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ANALYSIS OF THE CURRENT STATE AND MAIN TRENDS IN THE FORMATION OF THE WASTE MANAGEMENT SYSTEM

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АНАЛІЗ СУЧАСНОГО СТАНУ ТА ОСНОВНІ ТЕНДЕНЦІЇ ФОРМУВАННЯ СИСТЕМИ УПРАВЛІННЯ ВІДХОДАМИ

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The scale and significance of the waste problem in the Ukrainian economy is associated both with the domination of resource-intensive technologies and the lack of an effective waste management policy for many years. Significant volumes of accumulated waste, an increase in the number of unauthorized landfills and overloaded landfills that do not meet environmental safety standards; low regulation of the issue of waste management at the legislative level; the lack of an effective waste management system and effective measures aimed at preventing the generation, recycling, recovery and disposal of waste are the main factors that negatively affect the environmental safety of our country. Environmental assessment methods and the level of detail of accounting and analytical information on waste require improvement. The article examines the dynamics of waste formation in Ukraine, the current situation of waste growth is worsened by the military aggression of the Russian Federation against Ukraine. The main directions of the National Waste Management Strategy are considered. The necessity of forming an effective information system at the stage of implementation of the waste management process at each enterprise, which has both national and regional significance, is substantiated. The need for the formation of reliable data by enterprises of various forms of ownership for the formation of transparent and objective information about waste in order to implement a five-level hierarchy of waste management, which is based on recovery and rational consumption of resources, uses economic approaches to minimize the negative impact on the environment, is emphasized. waste-free production and achieving the goals of sustainable development. The need to regulate the concepts of "waste" and "irreversible waste" in regulatory acts has been proven. The method of accounting for standard and non-standard non-returnable waste at the enterprise has been clarified. The

study notes that the formation of an effective waste management system is one of the key tools for authorities to implement the basic principles of waste legislation at both the national and regional levels.

Keywords: waste management system, five-stage hierarchy of waste management, irrecoverable waste, normative waste, excessive waste, waste accounting, tax accounting of waste.

Problem formulation. Waste management in Ukraine is a very acute problem. The significant amount of accumulated waste, a growing number of unauthorized landfills and overloaded landfills do not meet environmental safety standards. The regulation of waste management at the legislative level is low. The lack of an effective waste management system and effective measures to prevent the production, recycling, recovery and disposal of waste are the main factors that negatively affect the environmental safety of our country.

The current situation is aggravated by the military aggression of the Russian Federation against Ukraine. The amount of war-related demolition waste in Ukraine is about 7.5 million cubic metres - it is concrete, bricks, glass, fragments of engineering networks, household items, wood, roofing material, including resin, tar paper, asbestos slate - hazardous waste.

Analysis of recent studies and publications. The issue of environmentally-oriented management of the enterprise, and in particular waste, was studied by domestic and foreign scientists. The works of Galushkina T. devoted to the development of scenarios for the activation of

state policy in the field of environmental entrepreneurship and issues of environmental insurance in Ukraine [1]. Melnyk L. studies the multi-channel transfer of eco-innovations aimed at forming a model of "green" economic growth [2]. Khvesyuk M. explores the ecosystem approach as a direction in enterprise management [3]. However, the methods of environmental assessment of waste, the level of detailing of accounting and analytical information for conducting such an assessment need to be improved.

The aim of the work is to review and assess the dynamics of waste generation and management in Ukraine, justifying the need to improve the strategy for

their management; research on the essence of waste and operations on its management as integral components of the country’s economic and ecological security management system.

Presentation of the main research material.

The main principles of Ukraine's state policy in the field of waste management are “priority protection

of the natural environment and human health from the negative impact of waste. Ensuring economical use of material and energy resources, scientifically based coordination of the ecological, economic and social interests of society in relation to the generation and utilisation of waste in order to ensure its sustainable development” [4].

Statistics on waste generation and waste management in Ukraine for the period 2013-2022 are presented in Table 1 and Figure 1.

For the period 2016-2022, the data in Table 1 and Figure 1 are presented excluding the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories in the Donetsk and Lugansk regions.

The volume of waste generated for the entire period analysed significantly exceeds the volume of waste recycled. Most of the waste is disposed of in landfills.

Let us analyse the dynamics of waste generation in Ukraine by year in Table 2.

Table 1

Waste Generation And Management in Ukraine in 2013-2022 [5]

Year	Volume of Generated Wastes	Volume of Disposed Waste	Volume of Incinerated Waste	Volume of waste removed to designated areas and facilities	The total volume of waste accumulated during operation in specially designated areas and facilities
2013	443795,5	153368,2	1039,2	251352,0	14372055,1
2014	446716,9	143110,3	1201,1	263562,6	14856638,5
2015	445262,1	146733,1	917,9	264665,6	15111636,2
2016	355000,4	109280,1	944,7	203698,0	12205388,8
2017	312267,6	92463,7	1134,7	152295,0	12505915,8
2018	295870,1	84630,3	1106,1	157379,3	12393923,1
2019	366054,0	100056,3	1064,3	169801,6	12442168,6
2020	352333,9	103658,1	1028,6	169523,8	12972428,5
2021	441516,5	108024,1	1059,0	238997,2	15398649,4
2022	462373,5	100524,6	1008,0	275985,3	15635259,6

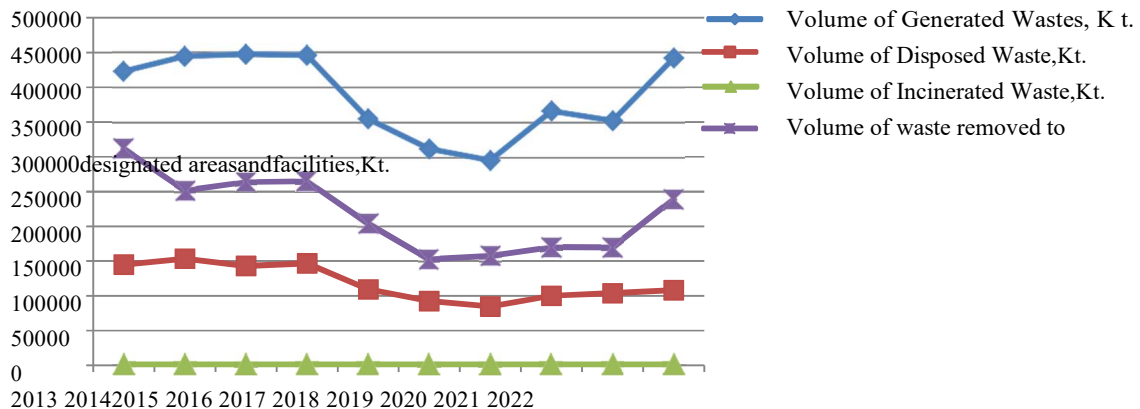


Fig. 1. Dynamics of Waste in Ukraine in 2013-2022

Table 2

Dynamics of Waste Generation in Ukraine in 2013-2022

Year	Basic Growth Rate of Waste Generation, %	Chain Growth Rate of Generated Waste, %
1	2	3
2013	100,0	100,0
2014	100,7	100,7
2015	100,3	99,7
2016	79,9	79,7
2017	70,4	87,9
2018	66,7	94,7
2019	82,5	123,7
2020	79,4	96,3
2021	99,5	125,3
2022	104,2	104,7

Analysing this data allows conclusions to be drawn about the increase in the volume of waste produced in the years 2013-2015 and the decline in

momentum in the years 2016-2021. However, these dynamics are not the result of waste management in Ukraine, but are associated with a decrease in production volumes. Thus, the index of physical production volume by region in Ukraine in 2016 was 93.4%, and in 2017 - 90.2%.

The Basic Principles of State Environmental Policy indicate that “in the structure of the total volume of waste generated in the state, waste of hazard classes I-III accounts for less than 2% of the total volume. In Ukraine, the share of mining waste (overburden and mineral enrichment products) is high - more than 75% of the total volume of waste generated, of which municipal waste accounts for less than 2%. The actual volume of waste generated exceeds the volume reflected in statistical reporting, as bankrupt and defunct companies that used to accumulate significant amounts of waste are not included in government statistical observations. Landfills on the premises of such companies have a negative impact on the environment.” [6].

Table 3

Structure of Generated Waste by Regions of Ukraine in 2021-2022 *

Region	Total waste generation in 2021, K, t	Total waste generation, in 2022, K, t	Structure of generated waste in 2021, %	Structure of generated waste in 2022, %
Total in Ukraine	441516,5	462373,5	100,0	100,0
Vinnyska oblast	2711,2	1557,7	0,6	0,3
Volynska oblast	668,1	630,2	0,2	0,1
Dnipropetrovska oblast	252234,5	309398,4	57,0	66,9
Donetska oblast	26407,9	26981,2	7,0	5,8
Zhytomyrska oblast	474,5	397,2	0,1	0,09
Zakarpatska oblast	153,1	145,0	0,03	0,03
Zaporizka oblast	5403,3	5531,0	1,2	1,2
Ivano-Frankivska oblast	2991,7	1729,8	0,7	0,4
Kyivska oblast	1414,3	2153,6	0,3	0,5
Kirovohradska oblast	37410,3	498,7	8,5	0,1
Luhanska oblast	443,4	260,0	0,1	0,06
Lvivska oblast	2047,1	3121,1	0,5	0,7
Mykolaivska oblast	2327,3	2502,1	0,5	0,5
Odeska oblast	638,8	456,2	0,1	0,1
Poltavska oblast	97442,8	98051,3	22,1	21,2
Rivnenska oblast	519,9	886,2	0,1	0,2
Sumska oblast	863,8	728,5	0,2	0,2
Ternopil'ska oblast	1062,6	279,9	0,2	0,06
Kharkivska oblast	1752,3	1487,8	0,4	0,3
Khersonska oblast	375,9	90,8	0,1	0,02
Khmelnyska oblast	900,4	500,9	0,2	0,1
Cherkaska oblast	1259,6	1124,2	0,3	0,2
Chernivetska oblast	318,7	208,9	0,1	0,05
Chernihivska oblast	695,9	498,4	0,2	0,1
Kyiv	999,1	3154,4	0,2	0,7

*excluding data on temporarily occupied territories.

Source: compiled by the authors based on Table 1

Large amounts of waste and a low percentage of its utilisation as reusable raw materials have led to the accumulation of a considerable amount of waste in Ukraine, a significant part of which ends up in landfills. In developed countries, unlike Ukraine, there is a well-developed infrastructure for waste management. In the absence of such infrastructure, significant amounts of resources are lost in our country, and at the same time, the environmental situation is deteriorating.

Table 3 analyses the structure of waste generation by regions of Ukraine in 2021-2022.

The Dnipropetrovska, Kirovogradska, Poltavaska and Donetska oblasts, where a large number of industrial enterprises in Ukraine are concentrated, account for the largest share of waste generation in 2021-2022.

The scale and importance of the waste problem in the Ukrainian economy is related both to the dominance of resource-intensive technologies, i.e. technologies with a large amount of production waste, and to the lack of an effective waste management policy for many years.

The lack of effective state control in Ukraine in the area of waste generation, use and disposal has led to the establishment of unauthorised landfills and numerous violations of waste management laws, including hazardous waste. Very little waste is recycled and disposed of in Ukraine and a high percentage of waste is disposed of in landfills. A large number of landfills in Ukraine can no longer accept waste and do not meet environmental or hygiene standards.

In 2017, the National Waste Management Strategy in Ukraine was adopted, the adoption of which “consisted in the need to resolve the critical situation that has developed in the generation,

accumulation, storage, processing, disposal and disposal of waste.” [7].

According to Directive 2008/98/EU of the European Parliament and of the European Council on waste: “Waste management - collection, transport, treatment (including recovery and disposal), supervision of these operations and subsequent control, after-care management of waste disposal facilities and activities of brokers and dealers” [8].

The main directions of the national waste management strategy in Ukraine are shown in Fig. 2.

The National Strategy for Waste Management introduces the principle of “adherence to the principles of the circular economy, which is a model of economic development based on recycling and the rational consumption of resources. It is an alternative to the traditional linear economy. It uses economic approaches to minimise the negative impact on the environment, produce waste-free and achieve the goals of sustainable development” [9].

This principle forms the basis for a waste management hierarchy that prioritises waste prevention and reuse.

“The five-level hierarchy of waste management is based on prioritising waste prevention, and when this is not possible, efforts are made to reuse, and when this is not possible, recycling is pursued” [10].

Recycling includes “the reuse of waste; the production of new materials and goods from secondary raw materials; the selection of useful fractions from waste and the disposal of waste classified as irreversible; the recovery of energy from the incineration or pyrolysis of industrial and household waste”.

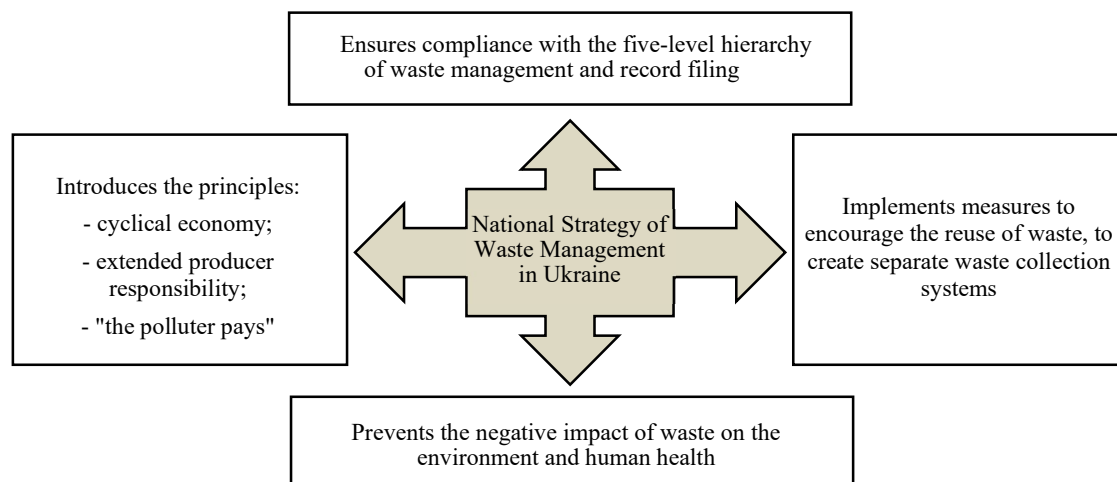


Fig.2. The main directions of the National Waste Management Strategy in Ukraine

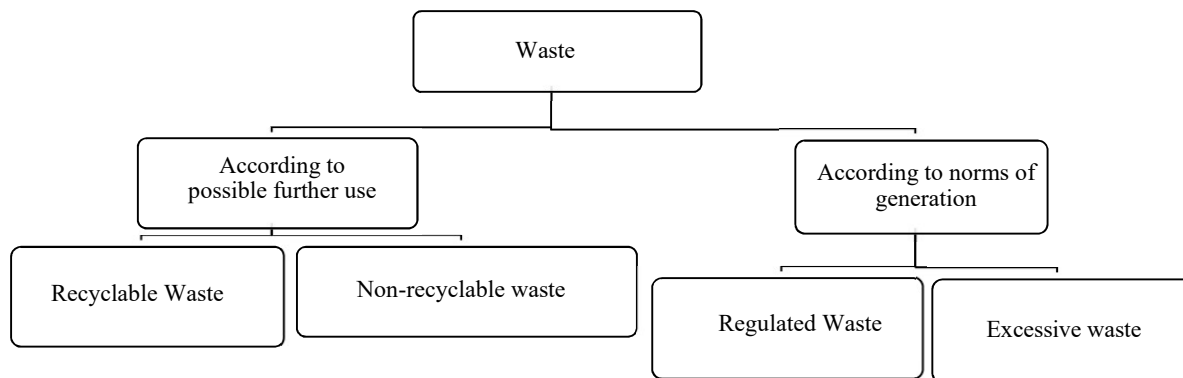


Fig.3.Waste Classification in Accounting

If recycling is not possible, the waste, in accordance with the relevant environmental standards, is either buried or destroyed in specialised facilities.

The development of an effective information system in the implementation phase of the waste management system has both national and regional significance. “Access to data on licences, permits, placement of landfills and dumps, up-to-date information on polluters and processing facilities is required” [9].

One of the principles in the implementation of the National Waste Management Strategy in Ukraine is the extension of producer responsibility. This is “a financial and organisational mechanism aimed at supporting the development and production of goods that fully take into account and facilitate the effective use of resources throughout their life cycle, including their recovery, reuse and disposal, without hindering the free movement of goods on the domestic market”. The main aim of extending producer responsibility is to minimise the impact of waste on the environment.

In the early 1990s of the XX century, the responsibility of producers in European countries was extended with regard to waste management policy. The system of extended producer responsibility made it possible to increase the rate of waste processing and reduce waste management costs.

The national reform of waste management corresponds to the peculiarities of the Ukrainian economy and European legislation, while the classification of waste must fully comply with EU standards. There are certain difficulties on this path. For example, there are still differences in the concept of “waste” in domestic practice.

The Law of Ukraine “On Waste Management”, the State Classifier of Wastes and the Procedure for Classification of Wastes and the National List of Wastes, define the term waste as

such: “waste are all substances, materials and objects that are generated in the process of human activity and have no further use at the place of generation or detection. Their owner disposes of, intends to dispose of or must dispose of by removal or disposal”. And hazardous waste - as “physical, chemical or biological waste, the properties of which pose or may pose a significant threat to the environment and human health and which require special methods and means for their treatment” [4, 10, 12].

The main distinguishing feature of waste is therefore that it has “lost its consumptive properties, even if only partially” [4]. In accounting, materials generated in the manufacture of products that can be reused or sold at the price of the original resource are not recognised as waste. At the same time, the separation of waste according to the classification shown in Figure 3 is important.

For accounting purposes, production waste is divided into reversible and irreversible. Waste is reversible if an economic benefit can be derived from its use. If the waste cannot be used or sold, it is considered irreversible and is included in the cost of the manufactured products.

The Clause 2.13 of the Methodological Recommendations on Inventory Accounting, approved by the Order of the Ministry of Finance of Ukraine, dated 10.01.2007, No. 2 (hereinafter - Methodological Recommendations No. 2) provides the definition of the reusable production waste. It is “the remnants of raw materials, materials, semi-finished products and other types of fixed assets generated during the production of products (works, services) that have completely or partially lost the consumable properties of the source material (chemical and physical) and are therefore used at increased cost (reduced production) or not used at all for the intended purpose” [11].

According to the same clause 2.13 of the Methodological Recommendations No. 2,

“irreversible waste is waste of raw materials and materials that have completely lost their useful consumer properties during the production process and are of no value to the company: It cannot be reused or sold within the company itself. Such waste is not recognised as an asset because the company cannot derive any economic benefit from it in the future and it is only recorded quantitatively in the accounts. This waste is not subject to measurement.”

It can be concluded that the terms “waste” according to the Law “On Waste Management” and the term “irreversible waste” according to the Methodological Recommendations No. 2 are identical. In our opinion, the ambiguity of the definition of the terms in the legal acts should be clarified.

Normative single-use waste is waste that is generated during the manufacture of products, so that its value is included in the cost of the manufactured products.

In contrast to reusable waste, disposable waste is only recorded quantitatively in the accounts. As the quantity of waste has a direct impact on the value of production costs, the accounts for the total quantity of waste generated are kept both according to where it occurs and according to specific products.

Unrecyclable waste is subject to disposal and is written off the balance sheet on the basis of the law, the form of which is authorised by the company's order. In our opinion, the cost of Waste disposal should be included in other operating expenses.

For accounting of disposable waste in enterprises, established cost norms are used in accordance with internal industry documents, National Standards of Ukraine, technical conditions or technical regulations. If the specified norms are not available, they must be approved by a company order.

According to the Tax Code of Ukraine, “when accounting for income tax, operations with irreversible waste are taken into account in accordance with the accounting rules, since no adjustments to the pre-tax financial result are provided for” [13].

Normative disposable waste has no impact on the accounting of VAT, as the occurrence of normative disposable waste is related to the production process. Accordingly, “materials in the form of disposable waste are considered to be used in the economic activity of the taxable person and it is not necessary to calculate compensatory tax liabilities in this case” [Section 198.5, 13].

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In contrast to reusable waste, disposable waste is only recorded quantitatively in the accounts. As the quantity of waste has a direct impact on the value of production costs, the total quantity of waste received is recognised both according to where it occurs and according to specific products.

Non-recyclable waste is subject to disposal and is written off the balance sheet on the basis of the law, the form of which is authorised by the company's order. In our opinion, the costs of waste disposal should be included in other operating costs.

For accounting of disposable waste in enterprises, established cost standards are used in accordance with internal industry documents, national standards of Ukraine, technical conditions or technical regulations. If the specified norms are not available, they must be approved by a company order.

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Conclusion. The problem of waste is extremely relevant for Ukraine, this is confirmed by statistical data. In the conditions of the growth of the amount of waste, the main method of handling it for the country remains landfilling. Changes in legislation and the existing infrastructure for the processing of the most common and resource-valuable categories of secondary raw materials require the implementation of effective waste management systems.

We believe that in order to achieve a significant result, it is necessary to pay attention to non-returnable waste that is subject to disposal. Non-returnable waste is subject to determination, i.e. calculation, but accounting and assessment as a material result of production activity are not subject to conditions for their use until conditions have been created.

When accounting, it is necessary to remember waste as a factor in increasing the enterprise's resource potential and reducing production costs. Therefore, used (recyclable) waste must be subject to planning, assessment, accounting and reporting. Creation of a system of correct collection and further use of such waste will allow to achieve significant indicators of the efficiency of using the potential of waste.

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Манухіна М.Ю., Тацій І.В. Аналіз сучасного стану та основні тенденції формування системи управління відходами.

Масштаби та значущість проблеми відходів в економіці України пов'язані як з домінуванням ресурсоемних технологій, так і через відсутність протягом багатьох років ефективної політики управління відходами. Особливо важлива роль у виконанні завдань щодо нейтралізації негативного впливу відходів на довкілля і здоров'я людини належить системам управління ними на регіональному рівні. Проте регіональна екологічна політика упродовж останніх десятиліть орієнтувала винятково на вирішення питань природоохоронного характеру у цій сфері. Значні обсяги накопичених відходів, збільшення кількості несанкціонованих сміттєзвалищ та перевантажених полігонів, що не відповідають нормам екологічної безпеки; низька урегульованість на законодавчому рівні питання управління відходами; відсутність дієвої системи управління відходами та ефективних заходів, спрямованих на запобігання утворенню, рециклінгу, відновленню та видаленню відходів – основні фактори, що негативно впливають на екологічну безпеку нашої країни. Потребують удосконалення методи екологічної оцінки та рівень деталізації обліково-аналітичної інформації про відходи. У статті досліджено динаміку формування відходів в Україні, поточну ситуацію росту відходів погіршує військова агресія РФ проти України. Розглянуто основні напрямки Національної стратегії управління відходами. Обґрунтована необхідність формування ефективної інформаційної системи на етапі впровадження процесу управління відходами на кожному підприємстві, яка має як загальнонаціональне, так і регіональне значення. Підкреслена необхідність формування достовірних даних підприємствами різних форм власності для формування прозорості та об'єктивної інформації про відходи з метою реалізації п'ятиступеневої ієрархії управління

відходами, яка заснована на відновленні та раціональному споживанні ресурсів, використовує економічні підходи з метою мінімізації негативного впливу на довкілля, безвідходного виробництва та досягнення цілей сталого розвитку. Доведена необхідність врегулювання понять «відходи» та «безповоротні відходи» у нормативних актах. Уточнено методику обліку нормативних та понаднормативних безповоротних відходів на підприємстві.

Ключові слова: система управління відходами, п'ятиступенева ієрархія управління відходами, безповоротні відходи, нормативні

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