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ASSESSMENT OF THE MAIN ASPECTS OF ENVIRONMENTAL RESPONSIBILITY IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT OF THE ECONOMY OF UKRAINE

ОЦІНКА ОСНОВНИХ АСПЕКТІВ ЕКОЛОГІЧНОЇ ВІДПОВІДАЛЬНОСТІ В КОНТЕКСТІ СТАЛОГО РОЗВИТКУ ЕКОНОМІКИ УКРАЇНИ

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Abstract: *The article considers the role of environmental responsibility of business in the context of ensuring sustainable development of the economy of Ukraine. The theoretical analysis is based on classical and neoclassical approaches to understanding the environmental responsibility of enterprises: from mandatory compliance with environmental standards to the formation of a conscious moral responsibility of producers for environmental protection.*

As part of the empirical study, key indicators of sustainable development have been analyzed, in particular, energy intensity, material intensity, carbon intensity, water intensity and waste intensity of Ukraine's GDP in dynamics for 2015 - 2023. Special attention is paid to trends in the volume of emissions of pollutants and carbon dioxide into the atmosphere. The dynamics of capital investments and current expenditures on environmental protection by type of environmental protection activity have been revealed.

The results of the study indicate positive developments in the field of energy efficiency and reduction of emissions per unit of GDP, which is evidence of the gradual adaptation of Ukraine to international environmental standards. At the same time, the identified problems with the growth of waste intensity and instability of material intensity signal the need to deepen environmental reforms, modernize production and strengthen the environmental responsibility of business.

The proposed recommendations provide for the integration of sustainable development principles into enterprise strategies, increased investment in green technologies, and reform of the waste management system and harmonization of Ukraine's environmental policy with the requirements of the European Green Deal.

Keywords: *environmental responsibility, sustainable development, energy intensity of GDP, material intensity of GDP, carbon intensity of GDP, water intensity of GDP, waste intensity of GDP, pollutant emissions, capital investments in environmental protection, current costs of environmental protection.*

Introduction.

Five or ten years ago, social responsibility of business was perceived more as an additional bonus, a pleasant marketing 'zest' that only the largest corporations allowed themselves. The topic of sustainable development (sustainability) was known only to a narrow circle of specialists. However, today the situation has changed dramatically: environmental friendliness and social responsibility have become necessary conditions for the survival, competition and profitability of companies.

Society has become more attentive to how business works, i.e. how environmentally friendly production is, how much plastic the company uses, what is the level of its carbon footprint, and in what conditions employees work. All these are areas that are increasingly becoming the objects of attention not only from the public, but also from state regulation. Regulatory pressure, the demands of consumers and partners for transparency and openness in matters of environmental activity, informing stakeholders about environmental risks and consequences, as well as active participation in solving environmental problems at the local, national and global levels, are increasing year by year.

In the modern business environment, sustainability has become a key factor of competitiveness. It is manifested in the implementation of the principles of sustainable production and consumption, environmental marketing, support for environmental initiatives and the integration of environmental criteria into management decision-making. Businesses that do not integrate environmental friendliness into their activities risk losing customers, investors and the opportunity to function in conditions of increased environmental requirements.

Sustainable development is not only about reducing harmful emissions. This is a holistic approach that includes the use of renewable energy sources, material recycling, the implementation of a circular economy, energy efficiency, waste reduction, compliance with workers' rights and minimizing negative environmental impact.

Analysis of recent research and publications. The following works are devoted to the study of the features of the implementation of the concept of social responsibility and environmental social responsibility: Moroz S.V., Meish A.V., Levchenko S.A. [4]

analyze the impact of the war on approaches to CSR in Ukraine, business participation in projects for ecological restoration, development of renewable energy, cleaning of contaminated areas and restoration of infrastructure; Bobko L.O., Vovk V.V., Korpan A.V. [1] investigate the environmental component of corporate social responsibility of enterprises, analyze the place of Ukraine in the index of environmental sustainability, emphasizing the need for rational use of natural resources; Smolennikova D.O. [6] investigates the concept of environmental responsibility of business, emphasizing its importance for sustainable development, and also considers the role of stakeholders in the implementation of environmental responsibility and the advantages that it provides to enterprises, including competitive advantages and a positive image; Tanasienko N.P. and Poplavska O.V. [5] consider the relationship between environmental problems and national security of Ukraine, analyze the state of environmental security, indicating the need for a systemic approach to solving environmental problems that may affect the stability and security of the state.

The purpose of the study is to comprehensively study the environmental responsibility of business in the context of ensuring sustainable development of the Ukrainian economy by analyzing key indicators of resource and energy efficiency, the level of pollutant emissions, the volume of capital investments and current expenditures on environmental protection, as well as to substantiate areas for improving the environmental policy of enterprises in accordance with modern international standards and the challenges of sustainable development.

The main material researches. Climate change is considered one of the most serious global risks of our time, being included in the list of five major threats according to the World Economic Forum. The acceleration of climate change is accompanied by an increase in the frequency and intensity of extreme weather events in recent decades, which is a direct consequence of the growth of anthropogenic greenhouse gas emissions.

The Organization for Economic Cooperation and Development emphasizes that carbon and energy productivity are important characteristics of the interaction between economic development, energy cycles, environmental and economic efficiency of

production and consumption. These indicators allow us to assess the progress of countries in the direction of the transition to a low-carbon economy and sustainable green growth. That is why these indicators have become key to measuring the so-called 'decoupling' process, which demonstrates the possibility of economic growth without a corresponding increase in negative environmental impacts. Ways of carbon neutrality achievement have been discussed in the work [3].

Particular attention is paid not only to global climate change, but also to local environmental problems, including air pollution by fossil fuel combustion products at thermal power plants, as well as improper handling of industrial waste.

Nowadays, there is no unified approach to the essence of environmental responsibility, which is interpreted differently by representatives of economic directions. Thus, according to the classical approach, environmental responsibility arose under the influence of environmental legislation. In order to avoid sanctions, enterprises were forced to revise their environmental policies and take measures to reduce the negative impact of their activities on the environment. According to the neoclassical approach, environmental responsibility is a consequence not only of regulatory restrictions, but also of the moral responsibility of producers for causing harm to nature [1].

Carbon and energy productivity indicators serve as important indicators of green growth and are a necessary element for the formation of sustainable development strategies. They allow us to identify the causes and trends of changes, as well as to determine the priorities of state policy. In essence, productivity is measured as the ratio of the volume of economic goods produced to the amount of energy consumed or the volume of greenhouse gas emissions. In other words, these indicators demonstrate how efficiently the economy uses natural resources (Table 1).

The resource intensity of gross domestic product (GDP) is an important indicator of sustainable economic development, which allows us to assess the efficiency of using natural resources in the process of creating national income. In this study, the analysis covers five main indicators: energy intensity, material intensity, carbon intensity, water intensity and waste intensity of GDP as a percentage of the base year 2015. In 2016, there was a temporary increase in the energy intensity of GDP (102.3%), which

Table 1 – Resource intensity of Ukraine's GDP (ratio of consumed physical volumes of natural resources, generated waste and emissions of pollutants to the volume of GDP), % to the level of 2015

Year	Energy intensity of GDP	Material intensity of GDP	Carbon intensity of GDP	Water intensity of GDP	Waste intensity of GDP
2015	100	100	100	100	100
2016	102.3	100	105.8	98.2	92.5
2017	94.7	98.2	85.1	91.7	111.6
2018	95.2	97.2	83.8	95.1	103.9
2019	88.5	100.4	77.9	91.6	126.1
2020	88.9	99.9	72.8	94.2	137.3
2021	-	108.2	72.2	77.3	141.6
2022	-	-	-	60.1	-

Resources: [2]

indicated a somewhat less efficient use of energy resources. However, since 2017, the indicator began to steadily decline, reaching 88.5% in 2019 and maintaining this level in 2020. This indicates a gradual energy modernization of the economy, the introduction of energy-efficient technologies and a reduction in the volume of energy-intensive industries. However, it is worth noting that even in 2020, the level of energy intensity in Ukraine remained significantly higher than in EU countries. For comparison, the average level of energy intensity of GDP in Germany is about 50% of the similar indicator of Ukraine for 2020; in France it is about 40%.

The material intensity of GDP shows insignificant changes in dynamics. During 2016–2020, it fluctuated within 97–100%, which indicates a stable, but insufficiently efficient use of material resources. A slight increase to 108.2% in 2021 may be associated with the reorientation of the economy to less technological and raw material sectors in the context of adaptation to new foreign economic challenges.

Carbon intensity is a critical indicator in the context of the state's environmental responsibility. In Ukraine, this indicator shows the most positive dynamics. From 2016 to 2021 it decreased from 105.8% to 72.2%, which indicates a decrease in greenhouse gas emissions per unit of generated GDP. This trend indicates positive steps towards decarbonization of the economy, which corresponds to Ukraine's international climate

commitments. However, it is worth emphasizing that the level of carbon intensity in Ukraine remains significantly higher than in most countries of the European Union, in particular Sweden, where this indicator was less than 30% in 2020 relative to the indicator of Ukraine.

The dynamics of water intensity also has a positive trend. From 2016 to 2021 the indicator decreased from 98.2% to 77.3%, which demonstrates an increase in the efficiency of water use in industry and agriculture. However, the significant drop in 2022 (to 60.1%) requires additional contextual analysis. It is likely due to a temporary shutdown of production caused by a full-scale war, and not the result of a real technological breakthrough.

The most unstable indicator is waste intensity. In 2016, it was 92.5%. This indicator grew almost every year, reaching 137.3% in 2020 and 141.6% in 2021. Such dynamics indicate a significant accumulation of industrial and household waste in the production process, as well as the lack of an effective system for their management. Compared to EU countries, where a significant part of waste is reused or recycled (for example, in the Netherlands the recycling rate is over 70%), Ukraine continues to operate according to the 'produce – use – throw away' model, which is a serious barrier to a sustainable economy.

Carbon dioxide emissions from the combustion of fossil fuels and biomass form a significant share of total greenhouse gas emissions. In Ukraine, these sources are responsible for approximately 53% of all greenhouse gas emissions. Such a high figure determines the importance of the issue of decarbonization of the national economy and reducing dependence on fossil resources.

In addition to the actual environmental consequences associated with greenhouse gas emissions, there are also economic risks, such as: climate externalities, changes in international financing standards, and an increase in the cost of capital for polluting enterprises. In this context, understanding the volumes and sources of emissions has become an important component of international environmental policy, in particular carbon pricing mechanisms and the transformation of market behavior of businesses and consumers.

Greenhouse gas emissions are at the heart of European environmental policy, particularly in the context of the European Green Deal. The strategic objective is to achieve climate neutrality by 2050, which involves a drastic reduction in emissions from industry and energy, the establishment of an effective carbon pricing system and supporting changes in consumption habits and citizens' behaviour. Emissions and resource efficiency are measured using a range of indicators that allow for an assessment of economic performance and the degree of sustainability (Figure 1).

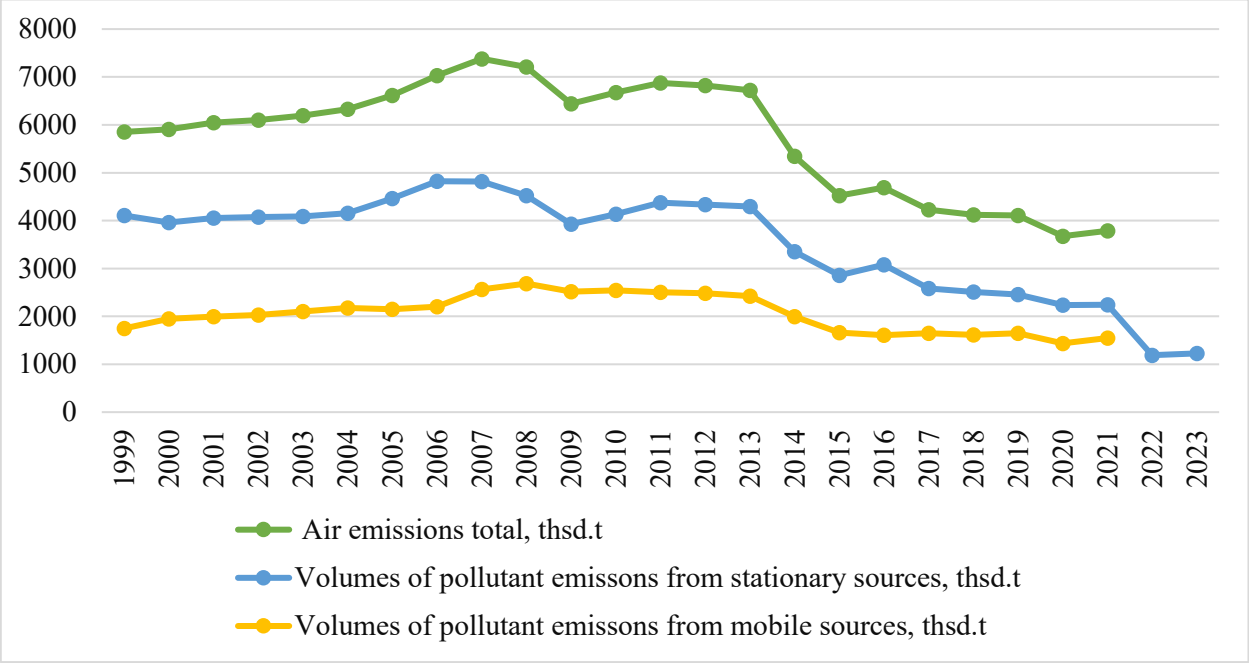

Figure 1 – Emissions of pollutants and carbon dioxide into the atmosphere*

Resources: Constructed by the authors based on data [2]

Air quality is one of the main environmental indicators of the state of the environment, which directly affects both the health of the population and the climate stability of the country. In 1999, the volume of pollutant emissions in Ukraine amounted to 5.85 million tons. In subsequent years, it fluctuated within 6 - 7.4 million tons, reaching a peak in 2007 (7.38 million tons). This was a period of industrial revival of the economy after the crisis of the 1990s, with the activation of heavy industry, especially in the energy and metallurgical sectors.

Since 2008, as a result of the global financial crisis, there has been a tendency to reduce emissions. Thus, in 2009, their level fell to 6.4 million tons. After a short-term

increase in 2011–2013, starting in 2014, emissions have been decreasing significantly – to 4.5 million tons in 2015, 3.67 million tons in 2020 and 3.79 million tons in 2021.

The reduction was particularly noticeable in 2014–2015, which coincided with the beginning of hostilities in eastern Ukraine, a partial halt in production in Donetsk and Luhansk regions, as well as a decrease in industrial energy consumption. Data for 2022–2023 are partially incomplete due to the difficulties of collecting information in conditions of a full-scale war, but it is known that in 2022, emissions from stationary sources fell to 1.19 million tons and in 2023 to 1.22 million tons. These are the lowest figures for the entire observation period.

At the beginning of the study period (1999–2008), stationary sources – mainly industrial facilities, thermal power plants, and metallurgical plants – formed the bulk of emissions. For example, in 2006, stationary sources accounted for over 68% of the total. But over time, their share began to decline.

In contrast, mobile sources (mainly motor vehicles) demonstrate a constant presence in the structure of air pollution, although their contribution has always remained smaller than stationary sources. The highest absolute values of emissions from mobile sources were recorded in 2008–2010 over 2.6 million tons, which was due to the intensification of transport mobility and low environmental standards of cars.

After 2014, due to the partial loss of control over certain territories, the introduction of EU technical regulations, and the renewal of the vehicle fleet, emissions from mobile sources also gradually decreased. However, in the last two years (2022–2023), despite the difficult situation, there has been a relative stabilization of this indicator: 1.22 million tons in 2023 (Figure 2).

From 2004 to 2012, CO_2 emissions increased from 148.8 million tons to a maximum of 229.9 million tons in 2011, which corresponds to the general trend of increasing energy consumption and production.

Subsequently, in particular after 2014, emissions steadily decreased to 148.2 million tons in 2017 and 131.9 million tons in 2020. The lowest emissions were recorded in 2020–2021, which is associated with both economic stagnation due to the COVID-19 pandemic and some progress in the field of energy efficiency.

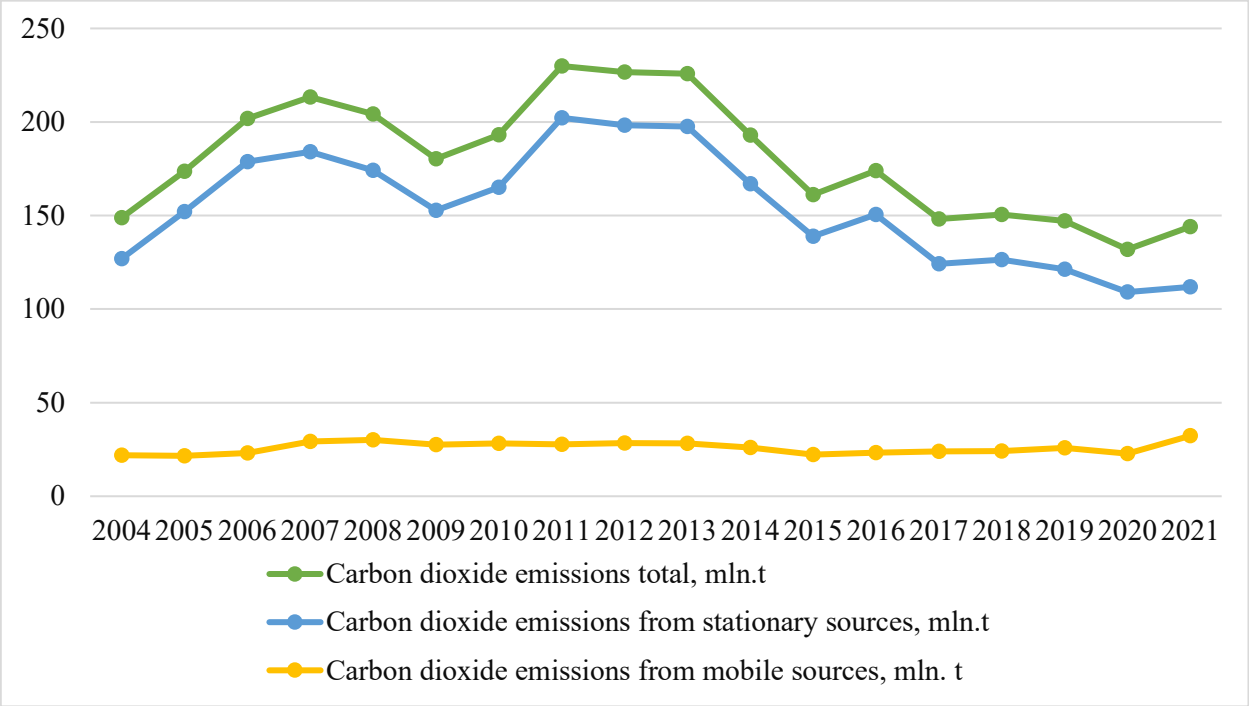

Figure 2 – Carbon dioxide emissions*

Resources: Constructed by the authors based on data [2]

The jump in CO_2 emissions in 2021 is extraordinary to 144.1 million tons, of which 32.3 million tons were from mobile sources. This is a record figure for emissions from transport for the entire period, which is likely related to the post-quarantine restoration of mobility.

In 2022–2023, the amount of carbon dioxide emissions from mobile sources continued to decrease to 63.4 million tons in 2022 and 67.6 million tons in 2023. This reflects both the reduction in mobility due to the war and the reduction in fuel use in temporarily occupied and frontline territories.

In light of global development and the intensification of European integration processes, Ukraine has a chance to use the post-war recovery period to restart the energy and industrial system on new principles: cleaner, more efficient and more focused on sustainable development. There is a need to analyze the amount of capital investments in environmental protection (Table 2).

Table 2 – Capital investments in environmental protection by type of environmental protection activity, thousand UAH [2]

Years	*Total*	*Including*				
		Protection of ambient air and climate	*Wastewater management*	*Waste management*	*Protection and remediation of soil, groundwater and surface water*	*Other environmental protection activities*
2006	2194188,5	762538,6	777924,5	339529,6	247695,4	66500,4
2007	3080687,6	1379250,6	809677,1	388386,6	393036,8	110336,5
2008	3731400,4	1476343,3	927352,9	422918,6	787303,8	117481,8
2009	3040732,7	1273789,4	882525,4	400016,9	401425,6	82975,4
2010	2761472,1	1139946,7	734663,4	475584,3	319922,0	91355,7
2011	6451034,6	2535632,6	721325,5	1183880,2	639123,1	1371073,2
2012	6589336,5	2462675,3	846955,4	730544,4	540516,8	2008644,6
2013	6038783,0	2411935,1	834114,8	713856,3	324980,1	1753896,7
2014	7959853,9	1915129,7	1122149,3	783965,4	359925,6	3778683,9
2015	7675597,0	1422946,6	848881,2	737498,9	388259,2	4278011,1
2016	13390477,3	2502805,8	1160029,1	2208676,6	419988,9	7098976,9
2017	11025535,2	2608027,4	1276530,2	2470969,5	1284502,0	3385506,1
2018	10074279,3	3505920,6	1692640,7	1182045,8	1444291,6	2249380,6
2019	16255671,8	4276767,6	1753869,1	5754260,9	1721924,9	2748849,3
2020	13239649,8	5595319,4	1578201,4	2899793,4	2554224,5	612111,1
2021	14113735,0	4891093,8	1383214,5	3719604,6	2716845,3	1402976,8
2022	6446017,8	1598709,5	743357,5	2795900,8	992562,9	315487,1
2023	8284027,4	1507599,3	1709535,5	3204646,0	1385950,4	476296,2

During the period from 2006 to 2023, the volume of capital investments aimed at environmental protection in Ukraine demonstrated unstable, but generally growing dynamics with clearly defined phases of upswing, downswing and reorientation in directions. The analysis traces not only the general trend of changes in funding volumes, but also the evolution of priorities of state and corporate environmental policy. In 2006, the total volume of capital investments in the environmental sphere amounted to about UAH 2.2 billion. In the following years, steady growth was observed, reaching a peak in 2016 over UAH 13.3 billion. Later, after a short-term decrease in 2018 (to UAH 10 billion), the volume of investments grew rapidly again,

reaching a record level in 2019 (UAH 16.2 billion). This was the highest figure for the entire period, after which a significant drop occurred in 2020, due to the pandemic crisis and shifting budget priorities. The gradual recovery in 2021 (14.1 billion UAH) was stopped by a sharp reduction in funding in 2022 to the level of 6.4 billion UAH, which is due to the full-scale war and military operations on the territory of Ukraine. However, a certain recovery is already observed in 2023, up to 8.3 billion UAH.

Investments in the field of air environment and climate protection consistently increased until 2020, when they reached a peak of 5.6 billion UAH, which is approximately 42% of all environmental spending that year. This indicates the significant importance of the topic of decarbonization and air purification, which occupies a key place in Ukraine's climate policy. At the same time, in 2022–2023, there is a significant decrease in funding for this area - to UAH 1.5 billion, which may be a consequence of both the redistribution of resources and the destruction of infrastructure in wartime conditions.

The dynamics of investments in wastewater treatment was less stable. Expenditures ranged from UAH 721 million in 2011 to over UAH 1.7 billion in 2023. After a sharp reduction in 2020–2021, there is a tendency for gradual recovery, which may indicate the activation of reforms in the field of water supply and wastewater disposal, especially in front-line regions that have experienced serious environmental stress.

Waste management costs in 2006 amounted to about UAH 340 million, in 2019 over UAH 5.7 billion, which became an unprecedented figure. This growth can be interpreted as a response to the current crisis in the field of waste disposal and garbage accumulation due to urbanization, as well as the intensification of the European integration process, within the framework of which Ukraine has undertaken to bring environmental policy closer to European standards. After that, the level of investment decreased (to UAH 2.8 billion in 2022), but in 2023 it increases again, exceeding UAH 3.2 billion.

Expenditures on soil, groundwater and surface water protection have increased significantly from UAH 324 million in 2013 to UAH 2.7 billion in 2021. This indicates

a growing awareness of the importance of soil resources, which, despite their 'invisibility', are critically important for food security. This direction has become especially relevant after the destruction of hydraulic engineering facilities and pollution of water resources in 2022–2023.

The category of 'other activities' (e.g. biodiversity, public awareness, laboratory research, etc.) showed sharp fluctuations. From UAH 66.5 million in 2006, it grew to a record UAH 7.1 billion in 2016, which accounted for more than 50% of all expenditures. Such an increase could be associated with classification changes or with the implementation of large-scale cross-sectoral projects. Subsequently, the volume of expenditures decreased, reaching a minimum in 2020–2022, and in 2023 showed a slight increase (Figure 3).

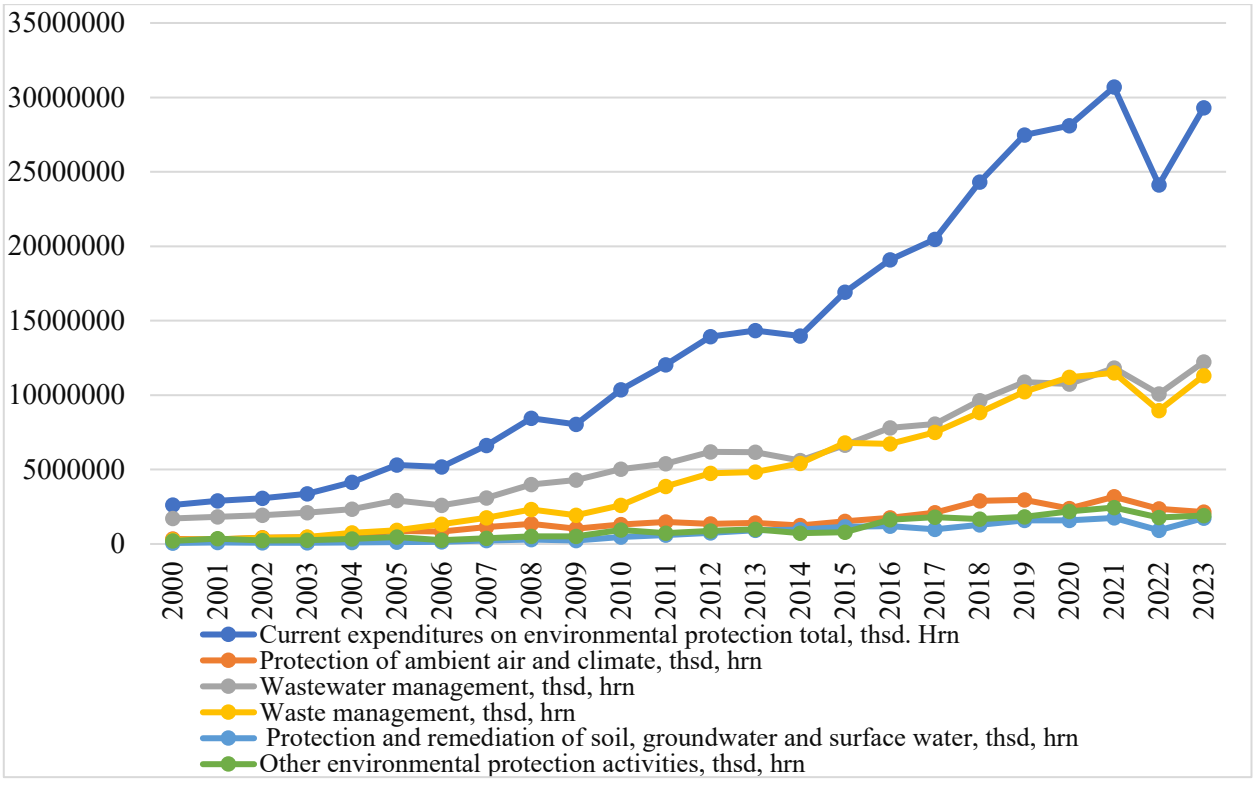

Figure 3 – Current environmental protection expenditures by type of environmental protection activity, thousand UAH*

Resources: Constructed by the authors based on data [2]

Current environmental protection expenditures are an important component of environmental policy, reflecting the scale of operational activities aimed at reducing

the technogenic load, maintaining ecosystems, and implementing protection measures in real time. Data for 24 years allow us to draw a solid conclusion about the evolution of environmental priorities in Ukraine, the transformation of funding sources, and the impact of external factors on the sustainability of environmental protection activities (Fig.3).

In 2000, the total amount of current environmental protection expenditures amounted to just over 2.6 billion UAH. Over the next decade, there was a gradual increase, which significantly intensified since 2010, when expenditures exceeded the mark of 10 billion UAH. This trend continued in the future, reaching a record figure of 30.7 billion UAH in 2021, which became the absolute maximum for the entire period. This year is marked not only by the largest total expenditures, but also by consistently high volumes in all areas of environmental activity.

The overall reduction in 2022 to UAH 24.1 billion, although noticeable, was not critical despite the war. The environmental sphere retained a significant part of its funding. In 2023, expenditures increased again to UAH 29.3 billion, which may indicate the adaptation of environmental policy to new conditions, as well as its preservation as one of the national priorities.

In 2000–2005, expenditures on air protection were relatively insignificant, accounting for only 10–13% of the total. However, since 2010, this area has been steadily growing, reaching a maximum of UAH 3.2 billion in 2021. This is due to the strengthening of national climate policy, the implementation of international agreements, in particular the Paris Climate Agreement, and the desire for integration with the EU. In 2023, expenses decreased to UAH 2.1 billion, which may indicate a temporary shift in priorities against the background of martial law. Despite this, the share of this area remains significant in the overall structure of current expenses (over 7%).

Wastewater treatment expenses traditionally occupy the first place among all areas of environmental protection. Back in 2000, expenses for this area amounted to over UAH 1.7 billion, i.e. 65% in relative terms. This trend continued: in 2023, more than UAH 12.2 billion was spent on wastewater treatment, or 41.7% of all expenses.

The explanation for this is the critical state of water infrastructure, the high level of wear and tear of sewage systems, and the need to modernize treatment facilities in cities and industry. In addition, the growth of water consumption in industry and the increase in regulatory requirements for water treatment contributed to the strengthening of this category.

Waste management costs are showing an upward trend. In 2000, less than UAH 280 million was spent on waste management, while in 2023 it was over UAH 11.3 billion, which is 38.6% of all current costs. This dynamics is a response to the garbage crisis, the rapid growth of household and industrial waste, as well as the inefficiency of the existing infrastructure for collecting, sorting and disposing of waste.

A particularly noticeable increase in costs has occurred since 2015: in 2014, waste costs amounted to UAH 5.4 billion, and in 2020–2023 over UAH 10–11 billion annually. This indicates the growing relevance of the circular economy and the beginning of the modernization of the industry.

Expenditures on soil, groundwater and surface water protection were less of a priority at the beginning of the period. In 2000 they amounted to 66 million UAH, but by 2023 they had increased to 1.73 billion UAH, which is about 6% of the total. At the same time, it should be noted that this area became especially relevant after 2014 in the context of agricultural policy, soil degradation and water pollution due to military actions and industrial accidents.

The category of ‘other environmental protection measures’ covers a wide range of expenses from information policy to scientific research and technical monitoring. Over the analyzed period, this indicator has increased from 206 million UAH in 2000 to 1.9 billion UAH in 2023. Peak values were observed in 2020–2021, which may be associated with the implementation of international projects and the modernization of environmental monitoring systems.

Most indicators are related to production activities, but it is also important to take into account consumer aspects. This means that it is necessary to assess not only the efficiency of production, but also the level of resource consumption by end consumers, taking into account the so-called ‘ecological footprint’ of the national economy. Thus,

a modern approach to assessing environmental impact includes a comprehensive vision of both production and consumer responsibility in the face of intensifying climate challenges.

Conclusions and recommendations.

The analysis conducted indicates certain positive developments in the context of energy efficiency, water use and reduction of carbon dioxide emissions per unit of GDP. This is a signal that Ukraine is gradually adapting to the requirements of sustainable development and international environmental standards.

However, the instability of material intensity and the sharp increase in waste intensity indicate the incompleteness of transformations in the field of environmental management. The situation with the volume of waste generation is particularly alarming, which requires both institutional changes and modernization of technologies in industries that generate the most industrial waste.

There is a steady reduction in emissions of pollutants into the atmosphere, which began in 2014 and intensified in 2022–2023. This is due to both the structural restructuring of the economy and external crisis factors. Carbon dioxide emissions remain critically high, despite their slight decrease. The country needs deep decarbonization and a transition to renewable energy sources.

In general, it can be argued that Ukraine is demonstrating a gradual increase in attention to environmental protection issues, which is reflected in the growth of capital investments in relevant areas. However, this dynamics is uneven and reflects both economic cycles and external challenges, in particular, financial crises, a pandemic and a full-scale war.

Taking into account the identified trends and problem areas, in our opinion, the following system of recommendations can be offered.

First of all, it is necessary to systematically increase investments in environmental innovations. Particular attention should be paid to the development of technologies aimed at increasing the energy efficiency of production processes, reducing greenhouse gas emissions, waste disposal and the transition to renewable energy sources. Financial support for innovation should become a strategic direction of state policy, which will

contribute not only to improving the environmental situation, but also to increasing the competitiveness of the economy.

One of the key tasks is the reform of the waste management system. Today, Ukraine needs to move from fragmented waste management to an integrated approach, which includes extended producer responsibility, development of infrastructure for waste sorting and recycling, and stimulation of the circular economy. Legislative support should support the implementation of EU standards in the field of waste management and encourage businesses to apply innovative solutions to minimize waste generation at all stages of the product life cycle.

In the context of increasing energy efficiency and decarbonization of the economy, it is extremely important to introduce mechanisms for monitoring the resource intensity of production at the level of individual enterprises. This will allow for timely identification of inefficiency zones, assessment of the impact of production activities on the environment, and implementation of targeted programs to optimize resource consumption. The openness and publicity of such data will also help to increase trust among consumers, partners and investors.

In addition, it is extremely important to harmonize national environmental policies with European standards of sustainable development, in particular within the framework of the implementation of the provisions of the European Green Deal. This includes adapting legislation, implementing a carbon regulation system, developing alternative energy, modernizing transport, and supporting initiatives to decarbonize industry.

Business should play a key role in transformation processes by integrating ESG (environmental, social and corporate governance) principles into their development strategies. Companies should move to active management of their environmental footprint: reduce emissions, implement energy-efficient technologies, use environmentally friendly materials, and develop sustainable development strategies.

It is also necessary to stimulate the development of green infrastructure in cities and communities, including the creation of green zones, the introduction of sustainable

water supply and wastewater systems, the development of public eco-transport, and energy efficiency programs for the housing stock.

In the field of public administration, it is important to ensure stable financing of environmental protection measures, to maintain the stability of investment programs even in crisis situations. Support for private-public partnerships in the field of ecology should become one of the priority areas of environmental policy.

Particular attention should be paid to raising environmental awareness of the population through educational programs, public campaigns, and support for environmental initiatives of civil society.

Thus, ensuring sustainable development of Ukraine requires comprehensive actions focused on both the public sector and the business community. Successful achievement of environmental and climate goals is possible only if economic, environmental, and social aspects of development are integrated at all levels of decision-making.

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