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## ENTREPRENEURIAL STRUCTURES OF THE EXTRACTIVE INDUSTRY: FOREIGN EXPERIENCE IN ENVIRONMENTAL PROTECTION

**Purpose.** To propose measures on assessing the initial state of the environment based on the foreign experience of natural resources protection by business structures in the extractive industry (using the example of some countries that are members of the Organization for Economic Co-operation and Development (OECD)).

**Methodology.** In the course of the scientific research, the authors used a number of general scientific and special methods of cognition, such as analysis – for critical assessment of approaches to the interpretation of the essence and necessity of nature protection; quantitative and qualitative comparisons – to highlight the mutual impact of environmental protection measures used by companies of OECD member countries; scientific abstraction and systematization – for setting out proposals regarding the application of the most successful measures for Ukraine, applied by OECD member countries.

**Findings.** The authors considered the experience of foreign member countries of the OECD such as Kazakhstan, Australia, Canada, the USA in terms of the implementation of some international regulations on labor protection, local maintenance standards, the government's focus on cooperation with license holders for subsoil use operations.

**Originality.** The authors suggested that the government of Ukraine pay attention to the measures introduced by Australia in terms of assessment of the initial state of the environment. Subsoil user companies should collect environmental information at the project planning stage in order to determine the factors that are subject to monitoring, further study, and control at the stage of liquidation of consequences after the termination of operations. Environmental information should include information on climatic conditions, geological data, soil data, hydrological data, data on vegetation, terrestrial and subterranean fauna, as well as information on socioeconomic conditions and cultural heritage sites.

**Practical value.** The considered experience is also useful for Ukraine, since we have a significant part of enterprises in the extractive industry and the issues of environmental protection and nature management should occupy one of the first places in companies. The results of the research can be used by practitioners, scientists, and civil servants for further perspectives of the development.

**Keywords:** *nature management, environmental protection, norms of local maintenance, mining industry*

**Introduction.** In the conditions of the inevitable approach of the ecological crisis, the protection of nature use, as the main measure for ensuring safety in the field of ecology, becomes an objective regularity. In recent years, scientists of various countries have paid considerable attention to the man-made impact on the natural environment both at the national and international levels.

Therefore, there is a need to research and implement innovative structured management systems for the environmental protection in the business structures of the extractive industry, which, when achieving financial and economic goals, must fulfill the duties assigned to them to protect the environment.

The natural environment management system enables business structures in the extractive industry to systematically and consistently approach the solution of issues related to environmental safety, through the distribution of natural resources, definition of responsibilities and regular evaluation of technical rules, methods and processes.

The environmental management system is essential for ensuring the ability of the business structure to determine its environmental goals and, as far as possible, achieve them, as well as for ensuring constant compliance with national and international requirements in terms of products, services or activities.

The attention of scientists is focused on the most acute problems of ecology, environmental protection and subsoil use, development of measures aimed at maximum protection of natural resources from the negative impact of business structures.

**Literature review.** The issue of rational use of natural resources and protection of subsoil use has gained considerable importance in Ukraine.

This was due to the fact that over many years, many natural resources (land, water, forest, mountain, etc.) have been involved in the economic complex of the country, which entered the production cycle of business structures.

Among domestic and foreign researchers of the problems of environmental protection, one can single out the works by Andreeva N., Tyutyunnyk H. [1], Veklych O. [2], Galushkina T., Zhemba A., Sernytska K. [3], and others.

Some domestic scientists in their works reveal the issue of rational nature management in terms of environmental protection through the prism of rational organization of the economy by entrepreneurial structures.

Karakash I. describes rational nature management as the most effective use of 60 natural resources during the production and economic process, in compliance with the laws of functioning of ecologically interdependent natural systems under the condition of continuous improvement and ensuring environmental protection [4].

Miroshnychenko A. notes in his writings that rational subsoil use involves establishing a balance of various interests and

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priorities (primarily environmental, economic, and others) in a specific situation [5].

As Brynchuk M. rightly pointed out [6], the ecosystem approach is expressed in the perception of objects of legal regulation as an integral part of the natural environment, in which natural interrelationships operate, which, if necessary, provide the conditions for human life and are therefore subject to mandatory taken into account when formulating legislative requirements.

The use of certain types of natural resources by business structures in their activities should not lead to unjustified damage to other natural resources [6].

Suyetnov Ye. explores the ecosystem approach in his writings. The author describes the ecosystem approach as a strategy of integrated environmental management, which includes the protection of certain types of natural resources and their habitats, the limitation of human activities that are harmful to the environment, and the protection of natural ecological systems and connections within them and between them [7].

In his writings, the scientist points out that the theoretical and practical significance of the justification of the ecological system approach is that it leads to a more effective operation of the environmental law, the achievement of its goals of maintaining and restoring a favorable state of the natural [7].

Pozniak E. claims that the use of natural resources, for which there is a differential approach to the formation of their legal regimes in environmental law (land, subsoil, waters, forests, animal and plant life, atmospheric air), should also be carried out on the basis of the principle of ecosystem [8].

Under the auspices of the National Academy of Sciences of Ukraine, leading specialists of the Institute of Market Problems and Economic and Environmental Research under the leadership of Academician of the National Academy of Sciences of Ukraine Burkynskyi B., together with specialists from other academic institutes, developed the “National Concept for the Implementation and Realization of Ecologically Clean Production in Ukraine”, which summarizes the fundamental methodological regulations for the implementation of ecologically clean production in Ukraine [9].

**Unsolved aspects of the problem.** Scientific and applied achievements are important for the study on foreign experience of environmental protection and use by entrepreneurial structures of the extractive industry (on the example of the OECD) for the adoption of best practices at enterprises of the extractive industry of Ukraine.

**The purpose** is to investigate the foreign experience of environmental protection by business structures in the extractive industry (using the example of some countries that are members of the OECD).

**Methods.** In the course of the scientific research, the authors used a number of general scientific and special methods of cognition, such as:

- analysis – for critical evaluation of approaches to the interpretation of the essence and necessity of nature conservation;
- quantitative and qualitative comparisons – to highlight the mutual impact of environmental protection measures used by companies of OECD member countries;
- scientific abstraction and systematization – for setting out proposals regarding the application of the most successful measures for Ukraine, applied by OECD member countries.

**Results.** Subsoil use has a significant impact on the environment and, in the case of an ineffective regulatory approach, can have long-term and irreversible consequences.

Rational, ecologically safe subsoil use requires complex political and economic decisions that take into account economic efficiency, public benefit, environmental protection and many other factors.

Consequences of environmental impact from mining operations include landscape change and air, water, and soil pollution [10].

In many countries, including those in the OECD, there is a requirement to carry out an assessment of the initial state of the environment before any subsoil exploitation operations begin.

The members of the organization are 37 of the most economically developed countries in the world, most of them are members of the European Union, the USA, Australia, Switzerland, Norway, South Korea, Japan and others (Ukraine is not a member of this organization).

OECD activities are aimed at:

- increasing the economic efficiency of member states;
- promoting the development of socio-economic conditions and improving employment situations;
- promoting economic development and growth of both developed countries and those that are in the stage of active development;
- encouraging business structures to actively participate in or support private or multilateral projects that take into account social, economic and environmental consequences.

Such assessment should include measurement of environmental parameters and, as a rule, a preliminary study on potential types of threats from the point of view of safety for life and health of people.

Issues related to water use are additionally considered in the Water Code, which is a separate legislative act, the Law of Ukraine “On Environmental Protection” and other legislative acts. The Code of Ukraine “On Subsoil” requires subsoil users to comply with land, water and environmental legislation [11].

Project documents on subsoil use operations, which are attached to the license application, are developed taking into account environmental and industrial safety requirements. At the same time, the code does not specify specific requirements for a comprehensive assessment of the initial state of the environment or preventive measures, except for water sampling.

Environmental issues are regulated from the legislation side by the Law of Ukraine “On the Basic Principles (Strategy) of the State Environmental Policy of Ukraine for the Period Until 2020” and the Laws of Ukraine “On Environmental Impact Assessment” and “On Strategic Environmental Assessment”, which in turn oblige industrial enterprises to carry out assessment of the impact on the environment, during the implementation of the procedure, control over compliance with the requirements of environmental legislation is carried out by the “authorized body in the field of environmental protection”, and in the case of operations related to increased risk – directly by the Ministry of Ecology and Natural Resources of Ukraine [12, 13].

We suggest considering the possibility of adding a preliminary environmental review to the assessment procedure, since in its current form the assessment is carried out when the design documentation is already being developed.

The Code of Ukraine “On Subsoil” also mentions authorized bodies in the field of environmental protection, but the degree of their participation in the procedures for issuing licenses and their functions in the framework of interaction with the relevant ministries are not defined (unless we take into account the provision according to which the representatives of such a body are members of the commission that signs the act of liquidation of the consequences of operations on the use of subsoil space).

In addition, the current legislation does not provide for open access to information about submitted license applications. Increasing the level of public awareness of subsoil operations and organizing discussions about planned works would contribute to increasing transparency in the industry and simplify the analysis of the environmental, economic and social consequences of proposed projects.

On the other hand, it would encourage subsoil users to present more information on environmental issues, which would have a positive effect on their investment attractiveness.

Linking environmental impact and licensing procedures, as well as introducing an individualized approach to licensing and permitting in Ukraine, is in line with OECD practices and can lead to increased trust and understanding from investors.

Let us consider the process of nature management using the Australian mining industry as an example. Primary responsibility for environmental issues in Australia's mining industry rests with state and territory governments. Various aspects of environmental protection are considered in a complex, which implies a detailed assessment at the stages of planning, development, operation, termination of subsurface operations and liquidation of their consequences.

Despite possible differences in methods, in most cases the actual procedure provides that the applications of mining enterprises must describe in detail potential threats to the environment and countermeasures against them. A number of government departments, including environmental departments, deal with the review of applications, which is often a multi-step process.

In particularly difficult cases, it is possible to organize a public discussion, during which opinions "for" and "against" are heard, which makes it possible to form a comprehensive picture of the possible social, ecological and economic consequences. Government agency's approval is usually impossible to obtain without a management plan that addresses water use, storage, noise, vegetation, land reclamation, soil erosion, emissions and dust, as well as disclosure procedures.

In carrying out environmental baseline assessments, the Australian Government requires subsurface users to collect environmental information during the project planning phase to identify factors to be monitored and further studied, as well as controls during the decommissioning phase of operations.

Environmental information includes information on climatic conditions, geological data, soil data, hydrological data, data on vegetation, terrestrial and subterranean fauna, as well as information on socio-economic conditions and cultural heritage sites.

In terms of environmental permits and taxes in the field of environmental protection policy, Kazakhstan managed to achieve considerable success, including the use of measures to limit carbon emissions. However, in certain sectors, the legal framework is still considered excessively burdensome in administrative terms and causes difficulties with practical implementation, leading to unsatisfactory results.

The further development of prevention measures and the introduction of incentives to reduce pollution levels in various industries, as well as the most active use of the principle of material responsibility of the polluter, contributed to the approximation to the standards of OECD countries. Environmental permits issued to subsoil users in Kazakhstan determine emission standards, which are set in accordance with the values of indicators of maximum permissible standards.

The Code of Kazakhstan refers to a permit that certifies the operator's right to emit emissions into the environment in compliance with the established standards. The complexity of mechanisms for calculating maximum permissible emissions, which take into account many different types of pollutants, makes it difficult for operators to comply with regulations, even with the implementation of the best available technologies to regulate discharges and emissions.

Maximum permissible emissions are usually calculated based on the maximum permissible emission levels at the maximum performance of the equipment. It does not encourage the implementation of best available technologies or

other measures aimed at reducing emissions beyond what is necessary to meet the level of maximum permissible emissions.

In addition, fees for emissions into the environment are charged in accordance with emission regulations, but these and other payments are regulated by tax legislation, not by the Code of Kazakhstan "On Subsoil and Subsoil Use".

Compliance with environmental regulations, which involve strict regulation and the implementation of certain technical solutions and technologies, can be burdensome and prohibitively expensive, especially for small businesses.

To help ensure compliance with environmental regulations and regulation of pollution levels in various countries, including the Organization for Economic Cooperation and Development, market mechanisms are implemented that are not only easier to implement, but also provide incentives that encourage operators to find effective ways to reduce emissions.

As a rule, market mechanisms mean such a form of environmental taxation which is designed not so much to bring income to the state as to stimulate enterprises to reduce the level of environmental pollution.

For example, environmental taxation can be based on Kazakhstan's taxes intended to compensate for environmental damage, and serve for the state to obtain funds for the elimination of the consequences of the damage caused or for the development of regions.

Another form of charging for emissions is fines for environmental pollution, whose sizes are set according to the quantitative and qualitative indicators of pollution resulting from subsoil use.

During the extraction of solid minerals, the subsurface user is obliged to ensure the preservation of all primary and secondary geological information obtained during extraction, including laboratory research and analysis data, but the text does not contain requirements for such laboratory research and analysis, as well as for the quality of laboratory equipment.

The use of mobile waste sampling equipment at pollution sites in various industries seems promising, as well as the most active use of the principle of material responsibility of the polluter, would contribute to the approximation to the standards of countries that are part of the OECD.

It seems promising to introduce mobile waste sampling equipment at work sites, which would allow control of aspects such as the possibility of acid mine drainage, simplify waste classification and promote the introduction of a risk-based approach in the field of waste management.

Despite the presence of provisions dedicated to investments in Research & Development, the Kazakhstan code does not specify information on potentially priority areas of such work and does not give any recommendations on the possible accounting of various factors throughout the subsoil use cycle.

The risks from the extractive industry are for water resources, they are particularly high, because the level of pollution of water sources is high. The intensive use of water in the industry creates problems related both to water availability and water quality, and has a devastating impact on the environment and living conditions.

As a result, complex measures of legal regulation aimed at reducing the negative consequences of subsoil use for water resources are needed. Some mountain jurisdictions in OECD member countries (for example, the US state of Nevada) have introduced separate permits for water use.

In order to begin a new project, a Nevada mining company must obtain a permit issued by Nevada's Environmental Protection Agency, the Bureau of Mining and Remediation.

The application for the issuance of a water use permit is attached to the work plan, and during its assessment, in particular, the potential impact on surface and ground water with-

Table

Norms of emissions of carbon dioxide into the atmosphere

Type of fuel	Mass concentration of CO in flue gases at $\alpha = 1.4$ , mg/m <sup>3</sup>
Gas	300
Oil fuel	300
Coal	400
Biomass and peat	250
Liquid fuel	300

in the relevant site is assessed.

The Table shows the permissible standards of emissions of carbon monoxide into the atmosphere during the operation of enterprises in the mining industry. These standards are generally accepted at the world level.

Kazakhstan has already suffered from water pollution in the past.

Local media reported on the production causing contamination of water supply and sewage systems, causing some areas to experience a shortage of clean water.

These incidents only emphasize the importance of effective measures aimed at legal regulation of water use and their practical implementation.

The Figure shows the volumes of emissions of carbon monoxide into the atmosphere. In 2020, emissions in Australia, Canada and the USA decreased compared to 2018. This shows that environmental protection measures were taken at the level of the countries.

The Code obliges holders of mineral exploration licenses to conduct hydrogeological studies and submit data to the authorized body, and requires operators who conduct mining within the water protection zones of surface water bodies to additionally coordinate the plan of mining operations with authorized bodies in the field of use and water fund protection, water supply, drainage.

It should be noted that the code of Kazakhstan prohibits the conduct of subsoil use operations on the territory of areas of economic and drinking groundwater.

Occupational health and safety issues related to the licensing of subsoil use operations should address both internal safety rules and regulations, as well as potential threats posed by mining operations to nearby settlements.

A number of risks of this kind are associated with the mining industry, including in connection with water use, landslides, dangerous equipment and occupational diseases.

The approach based on risk assessment is considered the most effective approach to solving problems in the field of occupational health and safety, recognized by OECD member

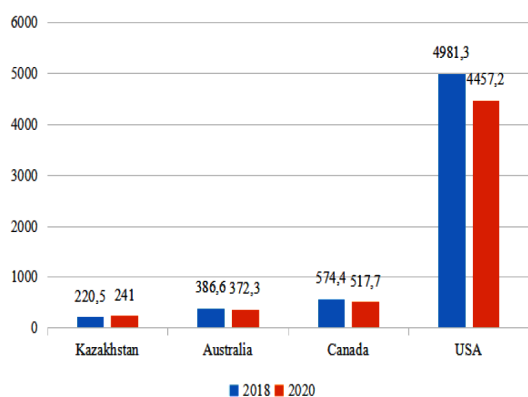


Fig. Volumes of carbon dioxide emissions into the atmosphere (thousand tons per year)

countries. This approach should include regulatory oversight and technical modernization, as well as research to identify ways to limit risk.

This approach often includes measures to exchange information and training – as, for example, in the Canadian province of Ontario, where, as part of an analytical review of occupational health and safety management in the mining industry, it was recommended to increase the awareness of employees of mining enterprises.

Occupational health and safety issues in Kazakhstan are regulated by industrial safety requirements. The Code of Kazakhstan “On Subsoil and Subsoil Use” provides for compliance with industrial safety requirements at the stages of exploration, extraction and completion of work, obliges subsoil users to report on planned measures to ensure safety during the elimination of consequences and coordinate plans with authorized bodies in the field of environmental protection.

In recent years, the number of accidents at Kazakhstan production sites has decreased thanks to the introduction of new technology and equipment by many mining companies, including Kazzinc and KAZ Minerals.

However, in order to reach the level of international standards in the field of industrial safety, further measures are necessary, including technical modernization and increasing the automation of production processes.

In addition, active cooperation between state bodies and subsoil users is necessary, as well as further legislative reforms, in particular, revision of certain industrial safety requirements, which is already underway.

In addition to occupational health and safety issues, economic and environmental issues, an effective policy of promoting the sustainable development of the mining industry, in our opinion, should also address social aspects.

The impact of mining operations in terms of protecting the interests and well-being of local residents should be assessed at the earliest possible stage before the start of project implementation and attracting investors.

Local content norms were developed and implemented to ensure the use of local sources at various levels of the production and sales chain (including personnel, services, technologies, goods, and others), thereby ensuring employment of the population, strengthening inter-industry interaction with all the accompanying benefits, establishing connections to share knowledge and practical experience and generally enhance the economic benefits of the industry.

The requirements are part of the state licensing procedures for subsoil use operations, and in some cases the right of market access depends on it.

The requirements may be mandatory and quantitative, for example, establishing the percentage of purchases from local suppliers, the number of local employees, and other value or volume targets, as well as provide for sanctions in case of non-compliance.

With the help of financial support or tax, tariff and credit mechanisms, it is possible to stimulate the development of links with local suppliers.

Norms of local maintenance can affect a wide range of areas, including the purchase of goods and services, employment (which often includes not only the provision of jobs, but also the development of professional skills and personnel training), promotion of the growth of the technological level and development, and the increase in local competitiveness.

In particular, the holder of a license for subsurface operations is obliged to ensure the participation of citizens of Kazakhstan in the total number of employees. The share of such employees should be at least 50 %.

The standards of the World Trade Organization, like many other bilateral or multilateral trade and investment agreements, impose restrictions on certain types of local

maintenance norms, and in particular on quantitative targets.

This category of quantitative requirements for local maintenance in Kazakhstan's mining industry will eventually be abolished, which will help to change the approach to local maintenance standards in accordance with the practice of OECD member countries.

The use of high environmental and social standards in extractive industries is a priority for many countries and territories. For this purpose, incentive mechanisms are created that stimulate compliance with business ethics and responsible business behavior.

In some cases, local retention policies allow local communities, indigenous peoples, and other stakeholders to participate in decision-making about land use and benefit from the resulting economic growth opportunities.

Such policies are being implemented in a number of OECD countries, including Canada, where the government has implemented initiatives to create jobs, regional development, training and skills development in areas where older residents live.

The legislation of Kazakhstan does not provide for local maintenance standards for certain groups of interested persons, but the new code requires subsoil users engaged in exploration and production to finance the training of Kazakhstani personnel, Research & Development near the country in the form of one percent of taxable income.

**Conclusions.** To increase potential effectiveness, it is recommended to consider the possibility of adding more detailed information for companies, which would help them take into account the interests of local settlements when implementing financing, and to take measures to ensure transparency of the financing procedure.

The experience of foreign OECD member countries, such as Kazakhstan, Australia, Canada, and the United States, in terms of the implementation of some international regulations on labor protection, local maintenance standards, and the focus of the government's work on cooperation with holders of licenses for subsoil use operations were considered.

The considered experience is recommended to be ratified in Ukraine, namely:

- to oblige license holders to provide jobs for at least 50% of citizens in the total number of employees;
- to require subsoil users at the project planning stage to collect environmental information, which includes information on climatic conditions, geological data, soil data, hydrological data, data on vegetation, terrestrial and underground fauna, as well as information on socio-economic conditions and objects of cultural heritage;
- to increase the awareness of employees of mining enterprises;
- to introduce separate permits for water use, namely, the application for the issuance of a water use permit must be attached to the work plan, and during its assessment, the potential impact on surface and ground water within the relevant area must be assessed;
- when assessing the initial state of the environment, sub-surface companies must collect environmental information at the project planning stage in order to determine the factors to be monitored and further studied, and control at the stage of liquidation of consequences after the termination of operations.

Environmental information should include information on climatic conditions, geological data, soil data, hydrological data, data on vegetation, terrestrial and subterranean fauna, as well as information on socioeconomic conditions and cultural heritage sites.

The considered experience is also useful for Ukraine, since we have a significant part of enterprises in the extractive industry and the issue of environmental protection should occupy one of the first places in companies.

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## Підприємницькі структури видобувної промисловості: зарубіжний досвід охорони природокористування

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**Мета.** Запропонувати заходи щодо оцінки вихідного стану довкілля на базі зарубіжного досвіду охорони природокористування підприємницькими структурами видобувної галузі (на прикладі деяких країн-учасників Організації економічного співробітництва та розвитку (ОЕСР)).

**Методика.** У ході наукового дослідження авторами було використано ряд загальнонаукових і спеціальних



методів пізнання, таких як: аналіз – для критичної оцінки підходів щодо тлумачення сутності й необхідності охорони природокористування; кількісні та якісні порівняння – для висвітлення взаємного впливу заходів з охорони природокористування, що використовуються компаніями країн-членів ОЕСР; наукова абстракція й систематизація – для викладення пропозицій у частині застосування найбільш вдалих заходів для України, застосованих країнами-членами ОЕСР.

**Результати.** Авторами був розглянутий досвід зарубіжних країн-членів ОЕСР, таких як Казахстан, Австралія, Канада, США, у частині впровадження деяких міжнародних нормативів з охорони праці, спрямованості роботи уряду на співпрацю із власниками ліцензій на операції з надрокористування.

**Наукова новизна.** Авторами запропоновано уряду України звернути увагу на заходи, запроваджені Австралією в частині оцінки вихідного стану довкілля. Компанії-надрокористувачі мають на етапі планування проекту здійснювати збір екологічної інформації задля визначен-

ня факторів, що підлягають моніторингу, подальшому вивченню й контролю на етапі ліквідації наслідків після припинення операцій. Екологічна інформація має включати відомості про кліматичні умови, геологічні дані, дані про ґрунти, гідрологічні дані, дані про рослинність, наземну й підземну фауну, а також відомості про соціально-економічні умови та об'єкти культурної спадщини.

**Практична значимість.** Розглянутий досвід є корисним і для України, оскільки ми маємо значну частину підприємств видобувної галузі, а питання охорони навколишнього середовища та природокористування мають посідати одне з перших місць у компаніях. Результати дослідження можуть бути використані практиками, науковцями, державними службовцями для подальших перспектив розвитку.

**Ключові слова:** *природокористування, охорона навколишнього середовища, норми місцевого утримання, видобувна галузь*

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