

Ecological Modernisation of Enterprises: Environmental Risk Management

Kachynska N.¹ *Senior Lecturer*, Prakhovnik N.¹ *PhD*, Zemlyanska O.*¹ *Senior Lecturer*,
Ilchuk O.¹ *Senior Lecturer*, Kovtun A.¹ *PhD*

¹ Department of Labor Protection, Industrial and Civil Safety, Institute of Energy Saving and Energy Management, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Kyiv, Ukraine

Abstract

Aims: The aim of this paper is to analyse current environmental risk management systems, identify their shortcomings and implement solutions that will help avoid them, as well as to study the environmental component when creating documents concerning the environmental modernisation of enterprises.

Materials & Methods: The present study investigates the environmental and civil safety and is performed using the method of logical analysis, the method of comparative analysis, the formal legal method, the method of synthesis, the method of deduction, as well as the method of analysis of scientific literature.

Findings: The result of this paper is the identification of theoretical and practical foundations of environmental risk management systems, their effectiveness in preventing anthropogenic and environmental disasters, as well as the analysis of the regulatory framework for creating and implementing documentation to be used in the environmental modernisation of enterprises.

Conclusion: The authors developed environmental risk management systems, eliminating shortcomings in their performance, introducing methods that will improve and make such systems more effective, as well as increasing the level of environmental component during operations with documents that are cornerstones for environmental improvement of institutions and enterprises.

Keywords

Anthropogenic Disaster [Not Found]
Eco-network [Not Found]
Use of natural resources [Not Found]
Environment [<https://www.ncbi.nlm.nih.gov/mesh/68004777>]
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*Corresponding Author

Tel: +38 (04) 42049494

Fax: -

Post Address: 03056, 37 Peremohy Ave., Kyiv, Ukraine.

Email: zemlyanska7442@tanu.pro

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Introduction

At present, an important issue in the policy of every country, including Ukraine, is environmental safety, since it plays a crucial role in all spheres of government and life of the population. For a long time, the activities of enterprises were uncontrolled and unbalanced regarding the use of natural resources, the issue of environmental protection was not a priority, which substantially affected the development and activities of such institutions and led to considerably adverse consequences. However, current business, regardless of the area it concerns, cannot prosper, or even exist, neglecting environmental problems ^[1]. This paper identifies environmental risks, including anthropogenic and environmental disasters on the territory of Ukraine, which consequently allows identifying approaches for their management systems at various levels, which are directly aimed at mitigating the share of adverse consequences for society. To improve the operation of such systems, it is necessary to use research methods such as observation and analysis, since they allow identifying and subsequently studying exogenous and endogenous environmental risks, which in the future will prevent disasters of various types. Analysing the state of natural and anthropogenic security of Ukraine, it can be argued that it is complex and this is conditioned upon several factors that only worsen as time passes. However, despite this fact, the main and cornerstone approach of enterprises in environmental management is a preventive approach, which lies in mitigation of the adverse environmental impact ^[2]. This paper also investigates the role and place of environmental risk management in the creation and implementation of a development strategy for enterprises in various industries. In addition, an important element of this study is the consideration and analysis of modern approaches to assessing environmental risks that enterprises currently use, so it can be argued that the current methods are insufficiently effective, since they do not consider the tasks of strategic planning for environmental modernisation of the above-mentioned institutions.

Environmental risk management constitutes a necessary component for effective and safe use of environmental networks, which allows identifying threats to enterprises and develop an express and high-quality environmental development strategy in the future ^[3]. The general theoretical concept of environmental modernisation can be interpreted as the transformation of an industrial society based on the principles of environmental ethics and the use of high technologies; super-industrialisation, accompanied by qualitative economic growth (considering the scarcity of resources), reorientation of technologies to restore ecological balance, technological overcoming of adverse consequences (creation of industrial ecosystems), the establishment of a sustainably developing technological society. The use of innovative green technologies will positively impact both business and the environment. An essential concept that needs to be used to improve the state of the natural environment is "green bonds", since their attraction will expand the list of opportunities for enterprises. Furthermore, it is established that the priority lies with the use of alternative sources of energy and fuel, mechanisms of environmentally friendly entrepreneurship, the use of clean technologies in agriculture, as well as a list of projects for cleaning air, water, and soil from pollution, recycling and disposal of waste. The purpose of environmental modernisation is to harmonise the entire complex of relations in the socio-ecological system, its sustainable, balanced development, which will help prevent a global environmental catastrophe and contribute to ensuring the process of coevolution of humanity, society, and nature ^[4]. The questions raised in this study have partly been developed by researchers, namely O. Bondar, O. Mashkov and V. Mikheev et al. ^[5], but the unexplored subject considered in this paper is the development of an ecological way of managing enterprises, which affects the solution of environmental problems using data on possible environmental risks.

Materials and Methods

This study is based on the use of several methods and methodological approaches for conducting research in the field of environmental and civil safety, namely the prevention of anthropogenic and environmental disasters, the creation of documents upon making decisions on environmental modernisation of enterprises. First of all, to conduct this study, it is necessary to identify the main goals and areas of research, which is possible through a functional and methodological approach. The method of logical analysis, namely the logical reasoning method, offers the required results quickly and without hindrance; in addition, it facilitates the structure of the study in becoming efficient and logical. Since the subject concerns environmental and civil safety, it is worth noting the importance of using a theoretical and methodological approach, because it provides clear insight into the meaning of each concept, their features and principles used in the study. The method of comparative analysis allows considering and comparing environmental risks of various types, comparing different

risk management systems and immediately identifying the main shortcomings for their further overcoming and improving the efficiency of their activities. This area, as an object of research, has a legal aspect, so the use of the formal legal method is essential in this paper. This allows considering certain legislative norms relating to environmental safety and affecting the creation of a high-quality regulatory framework for enterprises in need of environmental modernisation. The synthesis method allows combining the factors identified during the study, which affect the operation of environmental risk management systems, to obtain more accurate conclusive study results. It is necessary to focus on the method of deduction, since it provided an opportunity to cover this subject from the general to the particular, namely from the broad concept of environmental risks to the narrow concept of management system of eco-networks, using the logical chain method. Thus, the following tasks have been formed:

- review and evaluate the effectiveness of environmental risk management systems;
- discover means and methods of implementing environmental modernisation of enterprises;
- allocate the share of the environmental component when creating constituent documents for enterprises undergoing environmental modernisation;
- investigate the advantages and disadvantages of current systems for preventing anthropogenic and environmental disasters.

The subject of this study is investigated in three stages. The first stage highlights the theoretical foundations of this subject. For this, the authors of this paper analysed the main approaches of researchers, scientific studies of Ukrainian and world authors. A plan for conducting research analysis is drawn up, and the main goals and objectives are highlighted. The second stage compares the practices of foreign countries in the field of environmental safety, as well as analyses all environmental risk management systems designed to prevent anthropogenic and environmental disasters, and identifies promising means and methods to improve their activities with the involvement of international standards. The third and final stage lies in developing a clear algorithm for environmental modernisation of enterprises, increasing the share of the environmental component in documents, considering possible risks and obstacles.

Results

Notably, in Ukraine, the regulatory framework for establishing restoration measures, as well as determining and regulating the cost of environmental management is insignificant. Analytical data are also scarce in terms of their quantitative and qualitative indicators. Since the number of documents relating to the risk assessment of objects of impact, the selection of technical methods and the study of the level of disaster response is small, this does not allow for an unambiguous interpretation of certain issues in this area. One of the main components of the normal performance of environmental risk management systems is human resources, since the effectiveness of implementing any changes and reforms, including environmental modernisation of enterprises, depends on the qualification of employees. Thus, combining a high-quality regulatory framework with a high-level professional knowledge of employees will create a fairly clear management system, including disaster prevention and environmental risks. Moreover, the introduction of modern and orderly documentation in the activities of enterprises, which will have an environmental component, will allow calculating all the risks and amounts of damage from situations of various types, both environmental and anthropogenic, as accurately as possible. To ensure the effective implementation of timely and relevant strategies for responding to environmental risks, it is necessary to immediately investigate the possible environmental consequences of a process or product at the initial stage of planning its activities. This gives insight into the real situation and the danger of any activity at the enterprise. Furthermore, in case of a deterioration of the situation and the occurrence of troubles, ways will be known to overcome and eliminate them, which considerably protects production and employees.

Notably, one of the main factors influencing the environmental modernisation of enterprises is the stringency of environmental requirements put forward by stakeholders or parties with a legitimate interest in the organisation's activities. In addition, some entrepreneurs use modern environmental concepts, as well as are guided in their activities by the norms of international environmental law to increase the competitiveness of their institution. Consideration of the international practices of standardisation of environmental management systems by enterprises and companies will improve such indicators as energy efficiency, decarbonisation of the energy segment, and most importantly — the implementation of international environmental initiatives in Ukraine. Having analysed the

prospects for introducing the latest and most relevant approaches, there is no doubt that they constitute the so-called catalysts for the modernisation of enterprises in the environmental sphere. An example of such innovations can be the introduction of an eco-network approach in sectoral policy; the reform of the integrated environmental management system; the merger of environmental policy with other policies; the mandatory nature of the application of an environmental component upon creating and applying state planning documents. It is also necessary to resolve the issue of agreeing on conclusions on the creation of a particular industry enterprise that will impact the environment, in particular, it can be solved by reducing the environmental tax rate, as well as through an established annual compensation, combined with an increase in the level of environmental properties of products. This will facilitate bringing the state of Ukrainian environmental policy to the European level.

To modernise the entire mechanism of nature management, including enterprises, it is necessary to use a systematic approach. It allows identifying the main problems and shortcomings first, and then, based on their elimination, develop an optimal model of nature management. Creation of such a clear structure will enable:

- improvement of the efficiency of using and restoring natural resources, greening businesses;
- revenues to the state budget;
- mitigation of the risks of environmental disasters and losses from them and elimination of their consequences;
- replenishment of the personnel of the environmental protection industry by highly qualified environmental specialists;
- solution of the most pressing issues of modern environmental science and education in Ukraine;
- implementation of the strategy of the national environmental policy of Ukraine for the period up to 2030 ^[4]. Thus, the authors of the present study offer an algorithm for improving environmental risk management systems: determining the object of management, system analysis of management methods, identifying the characteristics of the model, planning experiments, studying management processes, implementing an optimal management system created considering all standards and corresponding to a particular area of activity.

To create an effective environmental risk management system and prevent possible disasters in the future, it is necessary to analyse the current state of the systems, and when developing new ones, it is necessary to consider all the shortcomings of the previous ones. In particular, at the current stage, the approach to the components of the environmental structure remains the main problem. This approach is a cornerstone in the performance of the system of environmental permits, since it is differentiated, it does not factor in and does not apply the necessary number and volume of international standards and innovations, including the legislative framework of the European Union. Therefore, the need for its reform is a priority. The system can be reformed by introducing separate permits for enterprises, if the products they put out pollute the atmosphere and water-world. Such permits should be justified based on sanitary and hygienic indicators in the form of establishing particular standards of indicators for maximum permissible concentrations and optimally safe levels of exposure to harmful elements in the natural environment. Notably, in these changes, the expected result is not the prevention of disasters and pollution, but the greening of each production stage. At present, the concept of environmental modernisation of enterprises is largely widespread. It is based on the creation of sectors for the collection, storage and processing of hazardous waste yielded during production in a particular industry, as well as lamps containing mercury, packaging materials and containers, used oils, worn tires, rubber products and waste of rubber production, disposal of unusable vehicles, electrical and electronic equipment (including transformers, stabilisers, and batteries), medical waste.

Important components in environmental risk management, the improvement of which will immediately have a positive impact on reducing the percentage of possible disasters are environmental audit, certification of environmental facilities, environmental insurance, certification and standardisation in accordance with current standards. Methods of research and consideration of this issue are as follows: implementation of forecast and analytical operations with subsequent use of the results obtained; creation of regulatory and methodological support for the development and implementation of the State Register of Environmental Passports of Enterprises; creation of the State Register of Environmental Passports of Enterprises; launch of a test project for certification of 5–10 of the most environmentally dangerous enterprises and institutions ^[6]. Environmental insurance is interpreted as a procedure for developing and applying civil liability insurance of stakeholders or

users of products of high environmental hazard in case of their possible adverse environmental impact, as well as damage to the interests of various entities, including the state. The purpose of environmental insurance is to create and develop a safe state of the natural environment for human health; to protect the property interests of owners and users of products of increased environmental danger in case of possible environmental pollution; compensation for a certain percentage of losses caused to the country and other persons as a result of environmental pollution; to reduce the number of environmental risks and environmental losses. The key element of solving this issue is the data of scientific and analytical research and the creation of regulatory and methodological support for the environmental insurance system. In the future, such an innovation as environmental insurance should be expected to provide enterprises — foci of environmental danger — with material resources to compensate for environmental losses caused to Ukraine and other persons [7].

Discussion

Many researchers from different countries have been investigating this issue mainly in the theoretical aspect for several decades in a row. The theory of environmental modernisation formed the basis for the development of national policy in many countries, including the Netherlands, Japan, Germany, and other highly developed countries, since it was in them that the eco-modernisation transformation reached the highest level of development and use. Analysing the scientific achievements of researchers in this field, it is possible to interpret eco-modernisation as a socio-ecological concept that eventually connects the environment with constant changes in society. An essential element for the study of this industry is also a list of works concerning the economic component in environmental policy, technologies, and mechanisms of green and safe entrepreneurship, as well as the environmental development of industrial production in the context of post-industrial development of society [8].

Considering the issues of environmental risk management, it is worth investigating the list of methods that can be used to assess the environmental safety at enterprises of various industries. In particular, one of such assessment methods allows investigating the system of costs for environmental safety of production, factoring in its mandatory and structured nature. In general, it can be used in planning activities in the environmental risk management sector, in comparison with the purpose of its direct analysis and evaluation [9]. Another method allows comparing the dangerous environmental impact by enterprises of different industries, thus immediately identifying the most dangerous among them to apply certain restrictions. This method is based on indicators and data that correspond to the characteristics of particular individual industries. Thus, the process of studying the assessment of enterprises occurs in several stages, the main of which is the examination of statistical data in points with the calculation of weight coefficients, the final stage is the analysis of the dynamics of indicators as a percentage, subtracting the actual value of the total amount of points for quantifying the characteristics of production to the application of methods of socio-environmental safety. In addition, an integral index of prospects of enterprises of various industries to the application of socio-environmental responsibility as the optimal value of financial and non-financial indicators has been developed. Undoubtedly, the advantage of this method is the correlation analysis of current indicators at the enterprise with the main European environmental indices [10].

It can be argued that the integral structure of the mechanism for implementing environmental development of enterprises is a necessary element for preventing and eliminating possible threats of violation of regulatory environmental standards and requirements, which as a result helps establish environmental responsibilities for industrial production. To develop and implement an enterprise development strategy, and most importantly to meet the interests of stakeholders and users, it is necessary to use the principle of duality. This principle lies in combining the interests of both parties and is aimed at a rational solution of the problem [11]. Environmental risk management of enterprises is a fairly new scientific area based on practical aspects. It allows identifying the additional advantages for enterprises, as well as mitigating the adverse environmental impact of a particular production. The effectiveness of the enterprise in the development and modernisation of environmental policy serves as the main guarantee of environmental safety and the ability to monitor and manage environmental risks during economic production. The concept of environmental risk management is becoming increasingly popular around the world, and it has received the greatest publicity in countries that actively promote the policy of green entrepreneurship, including Switzerland, Belgium, Austria, Finland, and others. The purpose of green entrepreneurship is to comply with and implement the approved established standards of sustainable development to

reduce the eco-destructive environmental impact, but without changing the pace of development of production activities. It is inherent in such entrepreneurship to reduce the adverse environmental impact, provided the rational economic and social development ^[12].

Thus, green production covers three elements at once: environmental, social, and economic, as opposed to conventional entrepreneurship, which is aimed only at social and economic elements. A precondition for such modernisation of Ukrainian enterprises is the acquisition of new and high-quality knowledge, approaches, methods to the development of new, modern, and most importantly green organisational structures, for full compliance with the principles of sustainable development ^[13]. Admittedly, it is worth paying attention to such a financial element as green bonds, that is, a debt obligation, the funds received during the sale are sent in full to finance green entrepreneurship and innovative eco-projects. To a certain extent, this tool will help accelerate the development and modernisation of most enterprises operating in Ukraine. This concept was introduced in 2007, and the first to support it were the World Bank and the European Investment Bank. However, the highest peak in the prevalence of bonds was obtained in 2016 in Luxembourg, as it was there that the first international green bond exchange was established. One of the main advantages of implementing this trend in Ukraine is the possibility of capitalisation of enterprises, which in the future will increase the level of their competitiveness and, most importantly, these institutions will become investment-attractive. As for the subjects in such relations, the main ones are European investors who act on the part of buyers, since for them the financing of such green projects and support for enterprises is a reflection of their socially responsible investment policy ^[14].

Analysis of the introduction of "green entrepreneurship" in Ukraine leads to positive changes in all sectors of the economy. First of all, the primary sector covering agriculture, fishing, forestry, and extractive industries will be able to improve the main priority processes in the output of products to meet the primary needs of the population. Therefore, changes will occur at the initial stage, which will allow changing the entire mechanism and production system. When it comes to the secondary sector, which includes industry and construction, it is safe to say that it needs modernisation and investment the most, since the basis of processes in this sector is the use of energy resources, which then form those hazardous elements and residues that enter the environment. This sector needs to be completely modified in technical terms, since production characteristics serve as the basis for creating the main mechanism on which all production, as well as machinery and equipment. As a result, this will free the environment from the harmful effects of enterprises, and allow using limited resources and control their balance effectively and efficiently. As for the tertiary sector, it is directly an image of the concept of a green economy, since it lies in providing services to both the population and businesses, and represents the integral structure of various branches of entrepreneurship. It is precisely this structure that includes the processes of complex research and development. Furthermore, it includes the development and implementation of business plans and methods and energy-efficient technologies directly aimed at environmental modernisation of the primary and secondary sectors. The use of innovations in the environmental sphere will allow increasing the efficiency of production processes, focusing on saving critical exhaustive resources for the planet, increasing commercialisation, and introducing as many eco-technologies as possible into the daily work of enterprises. Thus, the main prospects for the introduction of "green bonds" are to improve the ecological state of Ukraine, accelerate the environmental modernisation of enterprises, and ensure optimal use of natural resources ^[15].

The main purpose of assessing and monitoring the environmental risk management system is to apply minimal costs to achieve high results. Furthermore, to increase the efficiency of the management sector at the enterprise, it is necessary to search for and further apply optimal and reasonable methods of decision-making and solving issues ^[16-18]. The basis of greening of production facilities and enterprises is the potential to increase the size of production in the context of maintenance and transition to accelerated improvement of quality indicators and statistics of the ecological state of the natural environment. The structure of such high-quality integral ecological and economic marks and elements should include resource return, resource recovery, preservation, waste-free, environmental efficiency of the economy, which will serve as the basis for creating and producing important innovative concepts in the implementation of the greening policy. Such urgent actions for environmental modernisation should be performed in the production facilities of industrial enterprises that most pollute the environment, for which innovative technologies and ideas for greening their production are extremely prioritised ^[5]. Ukraine's course towards European integration processes certainly has a positive impact on the overall ecological state of the country

and is reflected in the creation of an innovative sector for modernising environmental entrepreneurship in accordance with the current standards of the European Union, its competitiveness, profitability, and improving living conditions for the population. Maintaining ecological growth and development allows natural assets to continue to provide resources and environmental services that shape the well-being of society businesses. For this purpose, it serves as a catalyst for investments and technologies to be used as the basis for sustainable development and give a list of new financial opportunities ^[19-21].

A characteristic difference from the current economy is that it is endowed with properties of environmental economy. The main goal of the environmental economy lies in reaching optimal development when comparing the concepts of ecology and economy as the basis for applying the ideas of sustainable development and putting forward proposals to the governments of countries for the transition to rational activity and production, which concerns supporting investments in national natural capital, solving energy issues and providing the population with ecological food products, optimal use of land resources and constant monitoring of their number, the development of more effective environmental and resource-saving innovations and mechanisms that will work to reduce the amount of emissions of hazardous elements, resource creation, timely response to the results of climate change, the creation and implementation of technologies and mechanisms based on waste-free production ^[22]. The European Environmental Agency interprets the environmental economy as a modern policy that gives the population the opportunity to extract more resources every year, while preserving the natural ecosystems that contain them. Studying all the definitions of the concept of ecological economy, it is worth concluding that its conceptual tendentious feature is greening. In turn, greening is an innovative process of consistent introduction of new equipment and technology, new forms of production organisation, implementation of management and other decisions that allow increasing the efficiency of using natural resources while preserving the natural environment, improving it at various levels and ensuring overall well-being ^[23]. Environmental production provides a list of benefits to the enterprise, because after the procedure of reducing operating costs as a result of stopping the unnecessary use of raw materials and energy, which is vital, it provides significant environmental benefits and creates added value ^[24]. Waste management is an appropriate example of environmental services that are extremely valuable for the ecology and the environment. Thus, processed raw materials that have lost their use for production can become valuable for a third party, which will be able to use it as raw materials for another product or restore it for reuse, it is for this process that it is necessary to attract the latest eco-technologies and innovative developments ^[25].

Conclusions

The conducted research demonstrates that consideration of the environmental component and environmental risks in the development and approval of documents related to the choice of an environmental strategy for the development of industrial enterprises allows identifying environmentally optimal alternatives to activities, predicting the possible result in the environmental aspect from economic activities factoring in the current ecological state in a particular territory. The use of environmental risk management elements such as environmental impact assessment, internal and external environmental audits will allow combining environmental standards, including European ones, with the economic plans of industrial enterprises. This study can be used as a basis for the future development of the methodology for assessing environmental risks of industrial enterprises, as well as its application in the environmental risk management system during production at the enterprise. In addition, the study identified the importance and necessity of transitioning from the current concept of classical economics, which focuses only on the economic growth of the enterprise with ignoring the main environmental responsibilities, towards a new "green economy". It will considerably improve the well-being of humanity and the environment, while entrepreneurs will manage to combine two components: material and environmental.

It is possible to identify numerous advantages after applying the concept of greening in Ukraine among them: production of environmentally friendly products; rational use of resources; optimisation of production costs; processing and waste-free production; increasing investment attractiveness and motivation to introduce innovations; better, environmentally safe working conditions and quality of life of personnel; increasing consumer confidence; reducing environmental risks; improving business reputation and image; positive impact on the environment, ensuring its restoration. As a result of the implementation of environmental modernisation of enterprises, the

issue of excess solid waste generation from production will be solved by changing the main production algorithm and minimising them, ensuring the maximum possible use of resource-intensive waste, and the issue of harmful waste disposal will be solved through the change and development of technological processes and the development of innovative complexes for their processing and use in the future.

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