187 (ILO, 1981; ILO, 2006). The novelty of the approach lies in the introduction of a standardized, automated, and scalable methodology that enhances worker protection through targeted social guarantees and risk-based workplace regulation. The study offers practical tools for government agencies, employers, and researchers in the field of occupational safety and health.

Keywords: occupational risk assessment, social guarantees, hazardous working conditions, risk-based approach, additional leave, reduced working hours, compensations, social policy.

I. Introduction

Amid deepening socio-economic transformations, accelerating technological changes, and increasing differentiation in working conditions, the issue of determining the scope of social guarantees for workers engaged in arduous, hazardous, and/or dangerous jobs is acquiring particular significance. The constantly evolving production environment requires new approaches to the regulation of working conditions, compensations, and benefits aimed at protecting workers operating in high-risk environments. The main challenge lies in the need to shift from outdated,

universal, and often inefficient schemes of providing guarantees toward more flexible, scientifically grounded, and economically rational systems.

For decades, many countries have applied list-based approaches, wherein predefined lists of occupations and industries served as the basis for assigning guarantees such as additional leave, reduced working hours, wage supplements, and pension benefits. While this approach offers a certain degree of administrative simplicity, it fails to reflect the actual working conditions and the extent of exposure to hazardous and dangerous factors. As a result, situations may arise where workers holding identical positions but working in different environments receive the same guarantees despite facing varying levels of occupational risk. This leads to both injustice and inefficiency in the allocation of resources.

The development of occupational risk assessment (ORA) systems, including those based on international standards such as ISO 45001 and ILO OSH-2001, creates a foundation for introducing risk-based approaches into the system of social protection for workers. Leading international labor organizations, including the International Labour Organization (ILO), the European Agency for Safety and Health at Work (EU-OSHA), and the U.S. National Institute for Occupational Safety and Health (NIOSH), actively promote risk management-based policies. According to these approaches, compensations and benefits should be determined not by professional affiliation or industry sector, but by the specific level of hazard present in the workplace, as objectively identified through workplace assessment procedures.

Thus, there is a pressing need for the scientific development of a methodology that formalizes the process of assigning guarantees based on quantitative and qualitative indicators from occupational risk assessment. Such a methodology should be transparent, reproducible, adaptable to sector-specific contexts, and serve as a practical tool for both state regulation and internal rulemaking by employers.

The aim of this study is to develop a scientifically grounded methodology for determining the scope of guarantees for workers engaged in arduous and hazardous work, based on the results of occupational risk assessment procedures. To achieve this goal, the following objectives are addressed:

- to substantiate the need to transition from a list-based approach to a risk-based approach;
- to review international practices in establishing guarantees that account for occupational risks;
- to develop algorithms and formulas for calculating the volume of guarantees (including leave entitlements, working hours, wage supplements, and pension contributions);
- to propose mechanisms for adapting the methodology to sectoral and regional specificities.

The proposed approach is based on the concept of fair compensation, whereby the amount of granted guarantees depends on the actual degree of workplace hazard, the duration of exposure, and the time worked under such conditions. It takes into account the class of working conditions as determined by a specialized assessment, the proportion of time worked in adverse conditions, and an overall integrated occupational risk score.

The methodology relies on the use of risk coefficients determined according to the class of working conditions, and a matrix distribution model that enables the differentiation of guarantees based on all influencing factors. Each form of social protection - leave, working hours, wage supplements, and pension contributions - has its own calculation scale and adaptation coefficient.

Unlike existing formalized approaches, the proposed methodology allows for the consideration of dynamic changes in working conditions and enables the prompt recalculation of guarantee volumes in response to improvements or deteriorations in the production environment. This makes it applicable both in the context of current rulemaking (e.g., local regulatory acts and collective agreements) and in the formation of national labor policy.

International experience also demonstrates the effectiveness of using risk-based approaches. For example, Germany has a system of occupational risk insurance in which the amount of contributions depends on the level of hazard in a given industry and enterprise. In France, the

«Compte pénibilité» model is applied, which takes into account the severity and duration of harmful exposures within the pension system. In South Korea, the system of compensation for hazardous working conditions is based on a point-based risk assessment and a formalized guarantee scale. These examples illustrate the effectiveness of integrating occupational risk assessment into social protection systems and can serve as a reference for the development of a national model.

The methodology proposed in this study was pilot tested at several enterprises in the Republic of Kazakhstan, including industrial sites with varying levels of risk. The results of the pilot testing revealed a high degree of adaptability to sector-specific conditions, ease of implementation, and economic efficiency: reductions in excessive compensation costs, increased worker motivation, and improved occupational safety and health indicators. Furthermore, the application of this model contributes to the formation of a new culture of occupational safety, in which each employer is incentivized to reduce risk levels both to ensure worker safety and to optimize expenditures.

Particular attention should be given to the regulatory consolidation of the methodology. Considering the ongoing modernization of Kazakhstan's labor legislation and the implementation of the «Safe Labor Concept for 2024-2030», the adoption of this model could serve as a foundation for revising the mechanisms for granting guarantees within the Labor Code, occupational safety and health regulations, and other normative legal acts. The methodology can also be adapted for implementation by insurance organizations participating in the mandatory workplace accident insurance system and used in actuarial assessments of insurance premiums.

Thus, the present study not only addresses the scientific challenge of developing a quantitative model for determining guarantees but also contributes to the formation of a fair and sustainable occupational safety and health system. The results obtained make it possible to propose concrete tools applicable in the practice of social partnership, labor resource management, collective bargaining, and law enforcement in the field of occupational safety and health.

The development of a methodology for determining the volume of guarantees based on occupational risk assessment opens up opportunities for further research directions. In particular, promising areas include the construction of integrated occupational safety indices at the enterprise and regional levels, the integration of the methodology into digital occupational safety and health management platforms, the creation of monitoring systems for guarantee implementation based on automated solutions, and the development of comprehensive policies to incentivize employers to reduce risks. Furthermore, it is advisable to conduct economic and mathematical modeling of the effects of implementing the proposed methodology at the industry or national level, which would allow for more accurate forecasting of fiscal and social impacts.

II. Literature Review

Modern approaches to the formation of social guarantee systems for workers engaged in hazardous and/or dangerous work are undergoing significant transformation. Leading international organizations and scholars emphasize the need to move away from a universal list-based method toward an individualized system based on occupational risk assessment (Benach et al., 2014; Gallage-Alwis & Weiner, 2022). Such an approach allows for the consideration of actual working conditions, individual risks, and the dynamics of harmful exposure on workers' health, thereby making the system more equitable and economically sustainable.

The French model «Compte pénibilité», cited as one of the successful practices of a risk-based approach, was thoroughly analyzed by Mahieu et al. (2021). The model is built on a point-based system that takes into account the intensity and duration of harmful exposures, and the accumulated points affect eligibility for early retirement and other entitlements. This has helped reduce abuse of the system and redirect resources to the workers who are genuinely in need.

Reports from the European Union bodies and the International Labour Organization (ILO, 2019; EU-OSHA, 2022) emphasize that integrating risk assessment procedures into the policy

framework for providing guarantees significantly reduces the incidence of occupational diseases, lowers public spending, and strengthens employers' motivation to improve working conditions.

For the post-Soviet space, and Kazakhstan in particular, the transition to a risk-based approach remains a pressing issue. As noted by Utepov et al. (2023), outdated methods based on occupational lists still dominate in practice, failing to reflect the actual hazards present in the workplace. This leads to distortions in the system of social guarantees and creates tension between employers and employees.

Particular attention in research is given to the economic aspects of differentiated guarantees. Friedrich & Gathmann (2020) demonstrated that the use of insurance rates based on risk levels leads to a reduction in the number of occupational accidents and incentivizes employers to implement preventive measures against workplace risks. This is further supported by Quadrini (2011), who notes that excessive regulation without consideration of actual risks may exacerbate cyclical fluctuations and contribute to instability in the labor market.

Digitalization plays a significant role in the reform of the guarantee system. The digital workplace monitoring system developed by Kaptanoglu et al. (2020) enables real-time assessment of risk parameters and the adjustment of entitlements accordingly. This approach is particularly applicable to large-scale enterprises and organizations with high staff turnover, where static models prove ineffective.

Mathematical models underlying the assessment of guarantee volumes are explored in the work of Mathur et al. (2021), who proposed an integrated calculation method that takes into account the frequency, intensity, and duration of exposure to harmful factors. Such a formalized methodology allows for an objective calculation of additional leave, wage supplements, reduced working hours, and other entitlements.

Of special importance is the relationship between working conditions, occupational risks, and workers' long-term health. Shahidi & Howard (2019) emphasize that exposure to harmful factors leads to the accumulation of chronic diseases, reduced work capacity, and increased costs for medical and pension provision. This was previously established in the classical work of Leigh (1983), which identified a statistically significant correlation between occupational risk, reduced income, and shortened working life.

In South Korea, according to the study by Kim et al. (2018), a system has been implemented in which the level of workplace hazard influences pension contributions and retirement age. This system is not only equitable but also incentivizes both workers and employers to reduce occupational risks.

From a global macroeconomic perspective, it is also important to consider the influence of financial depth and inclusion on the system of labor guarantees. As demonstrated by Baskaya et al. (2016) and Dabla-Norris & Srivisal (2013), excessive financial burdens on employers-if not aligned with actual risk levels-may become a destabilizing factor for the entire social protection system.

The issue of financial sustainability in social guarantee systems is also examined through the lens of financial accessibility. Studies by Ozili (2020), Čihák et al. (2016), and Sahay et al. (2015) emphasize the importance of maintaining a balance between coverage and the financial capacities of both the state and employers. Without an adequate risk assessment, such a balance cannot be achieved.

Thus, three key development directions in the scientific literature on social guarantee systems clearly emerge:

1.the shift from a formalistic to a risk-based principle grounded in the quantitative assessment of occupational risks;

2.the integration of digital technologies and mathematical models that ensure objectivity and adaptability in social guarantee systems;

3.the international experience of integrating risk assessment into pension, insurance, and labor mechanisms, enabling a balance between social justice and economic sustainability.

The methodology for determining the volume of guarantees proposed in this article, developed on the basis of international best practices and adapted to the specific context of Kazakhstan, represents a scientific contribution to the modernization of the social protection system for workers and may serve as a foundation for further regulatory reforms in the field of occupational safety and health.

III. Materials and Methods

3.1 Methodological basis

The methodological framework of this study is based on a systematic analysis of legal and regulatory acts and statistical sources governing issues related to occupational safety and health, occupational risk assessment, and the provision of social guarantees in the Republic of Kazakhstan. The primary data sources include official statistics from the Bureau of National Statistics under the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan on occupational injuries and work-related illnesses for the period 2014-2023. The analysis of the dynamics of workplace accidents, their severity, and sectoral distribution made it possible to identify critical segments of the labor market characterized by high levels of occupational risk.

The assessment of working conditions is conducted in accordance with the requirements of the national methodology for the Special Assessment of Working Conditions (SAWC), approved by the authorized labor authority. Hygienic standards, which define the maximum permissible levels of exposure to physical, chemical, biological, and psychophysiological factors, serve as the reference scales. Working conditions are classified into four categories based on the degree of deviation from regulatory limits.

The point-based system for assessing working conditions includes the following elements:

- the magnitude of deviation from the permissible exposure limit (in points);
- the duration of exposure (as a percentage of the work shift);
- the identified risk level (high, significant, moderate, acceptable).

Additionally, sectoral and regional coefficients, as well as the frequency and severity of outcomes (accidents, identified occupational diseases), are taken into account in the calculation.

3.2 An approach to occupational risk assessment

The assessment of occupational risk in this study is conducted to quantitatively evaluate the degree of harmful exposure to workplace factors affecting workers' health. Each factor is assigned an integrated risk score, calculated using the following formula:

$$R_i = \sum_{j=1}^{n} w_j * x_{ij}$$

where:

R_i - total risk score at the i-th workplace;

x_{ij} - level of exposure to the j-th factor;

w_j - weighting coefficient representing the significance of the j -th factor,

n - total number of factors being assessed.

Based on the resulting risk score, the corresponding level of occupational risk is determined and classified as acceptable, moderate, high, or extreme. This classification serves as the foundational basis for the subsequent calculation of the volume of social guarantees.

3.3 Calculation of the amount of social guarantees

For the purpose of objectifying the process of granting benefits and compensations based on the degree of risk, a model is proposed in which the volume of guarantees provided to a worker G is a function of the risk level R, the class of working conditions C, the duration of exposure to harmful factors T, and the sectoral coefficient α::

$G = \alpha * f(R, C, T)$

where:

G - the volume of social guarantees provided (including additional leave, wage supplements, reduced working hours, and early retirement);

R - the integrated occupational risk indicator;

C - the class of working conditions as determined by the results of the Special Assessment of Working Conditions;

T - the duration of exposure to harmful factors during the workday (as a percentage);

α - the sectoral and/or regional adjustment coefficient.

Assignment of risk categories and the corresponding volume of guarantees is carried out based on predefined threshold values. For example, employees whose risk scores exceed the established threshold are entitled to an extended package of guarantees, including increased leave duration and higher compensation payments.

3.4 Data sources and structure

To implement the proposed approach, the following resources were utilized:

– Official statistical data on the number of occupational accidents, their severity, and distribution by region and type of economic activity (data from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan for 2014–2024);

– Methodological guidelines for the assessment of working conditions and occupational risks, including evaluation scales and coefficients (based on current regulatory documents of the Republic of Kazakhstan);

– Analytical materials on sectoral and regional differences in working conditions, reflecting the specifics of the production environment and the typical level of occupational risk.

Data processing was carried out in the following areas:

– aggregation of data by year, sector, and region;

– normalization of indicators related to harmful exposure factors;

– construction of risk indices and comparative analysis of working conditions;

– ranking of worker categories by level of social guarantees.

IV. Results

4.1 Duration of Reduced Working Hours and Additional Leave

Modern social and labor policy in Kazakhstan is focused on protecting the rights of workers employed in conditions associated with occupational risks. According to data from the Bureau of National Statistics of the Republic of Kazakhstan, in 2024, the number of workers employed in hazardous and/or dangerous working conditions reached 1,619,995 people. This significant figure underscores the need for a well-founded methodology for determining the scope of social guarantees - one that is oriented not only toward regulatory and sector-specific requirements but also toward a realistic assessment of occupational risks.

As part of this study, an original Methodology for Determining the Volume of Guarantees for Workers Engaged in Arduous, Hazardous, and Dangerous Work was applied. This methodology is based on a point-based assessment system for risk factors, differentiates types of exposures, and takes into account individual worker characteristics and production-specific conditions.

Classical approaches to defining guarantees and compensations are based on the sanitary-hygienic classification of working conditions, as regulated by normative documents. However, such systems often fail to reflect the full scope of risk exposure, as they:

– only record exceedances of maximum permissible concentrations (MPCs) and thresholds;

– do not account for the cumulative and combined effects of multiple factors;

– do not consider individual worker parameters such as age, experience, gender, or sensitivity to harmful exposures.

The application of a risk-based methodology allows for a shift from a static assessment of conditions to a dynamic model in which each workplace scenario is considered as a combination of occupational risk elements.

In the Republic of Kazakhstan, social guarantees for workers engaged in arduous work and in conditions involving hazardous and harmful factors include reduced working hours and additional paid leave, established by the state based on the List of industries, workshops, occupations, and positions with hazardous working conditions. The annual working time balance is used when preparing shift schedules, rotational work schedules, and flexible work arrangements. Payment is made for the actual hours worked within a 36- or 40-hour workweek according to the working time accounting schedule. Employers independently determine the work schedules for shifts and rotational work, based on the requirements of labor legislation.

The working time balance reflects the standard number of working hours by month and accounts for limitations imposed by the 36- and 40-hour workweeks. Particularly strict limits apply to underground work, where working hours must not exceed 6 hours per day.

Social guarantees perform a protective function: by reducing working time and providing additional leave, the system helps limit workers' exposure to harmful factors, supports their well-being, and aids recovery. However, the current scheme is based on a list-based approach, where the same leave entitlement is granted regardless of the actual severity and danger of the job. This supports the research hypothesis that the list-based approach is neither fair nor evidence-based.

Instead, the proposed Methodology introduces a differentiated model based on occupational risk assessment-taking into account the intensity, duration, and actual exposure of the worker to adverse working conditions. This approach contributes to disease prevention and the preservation of workers' health.

For a justified evaluation, the following aspects must be considered:

– Actual working conditions;

– Presence of health risks;

– Results of the occupational risk assessment.

The model is based on Table 1, which links the degree of occupational risk to the duration of additional leave.

Table 1: Model for determining the duration of additional leave depending on the degree of occupational risk

Types of Social Guarantees	Level of Occupational Risk				
	1-Acceptable	2-Low	3-Medium	4-High	5 - Very High
Duration of Additional Leave (in calendar days)	-	6-15 days	9-18 days	15-24 days	18-36 days

Source : Compiled by the authors

Table 1 defines the ranges of leave duration by risk category; however, it does not account for the actual time spent in hazardous working conditions. To ensure a more accurate calculation, Table 2 is introduced, which simultaneously considers both the level of occupational risk and the proportion of time exposed to harmful conditions.

Table 2: Distribution of Additional Leave Duration Based on the Proportion of Time Spent in Hazardous Working Conditions and the Degree of Occupational Risk

The proportion of calendar days in harmful conditions, %	Degree of occupational risk			
	2-low	3-Medium	4-High	5 - Very High
1,00 - 5,00	6	9	15	18
5,01 - 10,00				19
10,01 - 15,00	7	10	16	20
15,01 - 20,00				21
20,01 - 25,00	8	11	17	22
25,01 - 30,00				23
30,01 - 35,00	9	12	18	24
35,01 - 40,00				25
40,01 - 45,00	10	13	19	26
45,01 - 50,00				27
50,01 - 55,00	11	14	20	28
55,01 - 60,00				29
60,01 - 65,00	12	15	21	30
65,01 - 70,00				31
70,01 - 75,00	13	16	22	32
75,01 - 80,00				33
80,01 - 85,00	14	17	23	34
85,01 - 90,00				35
90,01 - 100,00	15	18	24	36

Source: Compiled by the authors

This system provides a transparent mechanism for calculating additional leave by taking into account actual exposure and the corresponding risk category. This is particularly important in the context of modernizing the legislative framework and transitioning toward adaptive mechanisms of social protection.

4.2 Increased wage rate

The wage system is determined by the provisions of the employment contract, collective agreement, and/or employer-issued acts, taking into account the wage conditions established by agreements, employment and collective contracts, and employer acts, as well as the specifics and types of the organization's activities confirmed by the results of ORA.

According to subparagraph 4) of paragraph 5 of Article 153 of the Labor Code of the Republic of Kazakhstan, the minimum values of inter-grade coefficients are established by sectoral agreements.

For the practical application of the tariff-based wage system, the use of professional standards is required; in their absence, qualification and tariff-qualification reference books should be applied.

Professional standards-or, if unavailable, the Qualification Handbook and the Unified Tariff and Qualification Reference Book (UTQRB)-serve as the basis for establishing qualification requirements for employees and are used to address issues related to the regulation of labor relations and the implementation of an effective human resource management system.

The classification of workers employed in various sectors of economic activity is carried out in accordance with the UTQRB based on eight wage grades. For employees (non-manual workers), grading is determined by organizations using the Qualification Handbook (QH).

When developing a wage scale, it is essential to ensure that it provides for the distribution of workers according to the complexity and intensity of labor, working conditions (confirmed by the results of ORA), and qualification level.

In this regard, a clear procedure must be established for determining the minimum wage rate for a first-grade worker, including those engaged in arduous work or work with hazardous and/or dangerous conditions. This should be stipulated in the collective agreement or an employer's act, taking into account sectoral coefficients that classify working conditions by degree of harmfulness and danger, as defined in the relevant sectoral agreement.

Thus, the application of various wage systems depends on the specifics of the technological process and forms of work organization.

In addition to the base wage rate (or official salary), in order to differentiate employee efforts, assess the quality of their work, enhance material incentives, and increase labor productivity, supplements and allowances are granted based on working conditions.

These supplements and allowances are divided into two types: compensatory and incentive-based.

Compensatory supplements include payments for combining job roles, expanding service areas or performing the duties of temporarily absent employees, as well as for working in arduous, hazardous, and/or dangerous conditions, for mentoring, and for overtime work under piece-rate payment systems, among others.

These wage conditions apply specifically to workers whose employment in arduous or hazardous conditions is confirmed by the results of occupational risk assessment (ORA).

In certain economic sectors, when concluding sectoral agreements-which are binding on all employers-a unified procedure for establishing supplements for workers engaged in arduous and hazardous work is set in accordance with subparagraph 4) of paragraph 5 of Article 153 of the Labor Code of the Republic of Kazakhstan. When collective agreements are concluded, their provisions are determined by the parties in accordance with the general, sectoral, and regional agreements signed.

In the collective agreement, employment contract, and/or employer's regulatory act, the amounts of supplements must be clearly differentiated based on working conditions, taking into account the results of ORA and the specific nature of the organization. These documents must reflect the real difference compared to the remuneration of employees working in normal conditions.

Furthermore, these documents must clearly define, in compliance with legislative requirements:

– the criteria for assigning specific supplements and allowances by personnel category;

– the quantitative and qualitative indicators upon which such payments are based;

– the conditions under which the payment of certain supplements and allowances may be suspended or terminated.

Wages under summarized working time accounting are paid based on the actual number of hours worked, as recorded in the working time log. In this case, wages are calculated using an hourly wage rate, derived from the base wage (official salary) and the monthly standard of working time according to the working time balance for the corresponding calendar year.

For the analysis of compensatory payments for work under hazardous and/or dangerous conditions across economic sectors, data from the Bureau of National Statistics of the Republic of Kazakhstan were used, including tables on the Real Wage Index for 2024. Based on these data, average wage supplement coefficients were calculated across types of economic activity (Table 3).

The calculated coefficients reflect current differences in the level of compensatory payments across economic sectors and can serve as a reference point for revising wage regulations under conditions of harmful exposure. For example, the elevated coefficient for the «Electricity, gas, and steam supply» sector (1.2006) may be taken into account when planning wage budgets in energy companies, while the coefficient for «Information and communication» (1.2134) may be used when analyzing digital workload and occupational burnout levels.

Table 3: Wage coefficients by type of economic activity

Economic Activity	Bonus Coefficient (k)
Agriculture, forestry and fishing	1.1622
Industry (total)	1.1259
Mining and quarrying	1.1035
Manufacturing	1.1323
Electricity, gas, steam and air conditioning supply	1.2006
Water supply; sewerage; waste management and remediation activities	1.2166
Construction	1.0448
Wholesale and retail trade; repair of motor vehicles and motorcycles	1.1227
Transportation and storage	1.1217
Accommodation and food service activities	1.0683
Information and communication	1.2134
Financial and insurance activities	1.2166
Real estate activities	1.1964
Professional, scientific and technical activities	1.1355
Administrative and support service activities	1.0000
Public administration and defense; compulsory social security	1.0598
Education	1.0555
Human health and social work activities	1.0576
Arts, entertainment and recreation	1.1718
Other service activities	1.0747

Source: Compiled by the authors

These coefficients can also be applied:
– in the development of standard wage guidelines and recommendations,
– in the formation of sectoral agreements and collective bargaining agreements,
– in the justification of social support measures for workers engaged in arduous or hazardous working conditions.

4.3 Mandatory occupational pension contributions

According to Article 250 of the Social Code, mandatory occupational pension contributions to be paid to the Unified Accumulative Pension Fund on behalf of the individuals specified in paragraph 5 of Article 248 of the Social Code are established at a rate of 5 percent of the employee's monthly income used as the basis for calculating such contributions.

Mandatory occupational pension contributions are funds transferred by agents (employers) from their own resources to the Unified Accumulative Pension Fund in favor of employees engaged in work under hazardous conditions, whose occupations are included in the official List of Industries, Jobs, and Occupations with Hazardous Working Conditions.

Mandatory occupational pension contributions are made on behalf of employees whose occupations are included in the "General Occupations" section of the List, regardless of the specific industries or workshops in which they work, provided that these occupations are not explicitly listed in other corresponding sections or subsections of the List.

Employers are required to make mandatory occupational pension contributions payments for employees who have worked in hazardous (or particularly hazardous) working conditions for at least 80% of their working time in a given month.

The OPPC rate refers to the amount the agent is obligated to pay to the Unified Accumulative Pension Fund, expressed as a percentage of the employee's income used for calculating mandatory occupational pension contributions. As of current legislation, the mandatory occupational pension

contributions rate is 5%.

If hazardous working conditions are eliminated-confirmed by the results of workplace certification or ORA - employers (agents) are no longer required to make mandatory occupational pension contributions payments.

Article 79 of the Labor Code of the Republic of Kazakhstan stipulates that working time must be recorded in documents as defined by the employer.

According to subparagraph 19 of paragraph 2 of Article 23 of the Labor Code, employers are obligated to maintain accurate records of working time, including overtime, and work performed under hazardous (especially hazardous), dangerous conditions, or arduous jobs for each employee.

The procedure for the payment of mandatory occupational pension contributions is regulated by Order No. 170 of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan, dated May 24, 2023, «On the Approval of the List of Industries, Jobs, and Occupations of Employees Engaged in Work under Hazardous Conditions, for Whom Agents Shall Make Mandatory Occupational Pension Contributions from Their Own Funds».

4.4 Standards for the provision of milk or equivalent food products, and standards for the provision of specialized dietary (therapeutic and preventive) nutrition

Free distribution of milk or other equivalent food products, as well as dietary (therapeutic and preventive) nutrition, is provided to employees on days when they are actually engaged in work involving hazardous working conditions, caused by the presence of harmful production factors at the workplace as specified in the List of Harmful Production Factors (hereinafter – the List).

Milk or equivalent food products are provided to employees if harmful production factors specified in the List are present in the workplace, and their levels are confirmed by the results of the workplace conditions assessment.

Milk or equivalent food products are to be distributed in specially equipped rooms that comply with officially approved sanitary and hygienic standards. The amount provided is 0.5 liters of milk (3.2% fat content) per shift (during the break), regardless of the shift duration, on days when the employee is actually engaged in work involving the production or use of chemical substances. If the time spent working under harmful conditions is less than the full shift duration, milk is provided only if the employee has worked at least half of the shift under such conditions.

For employees who are medically restricted from consuming milk (as determined by a periodic medical examination and certified by a dietitian), milk may be substituted with other equivalent food products upon the employee's consent. This substitution must be formalized through the collective agreement or an employer-issued act.

Employees who come into contact with inorganic lead compounds must be provided, in addition to milk, with 2 grams of pectin in the form of canned plant-based food products, fruit juices, or beverages enriched with pectin (with actual pectin content indicated by the manufacturer). These products may be substituted with natural fruit juices with pulp in quantities of 250–300 milliliters.

In cases of regular exposure to inorganic compounds of lead, mercury, cadmium, phosphorus, chromium, carbolic acid, as well as hydrocarbons and their derivatives, it is recommended that fermented dairy products be consumed instead of milk. When working in the production and processing of antibiotics, fermented milk products enriched with probiotics (bifidobacteria, lactic acid bacteria) or colibacterin prepared from whole milk should be provided instead of fresh milk.

At the same time, it is important to note that milk is hazardous in cases of poisoning with carbolic acid, hydrocarbons, phosphorus, and their derivatives. When fat-soluble poisons (such as dichloroethane, carbon tetrachloride, gasoline and its derivatives, and many organophosphorus compounds) enter the stomach, the consumption of milk, as well as plant- or

animal-based oils and fats, is strictly contraindicated-these substances enhance the absorption of such toxins and may aggravate the poisoning.

In this regard, the authors recommend that production councils, employers, and trade unions consider replacing milk with specialized beverages with high detoxification activity, provided per shift regardless of its duration, on days when the employee is actually engaged in the production or handling of such substances.

Dietary (therapeutic and preventive) nutrition must be provided to employees before the start of the work shift. In certain cases, it is allowed to distribute dietary (therapeutic and preventive) nutrition during the lunch break, subject to approval by the organization's medical and sanitary unit. For employees working under increased pressure conditions (in caissons, hyperbaric chambers, or performing diving work), dietary nutrition is provided after decompression.

Dietary (therapeutic and preventive) nutrition is provided to employees when harmful production factors are present in the workplace and their levels, based on the results of the workplace conditions assessment, correspond to hazard classes 3 and 4, or are classified as dangerous working conditions.

Retroactive distribution of milk or dietary (therapeutic and preventive) nutrition for past shifts, advance distribution for multiple future shifts, as well as monetary compensation for unclaimed milk or dietary nutrition, is not allowed.

The procedure for the distribution of milk or equivalent food products and/or specialized dietary (therapeutic and preventive) nutrition in the Republic of Kazakhstan is regulated by:

– Order No. 1056 of the Minister of Health and Social Development of the Republic of Kazakhstan, dated December 28, 2015, «On the Approval of Norms for the Distribution of Milk or Equivalent Food Products and/or Specialized Products for Dietary (Therapeutic and Preventive) Nutrition to Employees»;

– Order No. 1054 of the Minister of Health and Social Development of the Republic of Kazakhstan, dated December 28, 2015, which regulates the Rules for the Distribution of Milk or Equivalent Food Products and/or Specialized Products for Dietary (Therapeutic and Preventive) Nutrition, Special Workwear and Other Personal Protective Equipment, and Provision of Collective Protective Equipment and Sanitary Facilities at the Employer's Expense.

To ensure a unified approach to determining the amount of supplements and to enhance the transparency of the wage system across economic sectors, a draft algorithm has been developed for distributing the types and volumes of social guarantees based on the degree of individual occupational risk of the employee, as determined by the results of ORA (Table 4).

The provided coefficients reflect the wage prioritization level across specific sectors, taking into account technological complexity, hazardous working conditions, and occupational risks. At the same time, the actual bonus calculation may be adjusted within collective agreements and employer-issued local acts, subject to mutual agreement between the parties.

For more precise calculations-particularly in industries such as the nuclear sector-a mathematical model is used, which accounts for the level of occupational risk, the proportion of days worked under hazardous conditions, and the total number of working days.

The presented matrix illustrates the relationship between increasing coefficients, the degree of occupational risk, and the number of days worked under hazardous conditions out of a 31-day calendar month.

To refine the approach to coefficient calculation using a specific sector as an example, the following formula is applied to determine the individual increasing coefficient.

Table 4: Matrix for the Allocation of Increasing Coefficients Based on a Risk-Based Approach, Taking into Account the Proportion of Days Worked (out of 31 Calendar Days) in Hazardous Working Conditions

		Degree of occupational risk			
		2 (3.1)	3 (3.2)	4 (3.3)	5 (3.4)
Number of days worked in harmful conditions	1	1,0500	1,0917	1,1333	1,1750
	2	1,0542	1,0958	1,1375	1,1792
	3	1,0583	1,1000	1,1417	1,1833
	4	1,0625	1,1042	1,1458	1,1875
	5	1,0667	1,1083	1,1500	1,1917
	6	1,0708	1,1125	1,1542	1,1958
	7	1,0750	1,1167	1,1583	1,2000
	8	1,0792	1,1208	1,1625	1,2042
	9	1,0833	1,1250	1,1667	1,2083
	10	1,0875	1,1292	1,1708	1,2125
	11	1,0917	1,1333	1,1750	1,2167
	12	1,0958	1,1375	1,1792	1,2208
	13	1,1000	1,1417	1,1833	1,2250
	14	1,1042	1,1458	1,1875	1,2292
	15	1,1083	1,1500	1,1917	1,2333
	16	1,1125	1,1542	1,1958	1,2375
	17	1,1167	1,1583	1,2000	1,2417
	18	1,1208	1,1625	1,2042	1,2458
	19	1,1250	1,1667	1,2083	1,2500
	20	1,1292	1,1708	1,2125	1,2542
	21	1,1333	1,1750	1,2167	1,2583
	22	1,1375	1,1792	1,2208	1,2625
	23	1,1417	1,1833	1,2250	1,2667
	24	1,1458	1,1875	1,2292	1,2708
	25	1,1500	1,1917	1,2333	1,2750
	26	1,1542	1,1958	1,2375	1,2792
	27	1,1583	1,2000	1,2417	1,2833
	28	1,1625	1,2042	1,2458	1,2875
	29	1,1667	1,2083	1,2500	1,2917
	30	1,1708	1,2125	1,2542	1,2958
	31	1,1750	1,2167	1,2583	1,3000
for 36 hours a week	%	3,89%	4,81%	5,74%	6,67%
for one hour of work	%	0,11%	0,13%	0,16%	0,19%

Source: Compiled by the authors

Sectoral increasing coefficients kkk are calculated using the following formula:

$$k = \left(\frac{k_{max} - k_{min}}{2}\right) \times \left(\frac{i-2}{3} + \frac{j-1}{N-1}\right)$$

where:

- k_{min} и k_{max} - lower and upper bounds of sectoral inter-grade coefficients;
- i - occupational risk level indicator;

- j - number of days worked under hazardous conditions out of N total working days.

Example.

Let us assume that it is necessary to determine the increasing coefficient for workers in the nuclear industry.

According to the formula mentioned above, the desired coefficient is calculated as follows.

$k = 1{,}05 + \left(\frac{i-2}{3} + \frac{j-1}{N-1}\right)$

This model ensures flexibility in determining wage supplements while maintaining predictability and fairness in remuneration—an especially important factor in industries with high safety standards and qualification requirements.

The application of such a matrix is recommended for assessing fair compensation within the framework of occupational safety and health management systems and for the differentiation of incentive payments.

The national model of occupational safety management in Kazakhstan is based on a compensatory principle, categorizing working conditions as either safe (optimal, acceptable) or unsafe (hazardous and dangerous). This approach partially incentivizes workers to remain employed in unfavorable working conditions.

At the same time, employers are not sufficiently incentivized to improve working conditions, reduce the number of hazardous workplaces, modernize production processes, or introduce automation in production and technology.

From a regulatory policy perspective, there are legal barriers caused by conflicts, gaps, and declarative (non-enforceable) provisions, as well as weak systemic linkages within and across sectors in the national legal framework for social guarantees.

Among the key problematic issues is the unjust nature of the current mechanism for providing social guarantees under the list-based approach, whereby at the same workplace, one employee may be granted benefits while another is not.

Research into existing practices in leading countries with high occupational safety culture has highlighted the relevance of differentiating workplaces based on the degree of occupational risk, where the volume of social guarantees corresponds to the level of risk: high risk – full benefits package.

Taking into account international experience and an analysis of the practical application of labor legislation across enterprises in various sectors, a draft Methodology has been developed for assigning social guarantees to workers employed in hazardous and/or dangerous industries, based on consultations with representatives of both employees and employers (hereinafter – the Methodology).

The Methodology is based on the principles of a new occupational safety ideology, under which the differentiation of workplaces, followed by the provision of personal protective equipment and social guarantees, is carried out according to the degree of occupational risk.

Currently, during the certification of production facilities based on working conditions, a classification is used that establishes whether working conditions are either safe or hazardous and dangerous. This principle will be retained even after the certification procedure is replaced with ORA.

The new approach will rely on differentiating the workplace by the level of occupational risk and the degree of protection the employer is obligated to provide.

The Methodology aims to establish and implement a socially just model (mechanism) for determining the parameters and provision of social guarantees.

The level of protection will vary from the minimum, corresponding to low levels of risk, to the maximum, in cases of very high risk. This new approach implies that both the type and volume of social guarantees will be differentiated based on the degree of occupational risk. A higher level of risk must correspond to a greater volume of social guarantees [1-22].

Regarding the improvement of regulatory policy during the transition period (including the elimination of the certification of workplaces and the full-scale shift to ORA, the gradual phase-out

of the list-based approach, substitution of milk, etc.), it is necessary to develop a dedicated Roadmap for improving the relevant normative legal acts.

V. Conclusions

In sum, the financial analysis underscores a growing prioritization of occupational health and safety across diverse industries. The differences in timing, volume, and category–specific focus point to varying levels of maturity and strategic orientation in safety management, offering valuable insights for policy development, benchmarking, and future enterprise–level planning.

Notably, 2024 marked the first year in which all enterprises began allocating funds to occupational risk assessments and workplace certification, highlighting a sector–wide transition toward more proactive and standardized safety practices, likely influenced by evolving regulatory frameworks.

Altai, while initially exhibiting moderate expenditures, made substantial one–time investments in specific areas—particularly in nutrition and compensation—during 2023, followed by more moderate levels in 2024. This may indicate reactive or restructuring–driven safety financing rather than a sustained programmatic strategy.

Across all three enterprises, there has been a noticeable intensification of investment in key safety domains, particularly in personal protective equipment, compensation for hazardous working conditions, and training. Fosfat maintained a leading position in overall spending, reflecting a robust and systematic approach to occupational safety, with consistently high investments across nearly all categories. Project demonstrated a steady and strategic increase in funding, signaling a long–term commitment to safety infrastructure and workforce support.

Companies that actively invest in OSH achieve lower injury rates, higher labor productivity, and enhanced competitiveness. The identified sectoral specifics emphasize the importance of a differentiated approach to planning and allocating OSH expenditures, which ultimately contributes to the sustainable development of enterprises and the improvement of working conditions.

The analysis of data from five enterprises across various sectors of the economy has made it possible to identify the key characteristics of the modern system of occupational safety and health (OSH) cost accounting within the context of Kazakhstani practice. The findings reveal both common patterns in expenditure allocation and variations driven by industry–specific factors and the internal policies of the organizations.

The expenditure structure demonstrates a high degree of standardization. Across all the analyzed enterprises, the main cost categories include: personal protective equipment, mandatory insurance, employee training and instruction, specialized nutrition, medical examinations, and compensation for hazardous working conditions. This confirms that the regulatory framework for occupational safety and health has a systemic influence on budget formation, and that enterprises – regardless of industry – rely on established expenditure categories.

There is evidence of uneven and unstable financing across certain areas of occupational safety and health. For example, in several cases, a sharp increase or decrease in expenditures was observed for specialized nutrition, sanitary and hygiene facilities, risk assessments, and collective protection measures. This may indicate the project–based nature of many initiatives, a lack of systematic planning, and limited enterprise resources, which affect the consistency and continuity of OSH investments.

Occupational safety and health financing is directly linked to sector–specific risks. In the mining and manufacturing industries, a higher share of expenditures is allocated to protective measures, training, and compensations, reflecting the increased hazards of the production environment. In contrast, in the energy and chemical sectors, the focus shifts toward material support and preventive measures, highlighting differing priorities in managing occupational risks.

Occupational risk assessment and workplace certification remained underrepresented in previous years and only began to appear in reporting from 2024 onward. This indicates a delayed

implementation of legislative requirements and a lack of integration of risk assessment procedures into the overall cost accounting system.

Conclusion. Investments in employee training show a positive trend, which may indicate growing managerial awareness of the importance of preventive measures.

In conclusion, the analysis indicates that while Kazakhstani enterprises generally strive to comply with occupational safety and health regulations, in practice, cost accounting is often fragmented and lacks completeness. The findings derived from the analysis of actual data will be further applied in Chapter 3 to develop recommendations for enhancing the occupational safety and health cost accounting system.

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CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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