



ECONOMIC
AND TECHNICAL
ENGINEERING

Scientific and practical journal "Economics and technical engineering"

Founders: State University of Economics and Technology

ISSN: 3041-1246

E-mail: ete@duet.edu.ua Journal homepage: <https://ete.org.ua>

JEL: J18,H70

DOI: 10.62911/ete.2026.04.01.12

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Citation:

Fedusov, I & Ushakova, L. (2026). Occupational safety management in mining and metallurgical complex: public administration aspect. Scientific and practical journal "Economics and technical engineering". Vol.4 No.1 (2026), 143–154. <https://doi.org/10.62911/ete.2026.04.01.12>

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Abstract: Article is devoted to the study of conceptual foundations and practical mechanisms of public administration of occupational safety in the mining and metallurgical complex (MMC) of Ukraine, taking into account the need for their institutional decentralization. It has been found that under martial law, management of technogenic and industrial safety goes beyond the purely corporate responsibility of business entities and is transformed into an issue of national and regional security. Critical analysis of existing centralized model of state supervision was carried out, in particular the unification of control functions of State Labor Service of Ukraine into multi-regional interregional departments. It has been found that for such highly concentrated industrial agglomerations as Kryvyi Rih Territorial Community, such an approach leads to a dispersion of administrative attention, a loss of industry specificity, and a critical decrease in efficiency of responding to emergencies. Based on the principle of subsidiarity, a new polycentric governance model is proposed. It provides for institutional deconcentrating through the creation of a local specialized territorial hub of State Labor Service exclusively for the MMC enterprises of the basin, as well as direct delegation of part of preventive and control powers regarding technogenic safety to local self-government bodies.

Received: 19/06/2026

Accepted: 24/06/2026



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Introduction

Current stage of development of Ukraine's national economy and public administration system in general is characterized by a deep conceptual transformation of approaches to ensuring industrial, environmental and technogenic safety. Mining and metallurgical complex (MMC) has traditionally remained one of the basic industries of our state. Even in conditions of macroeconomic instability, it not only forms a significant share of gross domestic product and export revenue, but also concentrates a colossal array of high-risk facilities. For a long time, in domestic scientific thought and management practice, issues of occupational safety management were considered mainly in a narrow sense – as an element of internal corporate human resources management, technical regulation, and the sole responsibility of employer (*On occupational safety: Law of Ukraine, 1992*). However, unprecedented scale of production processes, their deep spatial and social integration into the life of large territorial communities, as well as the inevitable growth of technogenic risks, is driving an urgent need to change management paradigm. (*Bek, 2020*). There is a transition from understanding of "occupational safety at a separate isolated enterprise" to a broad public-management dimension of technogenic safety of an entire macro region.

This paradigm shift has acquired the status of existential necessity since martial law was declared in Ukraine (*On the legal regime of martial law: Law of Ukraine, 2015*). Full-scale armed aggression, systematic terrorist attacks on critical infrastructure facilities and logistics chains have radically changed the risk profile for continuous production of MMCs (*Renn, 2020*). High public

significance and resonance of this issue are especially clearly manifested in industrially overloaded territories, the most representative example of which is the Kryvyi Rih City Territorial Community. Man-made incidents or disasters in such highly concentrated agglomerations have not a linear, but a cascading effect. Technogenic incidents or disasters in such highly concentrated agglomerations have not a linear, but a cascading effect of impact. Vivid confirmation of this is the incident with destruction of hydraulic structures of Karachuniv Reservoir, which instantly created a threat both to civilian population and to stable functioning of underground mines and industrial sites.

Despite these acute challenges of today, existing organizational and legal mechanism of state management in the field of occupational safety continues to demonstrate signs of institutional inertia. Instead of flexible adaptation to local risks, there is a tendency towards further enlargement of territorial supervisory bodies, which objectively distances the subject of authority (controlling body) from the direct object of danger. Such a disproportion requires immediate scientific understanding and development of effective reform mechanisms.

Purpose of article is to comprehensively study the existing organizational and legal mechanisms of public management of occupational safety in mining and metallurgical complex of Ukraine and to scientifically substantiate the objective need for their institutional decentralization (localization) using the example of territorial community of Kryvyi Rih industrial region under legal regime of martial law.

Materials and Methods

Issues of forming and implementing state policy in the field of technogenic safety, labor protection and legal regulation of the activities of enterprises of mining and metallurgical complex are in constant focus of attention of leading domestic and foreign scientists. Theoretical and methodological foundations of public administration in this area have been thoroughly studied by such scientists as V. B. Averianov, O. Yu. Obolenskyi, V. S. Kuibida, N. R. Nyzhnyk, and others (*Kuibida, & Tkach., 2021*) Issue of integrating European occupational safety standards (in particular ISO 45001) into Ukrainian legislation was considered in works of B. B. Melnychenko and I. A. Hrytsiak. (*Occupational health and safety management systems. Requirements and guidance for application DSTU ISO 45001:2019; Melnychenko, 2019*). Specifics of administrative and legal regimes of increased danger were analyzed by V. Ya. Nastiuk and V. V. Bielievtseva (*Nastiuk, & Bielievtseva, 2020*)

However, despite the thorough array of scientific developments, it is worth noting that there are significant gaps. Vast majority of researchers analyze occupational safety management mechanisms either at macroeconomic level (formation of state-wide legal framework, adaptation of EU directives), or exclusively at micro level (building of occupational safety management systems within a specific economic entity). Meso-level of governance remains beyond proper, deep attention of scientific community – public-administrative aspect of adapting territorial structure of state supervision bodies to the unique specifics of concrete industrial megacities and agglomerations.

Lack of comprehensive studies on impact of institutional centralization (for example, creation of interregional offices serving several regions at the same time) on the effectiveness of risk management in conditions of unprecedented challenges of martial law, energy shortages and personnel shortages is especially acute. Today, question of expediency of deconcentrate of government authority and direct involvement of local self-government institutions in implementation of preventive control over industrial safety in their territories remains open and debatable.

At the same time, domestic researchers have overlooked rich experience of those EU countries, where decentralized sectoral model of industrial safety supervision has long proven its effectiveness in practice. In particular, in Poland there is Wyższy Urząd Górniczy (WUG) – Higher Mining Government, founded in 1922. This is a central specialized executive body, directly subordinate to the ministry responsible for mining industry, and is completely independent of broader labor inspectorate. WUG forms a network of district mining administrations, each of whose jurisdiction is tied not to the administrative borders of voivodeships, but to real industrial basins. Supervision is

carried out exclusively by professional mining engineers. The result is deep narrow-sector specialization, maximum responsiveness, and high inspection density at high-risk sites: about 170,000 mining workers are under the supervision of WUG institutions.

A similar logic — separation of mining supervision from general labor supervision — is also embedded in Czech model. Czech Mining Government operates as an independent public administration body. Its district units are authorized to issue permits for mining activities, coordinate accident elimination, and prosecute directly at the level of specific mining region, without referring cases to the central office. Experience of Poland and Czech Republic convincingly demonstrates that sectoral specialization of supervisory bodies is not an administrative surplus, but a necessary institutional prerequisite for effective management of technogenic risks in the extractive industry – a prerequisite that is currently critically lacking in Kryvyi Rih region.

Results

From the standpoint of modern public administration theory, organizational and institutional mechanism for occupational safety management is not a simple set of supervisory inspections. It is a complex, multidimensional system of subject-object relations aimed at identifying, assessing and minimizing professional and technogenic risks through the use of regulatory, administrative-supervisory, economic and organizational-preventive tools.

Object of public management in this context is the state of safety of production processes at enterprises of the mining and metallurgical complex (underground iron ore mining, open-pit mining, enrichment and sintering processes, metallurgical production), as well as the safety of related industrial infrastructure, accidents on which can cause large-scale negative consequences for nearby territorial community.

Subjective component of this mechanism is traditionally formed according to a hierarchical principle and encompasses three basic levels:

1. **Macro-level (nationwide):** Ministry of Economy of Ukraine, which acts as main body in system of central executive bodies, ensuring formation of state policy in field of labor protection. Direct implementation of this policy, as well as the supervisory function, is carried out by State Labor Service of Ukraine (State Labor Service).
2. **Mesolevel (regional):** Regional state (in wartime – military) administrations, which carry out general coordination of activities of territorial bodies of ministries and departments, and are also responsible for state of civil protection and technogenic safety in the territory of relevant region.
3. **Micro-level (municipal):** Local self-government bodies (LSBs). According to the current Law of Ukraine "On Local Self-Government in Ukraine" (*On local self-government in Ukraine: Law of Ukraine, 1997*), powers of village, settlement, and city councils in field of industrial safety control are declarative and significantly limited. Legislator assigns them a mostly passive role of observer or communicator, despite undeniable fact that it is the infrastructure of communities and their residents who are the first to bear destructive blow in event of any man-made emergencies at local enterprises.

For a deep understanding of the nature of modern managerial imbalances in this area, it is advisable to take a brief historical and institutional excursion. Until 2015, functions of strict supervision in heavy industry were performed by a specialized central executive body – State Committee of Ukraine for Industrial Safety, Labor Protection and Mining Supervision (Derzhgirpromnaglyad). This structure had a clear vertical of subordination and a network of territorial departments built over the years, architecture of which largely reflected real industrial specifics of regions. In particular, in areas with a high concentration of extractive industry, specialized mining districts (for example, Kryvyi Rih Mining District) operated successfully, inspectorate staff of which consisted exclusively of professional mining engineers.

However, as a result of large-scale institutional reform of 2015, which was carried out under the slogans of deregulation and optimization of state apparatus, functions of Derzhgirpromnaglyad, State Labor Inspectorate, and partly Sanitary and Epidemiological Service, were mechanically

merged. Single mega-regulator was established – State Labor Service of Ukraine. This body inherited an extremely broad, sometimes incompatible range of powers: from checking documentation on timeliness of salary payments to supermarket cashiers to conducting extremely complex technical audits of safety of operation mine hoists, ventilation systems, and storage of industrial explosives (*On approval of the Regulations on State Labor Service of Ukraine: Resolution of the Cabinet of Ministers of Ukraine, 2015*).

Current stage of evolution (or involution) of State Labor Service has gone through further consolidation of territorial bodies, which was embodied in creation of multi-regional interregional departments. Clear example is that supervisory functions in territory of three extremely powerful industrial and agricultural regions at once — Dnipropetrovsk, Zaporizhia, and Kirovohrad regions — are currently consolidated within framework of a single South-Eastern Interregional Department of State Labor Service.

From the perspective of fundamental principles of public management, this approach in context of MMC risk management has a number of deep critical flaws. First, there is an acute **problem of scaling and dispersion of administrative focus**. Subordinating territory of three large regions to a single territorial administration inevitably blurs the focus of attention of leadership. Inspection corps is physically forced to simultaneously serve thousands of enterprises in completely different industries (from agriculture to IT sector) across a vast geographical area. This makes deep narrow-sector specialization and systematic, daily monitoring of high-risk facilities (HRFs) impossible (*On high-risk facilities: Law of Ukraine, 2001*). Second, there is a **loss of operational spatial reference to the risk territory**. Interregional center located hundreds of kilometers from the epicenter of potential accident is, by definition, unable to provide the same speed of preventive response, mobilization of expert resources, and direct communication with business and community that a stationary local body could provide. Third, there is a dangerous **leveling of unique industrial specificity**. Applying a template, unified management approach to regions with a predominantly agrarian profile and to macro-regions like Kryvyi Rih Iron Ore Basin is a gross managerial and methodological mistake.

Thus, institutional centralization of territorial bodies led to artificial alienation of subject of supervision from object of increased danger. A kind of administrative vacuum was formed on the ground, which began to be felt especially acutely and painfully with beginning of a full-scale invasion and implementation of crisis conditions of martial law (*Kozachenko, 2021*)

Until February 2022, occupational safety management system at MMC was focused primarily on identifying and minimizing endogenous (internal) risks. These included: wear and tear of fixed funds and technological equipment, violations of occupational safety instructions by employees, and shortcomings in organization of workplaces. However, implementation of martial law radically altered existing architecture of dangers, rapidly bringing uncontrolled exogenous (external) factors to the forefront. These factors are practically not subject to direct control by top management of enterprises and require deep intervention and support from public authorities.

The first, largest, and most critical catalyst for systemic risks was the total energy vulnerability of heavy industry enterprises. This was a direct consequence of targeted, cynical missile and drone strikes on key facilities of United Energy System of Ukraine.

Specifics of underground iron ore mining, which is fundamental economic and production base for Kryvyi Rih Iron Ore Basin, technologically and without alternative requires continuous, round-the-clock operation of mine's critical life support systems. It's all about infrastructure whose shutdown, even for a short time, is fatal: main fan units, high-power drainage complexes, and mine hoists (cage).

Sudden power outage at an enterprise (blackout) instantly, literally in a matter of minutes, turns deep-sea underground horizons (which often reach depths of over a kilometer) into a death trap and an extremely dangerous zone. Chain reaction of outages triggers several critical scenarios at once:

➤ **Aerogas collapse:** Stopping artificial ventilation systems inevitably and rapidly leads to a disruption of aerogas regime of mine. In a confined space, there is a rapid accumulation of

explosive and toxic gases, a sharp drop in oxygen levels, and an increase in air temperature to critical levels that are unbearable for human body.

➤ **Hydrological threat:** At the same time, shutdown of powerful drainage pumps creates a real, inevitable threat of rapid flooding of existing workings by groundwater. This could lead not only to a large-scale environmental disaster, but also to irreversible loss of entire mining horizons and destruction of unique, expensive equipment.

➤ **Logistical deadlock:** The most dramatic consequence is a power outage of lifting cages directly during lowering and raising of work shift. This results in physical locking of hundreds of workers in narrow mine shafts at great depths, in complete darkness and uncertainty. This situation requires immediate deployment of rescue operations unprecedented in scale, physical endurance, and complexity, involving specialized units from the military-style mining units (MSMU).

From perspective of the philosophy of public management and the architecture of national resilience (*Polovtsev, 2024*), this situation manifests a fundamental paradigm shift: occupational safety in modern realities of war has finally ceased to be an exclusive problem, internal corporate policy, and sole responsibility of employer. It has transformed into a matter of national security and economic survival of regions.

Addressing these existential challenges goes beyond capabilities of even the largest industrial corporations and requires the creation of comprehensive security ecosystem:

1. **Energy Autonomy:** Providing giant industrial complexes with super-powerful autonomous power sources (generating stations and megawatt-class gas piston units) that are capable of keeping the mine "afloat" until complete evacuation of people and preventing flooding.

2. **Updating Protocols:** Development of fundamentally new, rigidly adapted to realities of blackout, personnel evacuation plans in conditions of stress, complete absence of stationary lighting and traditional digital or radio communication.

3. **Management Synergy:** Logistics, uninterrupted fuel supply for generators, and coordination of rescue operations require unprecedented and precise synchronization of efforts.

Today, this is a shared responsibility of state (flexible regulatory framework and facilitation of energy equipment imports), regional military administrations (coordination of security protocols and response to emergencies), local governments (support of satellite city infrastructure), and large private businesses. Only such multi-level consolidation can guarantee the preservation of human lives and prevent collapse of a strategically important sector of Ukrainian economy (*Hollnagel, 2017*)

Second catalyst that is radically changing approaches to city management and its security architecture is the constant threat of cascading man-made disasters. In hyper-industrialized spaces, modern war experience has convincingly proven that destruction of even one critical infrastructure facility never remains an isolated event. It instantly triggers an unpredictable chain reaction ("domino" effect), where each subsequent accident scales devastating consequences of previous one, turning a local incident into a systemic crisis.

Classic precedent that should definitely be included in world textbooks on municipal crisis management and civil defense is missile strike on Karachuniv Reservoir dam in fall of 2022. This deliberate act of ecocide demonstrated how fragile balance between city and industry is. Strike to hydroelectric facility hit several life-supporting ecosystems simultaneously:

➤ **Hydrological and socio-ecological hit:** Leakage of millions of cubic meters of water and sudden rise in level of Inhulets River created a direct threat of mass flooding of dozens of streets, residential areas, and private sector of community. This required not only emergency evacuation of population in conditions of panic, but also carried enormous associated risks: flooding of drainage systems, washing away of hazardous substances from soil, and threat of a large-scale epidemiological outbreak due to contamination of drinking water intakes.

➤ **Industrial shock and threat to MMC infrastructure:** Technical water supply system for metallurgical and enrichment processes, which are the basis of city's economy, was critically disrupted. For enterprises of mining and metallurgical complex, sudden loss of water is an extremely serious emergency factor. Metallurgy operates at extreme temperatures – without continuous water cooling of blast furnaces and steelmaking furnaces, as well as gas purification

systems, there is an immediate threat of irreversible damage to expensive equipment, thermal explosions, and uncontrolled emissions of hazardous gases into air.

➤ **Transport and logistics paralysis:** Torrential flow of water flooded and partially destroyed bridges and pontoon crossings, cutting off key logistical arteries. Given unprecedented length of Kryvyi Rih (over 126 km), loss of even one bridge means the need for detours of tens of kilometers. At continuous-cycle enterprises, inability to safely and on time deliver a new shift of personnel (control panel operators, machinists, dispatchers) to their workplaces is a direct path to losing control over extremely dangerous production processes.

In conditions of Kryvbas, this cascading principle works for any basic infrastructure, turning ordinary industrial facilities into factors of increased risk:

➤ **Energy vulnerability:** Energy terror and sudden blackouts instantly create a two-pronged threat. Underground, this means locking hundreds of miners in cages a kilometer deep, rapidly flooding the workings due to the shutdown of drainage pumps, and the accumulation of explosive gases due to the failure of ventilation systems. On the above of ground, these are emergency shutdowns of factory filters followed by volleys of toxic substances directly into residential areas.

➤ **“Timing Bombs” – tailing ponds:** Potential damage or collapse of dams of giant industrial tailings ponds (which store millions of tons of finely dispersed toxic slurry) poses an existential threat. (*The Seveso III Directive, 2012*). This threatens not just from water, but dense mudflows capable of physically destroying urban buildings and poisoning aquifers with heavy metals and reagents for decades.

Karachuniv case and subsequent experience of blackouts irrefutably prove: boundary between the concepts of "occupational safety in a closed production facility" and "safety of life in an open territorial community" has finally and irrevocably blurred today.

In modern realities, a high fence of an enterprise no longer isolates it from the problems of community, just as a municipality cannot ignore processes behind this fence. Plant is doomed to shut down if city's infrastructure is paralyzed, and city will never feel safe as long as there is a risk of secondary man-made accidents at industrial giants. This new, cruel reality dictates only possible way out: full, seamless integration of security systems of MMC enterprises and municipal rescue services into a single, synchronized crisis monitoring and response mechanism.

Third, extremely important factor is deep crisis of human capital in the industry. Large-scale mobilization into the ranks of Armed Forces of Ukraine and Defense Forces led to a mass exodus from MMC enterprises of the most qualified, experienced personnel (*Drahan, 2025*) of working (tunnelers, fasteners, drilling machine operators) and engineering and technical specialties. Vacancies created are inevitably filled by attracting workers with less work experience, women (who are today en masse and successfully mastering traditionally "male" difficult professions in mining) and people who undergo accelerated targeted training courses. However, objective decline in overall level of intuitive and professional "safety culture", multiplied by chronic psychological stress, sleep deprivation and exhaustion from nighttime air alarms, creates an explosive basis for a sharp increase in level of industrial injuries precisely due to notorious "human factor".

Under such difficult conditions, functions of state supervision by State Labor Service should immediately transform from classic punitive and fiscal to preventive, advisory and service-oriented (*Tkachuk, 2023*). However, as noted above, existing mechanism of consolidated interregional management is simply physically and institutionally incapable of providing such in-depth, daily, mentoring support to thousands of enterprises.

Statistical measurement of threats. Quantitative indicators allow objectively assessing the scale of problem and provide it with an empirical basis. According to official data from State Labor Service of Ukraine, in 2024 3 509 workers were injured as a result of accidents at work — 405 more people than in 2023. At the same time, 1 006 of them were directly injured at the workplace as a result of military shelling – which is more than double the similar figure in 2023 (450 people). Fatal injury rate was 493 cases, of which 224 (45%) were direct deaths from combat operations. Mining industry consistently remains the most dangerous industry: according to research, it accounts for more than a quarter of all cases of industrial injuries in Ukraine. In coal industry, 275 accidents were recorded

during 2024, 18 of which were fatal. At the same time, these figures do not reflect the real deterioration of situation in iron ore sector, where deepening of mines and increase in share of inexperienced workers objectively create additional risk potential. These data convincingly demonstrate that remote model of expanded interregional oversight is unable to withstand the qualitatively new profile of wartime threats (*Amosha, 2023*).

Application of unified (template) public management approaches to territories with radically different economic, spatial, and demographic profiles is a systemic conceptual flaw in current architecture of territorial executive authorities in Ukraine. In this context, Kryvyi Rih City Territorial Community requires a deep reassessment of its status in general system of state oversight of industrial safety.

Kryvyi Rih is not just a large city. It is one of the most powerful and longest industrial megapolises in Europe, whose spatial development and socio-economic structure are completely, historically subordinated to mining and metallurgical production cycle (*Sharov, 2024*). Unprecedented length of the city, exceeding 126 kilometers (from Inhulets to Terny), is a consequence of gradual establishment of workers' settlements directly around places where iron ore deposits emerge to surface. This has resulted in a unique spatial configuration that is very difficult to manage: densely populated residential areas closely border, and sometimes wedge themselves into, the sanitary protection zones of industrial giants.

Concentration of high-risk facilities in territory of Kryvbas is unprecedented for continent. Here, simultaneously, as a single organism, the following operate:

- Network of deep (over 1200-1500 meters) mines for underground iron ore mining, operated in extremely difficult mining and geological conditions. They have status of objects with the highest risk level due to constant threats of sudden rock bursts, rock falls, underground fires, and flooding.

- The largest mining and processing plants (MPP) in Europe with giant open pits, where massive industrial explosions are regularly carried out using hundreds of tons of explosives, which generates seismic loads on urban buildings and large-scale dust emissions.

- Complete complex of metallurgical production (blast furnaces, steelmaking, rolling and coke chemical workshops), which is a source of constant thermal, chemical and gas hazard.

- Critical infrastructure for industrial waste management is giant tailings ponds. Dams of these tailings ponds are hydraulic structures of the highest consequences class. Their potential damage (for example, due to a missile strike) can trigger the descent of millions of cubic meters of mudflows directly towards residential areas.

Concept of "hyperconcentration of technogenic risk," which is immanently inherent in Kryvbas, by all laws of logic requires a corresponding "hyperconcentration of administrative attention" on the part of state. (*Velychko, & Barannyk, 2024*) However, the current state model operates in exactly the opposite way.

From the standpoint of modern management theory, such institutional distance grossly violates basic **principle of subsidiarity** and principle of bringing administrative services closer to the consumer. Center for making key management decisions and coordinating operational response is located far outside the epicenter of potential emergencies.

Crisis of centralized management model requires an immediate transition from a reactive (post-emergency) to a proactive (preventive) paradigm of public management (*Lysiuk, 2024*). Basic vector of such comprehensive modernization should be institutional decentralization. Given the unique scale of Kryvyi Rih Agglomeration MMC, we propose implementation of a two-tier specialized occupational safety management model, which is based on synergy of a powerful state presence and significantly expanded powers of local self-government (*Kuibida, & Tkach, 2021*)

First level of proposed model involves the creation of a specialized (industry) territorial hub of State Labor Service. Abandoning destructive principle of territorial consolidation in favor of principle of *industry concentration* is the first, most important step towards solving problem of dispersion of attention. For such industrial giants as Kryvyi Rih, it is advisable and justified to create a separate,

functionally and financially independent unit – *Kryvyi Rih Mining and Industrial Department of State Labor Service of Ukraine*.

This newly created body should be removed from the subordination of existing interregional administration and given status of a separate territorial body with direct subordination to the central apparatus in Kyiv. What will this mean in practice? First, it will ensure strict narrow industry specialization of inspection staff. Specialists who supervise underground mines or complex blast furnace production must have exclusively relevant specialized mining, surveying, or metallurgical higher education and many years of experience in production, and not be general lawyers. Second, this will drastically reduce the time for rapid response to emergencies to a minimum. Control center, based directly in the city where HRFs is located, is able to mobilize expert support in real time (24/7) and coordinate rescue operations with local headquarters of MSMU and SES. Third, it will ensure a transition to a continuous (stationary) monitoring model. Instead of episodic, often formal scheduled inspections, specialized hub will be able to implement modern digital systems for continuous remote auditing of security processes.

Second level of model involves delegation of powers to local governments (Municipalization of Security). However, structural reorganization of state bodies alone is not enough today. Modern European theory of public management is firmly based on the principle of subsidiarity, according to which any powers of government should be exercised at the level of government that is closest to citizens and is able to exercise them most promptly and effectively (*Occupational health and safety management systems. Requirements and guidance for application, DSTU ISO 45001:2019*)

Since environmental, social, and economic consequences of any man-made accident directly destroy vital activity of territorial community, local governments (LGs) no longer have moral and legal right to remain in status of passive relays of information. Currently, Article 34 of the Law of Ukraine “On Local Self-Government in Ukraine” (*On local self-government in Ukraine: Law of Ukraine, 1997*). leaves municipalities with a minimum of leverage in this area.

Therefore, we justify the urgent need to amend current legislation to assign delegated powers to LGs of industrial cities (*Novachenko, 2025*) (as a pilot project for Kryvyi Rih) in the field of preventive supervision and management of technogenic risks. Practical step should be creation of a specialized *Municipal Inspectorate for Industrial Safety and Labor Protection* within the structure of Executive Committee of City Council.

Scope of powers of such a municipal inspection should cover:

1. **Powers for preventive spatial monitoring:** The right of unhindered participation of representatives of LGs in commissions of MMC enterprises to verify safety status of those production areas that directly border residential buildings, public water bodies, or critical municipal infrastructure. This also includes a joint technical audit with State Labor Service of readiness of enterprises to work in winter blackouts.

2. **Expert assessment powers:** Introduction of a procedure for mandatory approval with municipal authorities of plans for localization and liquidation of emergency situations (*Civil Protection Code of Ukraine, 2013*) at enterprises, especially in terms of calculating zones of possible damage to adjacent urban areas and algorithms for evacuating the civilian population.

3. **Control and sanction (emergency) powers:** Granting municipal inspectors the legal right to draw up official acts on identified flagrant violations and, in exceptional cases, the right to issue orders to temporarily stop work at high-risk facilities if there is a direct, imminent and obvious threat of a large-scale accident (until the arrival of competent representatives of state supervisory authorities at the facility).

Implementation of proposed decentralized model will allow for formation of an innovative format of a social contract in security sector – an effective triangle of partnership. In this configuration:

State (represented by localized branch department of State Labor Service for Dnipropetrovsk region) retains functions of strict regulatory control, licensing of hazardous industries, conducting complex technical audits, and applying administrative and criminal sanctions for gross violations. Its role is to be a guarantor of compliance with national safety standards.

Community (represented by Municipal Inspectorate of LGs) performs function of daily spatial monitoring of hazards at "enterprise-city" boundary, is the main communication intermediary between residents and industry, and promptly signals risks that are formed slowly and imperceptibly for remote state control, but are clearly visible at the level of a specific block or street.

Business (MMC enterprises) receives quite tangible practical benefits from this model: much more operational management feedback with local authorities, acceleration of permitting and approval procedures due to the municipal "single window", reduction of reputational risks due to demonstration of openness to public control, as well as opportunity to jointly finance targeted preventive technogenic safety programs with municipality – which in long term is much cheaper than eliminating consequences of a major industrial accident (*Hale , & Hovden, 2018*)

Implementation risks and conditions for effectiveness of proposed model. Scientific objectivity requires a balanced analysis: along with undeniable advantages of decentralized model, it is necessary to clearly identify potential risks of its implementation and formulate mechanisms for their minimization.

First, there is a risk of duplication of powers and jurisdictional conflicts between industry hub of State Labor Service and Municipal Inspectorate. Minimizing this risk is possible only through a clear legislative demarcation of competencies: state authority – technical audit, licensing and sanctions; municipal – spatial monitoring of adjacent areas and communication with community. Mandatory mutual participation of representatives of both bodies in scheduled inspections and joint emergency response protocols should be enshrined in regulatory framework.

Second, corruption vulnerability of municipal level of control should be recognized. Local governments of large industrial cities are in constant financial dependence on city-forming enterprises — main payers of local taxes and fees. To neutralize this risk, proposed mechanism provides for: appointment of head of the Municipal Inspectorate through an open competition procedure with mandatory participation of representatives of State Labor Service; financing of inspection exclusively from the State Budget within the framework of delegated powers (and not from the local budget); strict requirements for publicity of check results and publication of all acts in an open register.

Third, implementation of model is impossible without resolving personnel issue. Neither industry hub of State Labor Service nor Municipal Inspectorate will make sense without specialized specialists. This requires the restoration of specialized departments of mining supervision and occupational protection in higher education institutions of Kryvyi Rih region (primarily at Kryvyi Rih State Pedagogical University and SHEI "Kryvyi Rih National University"), as well as the introduction of targeted programs to stimulate the return of demobilized mining engineers to positions of inspectors with guarantees of social protection. Without this, any institutional reorganization will remain an empty administrative shell.

Conclusions

Conducted study provides reasonable grounds to assert that existing enlarged, rigidly centralized multi-regional model of public occupational safety management in Ukraine has completely exhausted its organizational potential for managing large industrial agglomerations (*Halunko et al, 2018*). Under continuous influence of exogenous threats of martial law (energy terror, destruction of infrastructure, mobilization outflow of qualified personnel) (*Novachenko, 2025*), risks of large-scale industrial injuries and cascading man-made accidents (*Civil Protection Code of Ukraine, 2013*) in mining and metallurgical complex have increased to a critical level.

Current subordination of economic entities of Kryvyi Rih Iron Ore Basin to interregional administration, responsible simultaneously for three large regions, leads to managerial dysfunction, institutional distancing of supervisory body from objects of critical danger, loss of mining industry specific, and an unacceptable reduction in response efficiency (*Kozachenko, 2021*). To resolve this systemic crisis, a transition to a polycentric, decentralized governance model has been proposed. It is based on two key pillars: creation of specialized branch-specific territorial hub of State Labor Service exclusively for Kryvbas (first level) and direct legislative delegation of part of the powers for

preventive technogenic monitoring to municipal level — to local self-government bodies of community (second level) (*Melnychenko, 2019*) Practical implementation of this model requires making appropriate structural changes to the Law of Ukraine "On Local Self-Government in Ukraine" and resolutions of the Cabinet of Ministers of Ukraine that regulate activities of State Labor Service, and is a promising direction for further legislative and scientific research.

Conflicts of interest

Authors declare that there is no conflict of interest.

Funding

This study did not receive any external funding.

Authors contribution

Conceptualization, F I.; methodology, F I.; software, U L.; validation,. F I; formalized analysis,. F I and U L.; writing – initial version, F I and U L; writing – review and editing,. F I and U L; visualization, F I and U L; project administration, F I.

All authors have read and agreed with the published version of manuscript.

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