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ENVIRONMENTAL RESPONSIBILITY AS A FACTOR IN SUSTAINABLE DEVELOPMENT OF INDUSTRIAL RESOURCES (BASED ON THE EXAMPLE OF KRYVYI RIH, UKRAINE)

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Abstract: The article reveals the essence of environmental responsibility as a socio-economic and moral-legal category. It has been proved that environmental responsibility is defined not only by legal restrictions and punishment of those subjects that use natural resources in the process of economic activities often causing damage to the environment and the level of environmental awareness of all citizens, whose activities should be focused on sustainable use of natural resources. In the work, features of sustainable development has also been outlined, environmental risks in Ukraine have been analyzed and the author's understanding of the meaning of environmental responsibility and role of managers ensuring the sustainable development of Ukraine and its big industrial regions of the Kryvyi Rih iron ore basin has been presented.

Keywords: sustainable use of natural resources, environmental risks, sustainable development, environmental responsibility, environmental consciousness.

1. Introduction

In recent years, environmental problems have become a real threat to human health and life not only in Ukraine, but in countries of Western Europe. Polluted air and water basins, destructed forests, accumulated household wastes that are exacerbated by climate changes — anomalous heat, tornadoes, showers, snowfalls, landslides — require increased attention of not only governmental structures but communities as a whole. Environmental problems are exacerbated by the fact that the mining process disrupts the geological conditions that leads to degradation of land resources, restoration on which often becomes impossible. And while in European countries, mining has long been restricted, Ukraine remains a raw material producing country expanding significantly its range of environmental risks. This is especially true in regard to industrial regions, one of which is Kryvyi Rih — a powerful iron ore basin in Europe.

Therefore, it is not by chance that economically developed countries have chosen sustainable development that has become a global trend as their strategic purpose. Sustainable development is known to be associated with a reduction in industrial environmental footprint, a careful attitude to natural resources, and the introduction of innovative energy-intensive technologies in production. First of all, fulfillment of the main tasks of sustainable development is connected with the formation of *environmental responsibility* in all members of communities, especially working population. However, as evidenced by the real environmental situation in the industrial regions of Ukraine, in particular in Kryvyi Rih, where the country's largest iron ore basin is concentrated, environmental problems are becoming a threat to society and, therefore the ways allowing their prevention demand scientific understanding.

Therefore, the *purpose of the scientific work* is to clarify the content of environmental responsibility, to determine its role in reducing environmental risks and to ensure sustainable development of industrial regions of Ukraine based on the example of Kryvyi Rih, as well as to outline the prospects of its formation in business entities.

2. Environmental responsibility as a socio-economic, moral and legal category

The search for sociological interpretations of the "responsibility" category was traditionally peculiar to philosophers, but, even today, it has not been stopped yet, particularly in the Ukrainian sociological society. It is no coincidence that on 29 March 2019, at the Institute of Sociology of the National Academy of Sciences of Ukraine, a round table discussion devoted to topic "Forming a Responsible Society: Opportunities, Limitations, Perspectives" was held and attended by leading sociologists of the country (Round Table, 2019). As a result of the discussions, theoretical thinking and opportunities of empirical verification of *responsibility* as a phenomenon and as a category have been crystallized.

In particular, I. Martyniuk and N. Sobolyeva state that "responsibility is the basic category, on which the whole system of social relations is based. Trust, justice, solidarity, equality, tolerance — these are all foundations of a certain type of social interaction, each of which them in terms of its historical implication is an essential characteristic of the era, but it is responsibility along with freedom are the primary values in respect to other values derived from them" (Martyniuk, and Sobolyeva, p. 26). We can't but agree with the opinion of M. Shulha, who has emphasized that responsibility is "not only one of the qualities of society, but also one of the main conditions of its existence, since society can exist only under the conditions of presence of responsibility that permeates throughout all its spheres" (Shulha, 2019, p. 7).

Indeed, there is no sphere of social life where responsibility of individuals, social groups, social communities, or state structures does not form the basis for the relationship of social actors. Thus, in recent years, there has been a lot of talk going on about social, international, political, legal responsibility. The environmental sphere is not an exception.

However, justification of the content of environmental responsibility, as well as responsibility as a whole, remains an open question. As Ukrainian sociologists I. Martynyuk and N. Sobolyeva point out, "one can only be surprised by the limited nature of research on responsibility in the sociological sphere, because rights, duties and responsibilities are three pillars, on which the whole system of social interaction leans on" (Martynyuk, and Sobolyeva, p. 27).

Meanwhile, the concept of social responsibility in organizations, corporations and business as a whole is actively discussed by Polish sociologists. According to Polish researcher K. Kazojć, there are many definitions of social responsibility that arise from the history of peoples, their culture and experience, approaches to business or environment. Therefore, it becomes clear that social responsibility of the business is linked to both the society and natural environment, in which it operates. Therefore, it is not by chance that the question under discussion is sustainable development that is aimed at preserving the environment. Social responsibility in the context of sustainable development, as defined by K. Kazojć, is a "balanced behavior between actions aimed at taking care of achievement of goals in environmental, social and economic aspects" (Kazojć, 25.06.2019). That is, social responsibility includes or generates environmental responsibility.

As S.V. Bendas points it out, "according to the classical approach, environmental responsibility arose under the influence of environmental law: in order to avoid sanctions, companies were forced to revise their environmental policies and take measures for reducing the negative impact of their activities on the environment" (Bendas, 25.6.2019). It is obvious that environmental intervention and environmental damage fall within the purview of environmental legislation.

Environmental responsibility, as defined in the analytical document of the Resource and Analysis Center "Community and Environment" (2018), is an "obligation of the operator to take measures aimed at preventing environmental damage or eliminating consequences of environmental damage in order to restore natural resources to their original state that existed before such damage was caused and cover the costs of the measures taken" (Environmental Responsibility, 14. 07.2019).

Surely such definition of responsibility determines only the instructive actions of certain persons for environmental damage, but does not reveal its meaningfulness.

According to O. O. Okhrimenko, environmental responsibility is "a phenomenon that is a voluntary and deliberate fulfillment, use and observance by the subjects of social relations of regulations, social norms, and, in case of their violation, taking measures of influence provided by these norms to the offender" (Okhrimenko, 2015, p. 9). This definition already refers to the

personal moral responsibility of the business entities for its consequences. However, such definition is of broad scope and may refer to understanding not only of environmental but also of political, legal, scientific and other responsibility, as environmental specificity is not discernible in it.

A more meaningful definition is provided by L.I. Bilyk, who construes environmental responsibility as a quality that "characterizes the higher level of development of humanity attributes in the human being, the higher level of development of ecological consciousness of the human being" (Bilyk, 2005, p. 4).

Polish sociologist A. Marek-Bieniasz also focuses on the human being person and development of the human being. In particular, she believes that environmental responsibility reveals all the properties of responsibility as a whole, but has its own specificity that lies in the fact that, firstly, the subject of it is the human being who is responsible for the whole world of nature, without which biological existence of the human being is not possible, and secondly, nature itself, with all its elements, in the aspect, in which the consequences of human actions affect the functioning of nature and the reproduction of its usefulness (Marek-Bieniasz, 02.08.2019).

Ukrainian ecologists V.M. Shapoval and O.A. Kovalenko provided a more comprehensive definition of the content of environmental responsibility by defining it as "sustainable use of natural resources; activities on preservation of environmental assets for future generations and diversity of biosphere resources; the interaction of economic entities and society in the transformation of the biosphere into the noosphere, that is, the sphere of reason; environmental awareness of business representatives in solving environmental problems" (Shapoval, and Kovalenko, 10.08.2019).

To sum up, it can be argued that understanding the content of environmental responsibility combines both the classical approach, that is, the traditional approach that is based on environmental law and other legal and regulatory acts and the neoclassical approach that is based on the intellectual and moral properties of the human being as a conscious subject using natural resources.

Therefore, we propose to define ***environmental responsibility*** as *the fundamental principle of interaction of the human being and society with the natural environment that is formed in the minds of people in the process of education and upbringing, is developed in all spheres of their work on the basis of legal and moral principles, values, norms and shows as careful attitude of people to nature and the rational use of its resources for the social and economic needs of society.* Such understanding of the content of environmental responsibility gives reason to consider it as a socio-economic, moral legal category.

3. Environmental risks of industrial regions as a threat to their sustainable development (based on example of Kryvyi Rih)

The concept of sustainable development is known to be based on two major ideas: a) the search for the effective solution to environmental, economic and social problems through the optimal use of natural resources and b) the desire to achieve balance between environmental and economic factors that provide a fair standard of living for people, in particular for future generations, through the conservation and restoration of natural resources and the environment that suffer from devastating consumer use by people. In other words, it is about a rational attitude to nature, its careful use, constant management of natural resources that can ensure balanced economic and therefore social development.

It is clear that the implementation of the principles and provisions of sustainable development have to be based on certain fundamental principles that, first of all, should include the formation of socially responsible business, an integral part of which is environmental responsibility of business entities. Although the ethical fundamentals of socially responsible business in Ukraine are just being laid, and, with new President of Ukraine Volodymyr Zelensky, the active phase of the fight against corruption has been started in real terms rather than imitating them as it used before, it can be said with confidence that a class of entrepreneurs with a new thinking and European orientation begins to form. These include those entrepreneurs who have been involved in ensuring support and provision for the Ukrainian Army and Volunteer Battalions during the war in eastern Ukraine (2014-2019); those who participated in social programs related to the support of people with disabilities, veterans of the anti-terrorist operation in the East of the country, talented students, athletes, musicians; those who initiated and actively implemented projects on environment protection.

Social surveys conducted in Ukraine by the Allbiz International Internet Trade Center indicate that 90 % of surveyed employees of Ukrainian enterprises consider that corporate social responsibility is extremely important and useful, since it contributes to increasing the social guarantees of employees, in particular, one in five agree with it, it should be implemented through the high quality of the goods; 17% — through provision of the social package as a whole; 14% — through programs aimed at solving public problem to be implemented jointly with non-governmental organizations; 13% — through participation in charitable programs and cooperation with local authorities. However, only 3% of respondents are determined to be guided in the production of products by the environmental requirements and principles of openness and transparency of business (Lobanova, and Slavina, 12.07.2019). These data from sociologists indicate a lack of environmental awareness and therefore environmental responsibility of most Ukrainian entrepreneurs. And this affects the results of their economic activities. According to the data of environmental monitoring that are already open in Ukraine, more than six million tons of harmful substances and carbon dioxide get into the atmosphere of

our country every year (Oniliohvu, and Viskub, 10.08.2019). In the country, an extremely critical situation has come about the state of water reservoirs, in which now more than 10.6 thousand cubic meters of untreated and insufficiently treated wastewater are discharged every day (Ecological Situation, 10.08.2019).

The main pollutants of water reservoirs and air remain industrial enterprises**.** In Ukraine, one of the largest *industrial* cities is Kryvyi Rih, the economic potential of which is represented by about six thousand enterprises. The city's industry consists of 87 large enterprises in different industries: ferrous metallurgy, machine building, construction materials, chemical industry, printing industry, woodwork and timber industry, light industry, food industry, etc. In the Kryvyi Rih basin, there are eight out of 11 enterprises of Ukraine involved in for the production and processing of iron ore raw materials, as well as the enterprises for servicing the main production. Therefore, the main city-forming industry that determines steadily the city profile in the territorial division of labor is ferrous metallurgy. In Kryvyi Rih, there are one of the largest metallurgical plants in the world – Arcelor Mittal-Kryvyi Rih, five mining-and-processing integrated works, three mining equipment repair plants and other enterprises. Prevailing nomenclature: iron ore, concentrate, agglomerate, pellets, cast iron, steel, finished steel (fittings, angles, rods). The share of mining and metals sector is 86 % of the total industrial output in the city (Kryvyi Rih, Industry, 13.08.2019).

Of course, the long-term production of iron ore (confirmed deposits of which amount to about six billion tons) and 10 types of metallic minerals (gold, germanium, chromium, nickel, platinum, etc.) and 30 types of non-metalliferous minerals (diamond, talc, garnet, marble, clay, limestone, etc.) has a destructive risk-oriented impact on the environment.

According to geologists, “the total volume of the Earth crust involved in man-made geotechnical processes in the Kryvyi Rih region is about 20 billion cubic meters, and they form quarry and mine spaces with an area of 0.1-0.6 square kilometers and a depth of up to 100 m” (Malakhov, 2003, p. 100). So, the quarries that are flooded with water or covered with earth and tailings management facility (about 8,000 hectares of land) for accumulating mine water that is subsequently drained into the Ingulets river and the Saksahan river and pollute them are extremely *risky man-made* impact on the region ecosystem as a whole, threatening its complete destruction — pollution, landslides and flooding of large urban areas.

Next to the quarries there are shot piles (more than 36 thousand hectares) that disrupt the landscape by limiting the use of land for the summer residences of city dwellers. In addition, the waste generated in the process of enrichment of ferrous quartzites is placed in natural gullies that result in their pollution.

An important driver of environmental risks is the massive explosions in quarries that causes the exceeding of the permissible dust concentration in air by 15-20 times for settlements. According to experts, industrial emissions are the main source of depositing heavy metals on the earth's surface, in particular, on soils in the form of solid or liquid precipitation that negatively affects plants by reducing their yield (Chasova et al., 2011, p. 125). This situation

creates anthropogenic environmental risks for water reservoirs and soils, namely, causes their chemical and biochemical changes, as heavy metals have high biological activity, as well as carcinogenic, mutagenic and pathogenic properties. Road and rail transport also cause the entry of a significant amount of heavy metals into the city's ecosystems through the accumulation of lead and zinc compounds along highways. Heavy metals, needless to say, can be accumulated in plant tissues, in water reservoirs, in air and, through them, enter the organisms of warm-blooded animals and humans, adversely affecting them, destroying their physiological processes. Therefore, the man-made impact of enterprises of ore mining and processing industry in Kryvyi Rih on the environment is destructive and harmful for both natural landscapes that surround the urban area and/or located around it and air and water basins, and most importantly for health and life of the city population.

For decades, residents of Kryvyi Rih have been experiencing a critical increase in man-made load on the environment that is caused by an increase in industrial production capacity and concentration of industrial enterprises without provision of any compensations for the violation of environmental rights. Despite the introduction of a long-term program to address the environmental problems of the Kryvyi Rih iron ore basin (2011-2020), the level of environmental risks for humans remains high. So, according to the operative data of the enterprises of the mining and metallurgical complex of the city, in 2018, emissions of pollutants into the air amounted to 266.5 thousand tons; about 232.7 thousand tons of waste were generated, of which 153.1 thousand tons were disposed in the environment. The main part of industrial waste is the waste generated as a result of iron ore extraction and enrichment (Environmental Pollution, 14.08.2019).

As environmentalists E. Yevtushenko and S. Potapenko rightly point out, in connection with the long-term operation in Kryvyi Rih of a powerful mining complex and its related industries, the Kryvyi Rih region is recognized as “a region with a critical state of the environment, where the environment has often undergone irreversible changes and transformations, where all environmental systems are under influence of man-made impacts due to the complex and diverse nature of the functioning of various industries and numerous enterprises” (Yevtushenko, and Potapenko, 2014, p. 23). It is not by chance that Kryvyi Rih usually tops the ratings of the dirtiest cities in Ukraine and Europe.

Thus, the existence of environmental risks — both anthropogenic and anthropogenic risks — in the industrial region of Kryvyi Rih impedes its sustainable development that significantly increases the environmental hazard to the life of the urban community. This means that the level of environmental responsibility of both business entities and employees of regional self-government bodies is obviously insufficient to address economic and urban social problems in a demanding and appropriate way.

4. Environmental responsibility as a value, a social norm and a tool for ensuring sustainable development of industrial regions

Considered environmental risks that tend to progress in Ukraine and especially in the industrial regions, of course, have a destructive potential for society as a whole and for the health and life of each human being in particular. Therefore, it is necessary to mobilize those human, public, state and social opportunities that would hinder the destructive environmental processes. We are inclined to believe that these opportunities lie in the plane of forming the proper level of environmental responsibility not only for business entities, but for all the citizens without exception, including city authorities.

As environmental responsibility is not only a socio-economic but also a moral and legal category, it is realized at all levels of individual, group (corporate), social life and especially in the field of production of material assets and services that has an all-embracing space. While, in the legal plane, environmental responsibility can be formed by increased attention of law enforcement agencies to violations of environmental legislation that is extremely necessary to do on a permanent base, then, at the level of environmental consciousness and ecological culture of people, it is impossible to form it by bans and punishments.

It is clear that environmental responsibility should acquire the status of a social value and social norm for every person, regardless of gender, age, occupation, religion or place of residence. Therefore, it is necessary to form it, first and foremost at *the individual level*, starting from childhood — from the family, primary and secondary school, deepening it in the higher professional education system through special education courses and programs on forming environmental culture. The specialist with a high level of environmental responsibility for the consequences of his/her entrepreneurial activities should come into the production sphere, i.e. with a developed environmental thinking, need and desire to make such decisions and carry out such actions that would be aimed at environmental protection, rational and economical use of natural resources. As sociologists rightly point out, “illicit and frivolous actions are becoming unacceptable, as the technical power of mankind has grown to such an extent that a wrong, irresponsible decision may cause large-scale consequences and lead to results irreversible in their detriment” (Martynyuk, and Sobolyeva, 2009, p. 27). It is sufficient to recall the disaster occurred at the Chernobyl Nuclear Power Plant in 1986 as a result of the irresponsible actions of the then Soviet specialists and state leaders, the consequences of which are still felt today.

At the *enterprise level*, as I.S. Ladunka and D.A. Symonenko rightly points out, environmental responsibility can be implemented as «rational and economical use of natural resources on the basis of active introduction of innovative technologies; taking measures to prevent damage, pollution, depletion of natural resources, negative impact on the environment; application of biological, chemical methods for improving quality of natural resources; carrying out economic activities without violating the environmental rights of others; conservation of

the territories and objects of the nature reserve fund that are subject to special protection" (Ladunka, and Symonenko, 11. 08.2019).

At the *state level*, it is urgent to create such a legislative field that would interest business owners to use the mineral wealth rationally; to introduce a system of continuous monitoring of the state of all geospheres for preventing man-made disasters and introduce innovative technologies for mineral extraction and processing. An important direction of the state should be the introduction of powerful state programs that will help to solve the republican and regional environmental and economic problems, in particular, there is an urgent need to develop the concept of balanced nature management for Kryvyi Rih. (Hubin, Hubina, 2011, p. 122).

At the *societal level*, it is necessary to promote more widely public initiatives aimed at protection of the environment and minimization of environmental risks need by studying and implementing the experience of developed countries in Europe and the world.

With such approaches, environmental responsibility will become a social value and an effective tool for sustainable development, which is a modern global trend, of Ukraine as a whole and its industrial regions in particular.

5. Conclusions

Nowadays, environmental risks associated with a large-scale contamination of soil, air, and water areas are increasing rapidly. Scientists consistently draw attention of politicians and mankind to the inevitability of on the global environmental catastrophe. Therefore, in today's world, the problem of preserving the environment, restoring natural resources, clearing of the air is especially acute. In our opinion, the solution of this problem is not possible without a high level of environmental awareness of all citizens of the world, including politicians, business entities, and managers of various levels. Environmental responsibility is both a socio-economic and moral-legal category, as it appears in the process of economic (production) activities as sustainable use of natural resources and in everyday life as reasonable needs and a caring attitude to the environment. Environmental Responsibility acquires the status of a social value as a property of specific individuals, social groups (corporations and enterprises), as well as society as a whole in the current conditions of accelerated economic development caused by intensive use of natural resources. It is an integral part of environmental awareness of the human being, as it manifested in the need of the human being to treat the environment with care, to comply with the environmental and legal requirements of doing business, to use natural resources rationally, and to care for preserving cleanliness of the air space and water area.

Environmental responsibility is a type of social responsibility that is inseparable from the doctrine of sustainable development, because it means, firstly, certain expectations of society from citizens and business entities regarding cooperation with the natural environment,

and secondly, their awareness of their duty to nature and society for consequences of human activities.

However, sociological studies show a relatively low level of environmental responsibility of business people in today's Ukraine, in particular, in large industrial areas, such as the Kryvyi Rih basin, where norms of permissible environmental pollution are exceeded tenfolds as a result of mining and metallurgy development.

Environmental threats and risks inherent in modern Ukraine and its industrial regions, in particular to the Kryvyi Rih region – their landscapes and population, can be reduced not only by improving legislative and legal mechanisms, state environmental programs, but also by supporting public environmental movements and extensive educational activities among all socio-professional and age groups of the population that would be aimed at forming the proper level of ecological thinking, ecological culture, and therefore environmental responsibility.

Only under these conditions the environmental responsibility of citizens and business entities can become an effective tool for sustainable development of the industrial regions and the country as a whole, as it will limit the disruption of the social-natural balance and encourage a rational approach to environmental management.

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