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Grygorii KALETNIK<sup>1</sup>, Natalia PRYSHLIAK<sup>2</sup>, Michael KHVESYK<sup>3</sup>, Julia KHVESYK<sup>4</sup>

## Institutional capacity building on waste management as a secondary resource in Ukraine on the path to European integration

**Abstract:** The generalization of the European experience in waste management in the context of the directives, decisions and regulations adopted in the last decade in the European Union, as well as the state of the organizational, economic and regulatory framework for solving the waste problem in Ukraine, reveals a systemic lag in the implementation of new conceptual, methodological and practical approaches to the formation of an appropriate state policy.

The dynamics of handling certain types of waste in Ukraine have been analyzed. Features of disposal and waste management in Ukraine have been identified. A comparative assessment of the dynamics of waste generation in European countries and Ukraine per capita has been carried out, a block model of the financing system for the waste management sector in Ukraine has been formed and the directions of effective waste management in Ukraine have been determined. Furthermore, priority policy measures for waste management and secondary resource use in Ukraine have been formulated.

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A set of obstacles on the method of efficient waste management in Ukraine has been prioritized. In the context of the formation of an efficient waste-management strategy, it has been advised to structure its three components of the subsystem: receipts (sources of formation) of funds, their accumulation and costs (expenses). This structuring indicates the presence of a number of flows of funds, each of which is largely autonomous but together they create a complementary system. Improvements to the legislative framework have been suggested. In particular, it is recommended to devote more resources to reorienting the existing economic model, which will create new business projects and will increase the flow of investment into the country.

KEYWORDS: management, waste, institutions, European integration, secondary resource

## Introduction

With the development of economic relations, population growth and quality of life in the world, there is a rapid increase in the accumulation of both volumes and types of waste – industrial, domestic, agricultural and others. The growth of waste accumulation is much faster than measures to regulate the volume of its generation. At the same time, as noted by [Lutkovskaya and Kaletnik \(2020\)](#), economic development and the technical modernization of production is accompanied by the increasingly dynamic growth of secondary resource use and recycling.

Waste generation and accumulation create a set of interrelated risks that negatively affect both people's living conditions and their economic well-being. The problem of managing such risks is now becoming pervasive and global. The effective solution of the problem of waste management is becoming an important element of the sustainable development of society in connection with environmental safety and the protection of natural resources. Considering the problem of waste management in the national context, it is important to mention that waste management exceeds technological issues, as it is essentially a combined issue that includes a set of important elements of sustainable development – environmental and socio-economic.

Now, the Ukraine is facing the most difficult times since the moment the country gained independence from the Soviet Union on August 24, 1991. The situation related to the Russian military invasion of Ukraine has put Ukraine's economy and the lives of all people into new conditions.

Thus, with the present circumstances it is extremely important to formulate and implement a policy that is, on the one hand, adequate to the objective place and the role of Ukraine in the world community, and on the other hand, capable of resisting real threats to its national interests and security ([Kozlovskiy et al. 2019](#)).

Currently the importance of the diversification of the fuel sector in Ukraine has become extremely important. Russia's invasion of Ukraine has led to a shortage of fuel and a significant increase in its cost. Among the main factors is the shutdown of the most powerful Ukrainian

refinery (the Kremenchug Oil Refinery), which was destroyed by rocket attacks from the Russian Federation. Another factor that influenced the deficit of fuel is the blocking of ports, due to which the import of fuel by sea became impossible. The only option left has been to import fuel by land, which is much more expensive. In addition, almost two dozen oil depots were damaged, which has also caused difficulties with fuel storage and supply.

Waste can be not only a problem but also a valuable resource. Considering the current state of the environment and the aggravation of the waste problem, the state environmental policy in Ukraine cannot provide society with a safe living environment. The catalyst in this context is the imperfection of the legislative framework, the low efficiency of public administration and the diffusion of powers between the authorities. Funds allocated to special funds for environmental protection do not cover the costs of environmental measures, which does not encourage businesses to make any progress in this direction.

The current legal framework and organizational mechanism of waste management do not meet modern requirements, and the methods of waste management and technologies used in Ukraine do not meet international standards. Waste generation is increasing, and the capacity to dispose of it at existing landfills has largely exhausted its resources and landfills themselves have become a factor in environmental pollution. Due to opposition from the population, public organizations and the lack of practice of providing social guarantees, the solution of problems that corresponds with the allocation of land for the construction of new waste-disposal places for household and other waste has been delayed or even blocked. Therefore, there is a problem of creating, first of all at the regional level, an adequate management system in this area that is able to respond to challenges in their current and strategic sense.

The environmental risks posed by waste generation and accumulation are systemic due to the pervasive nature of the problem. The basic safety principle is unity in solving environmental, resource and social problems. Therefore, the waste minimization policy should be based on setting goals of both decreasing the hazardous impact on the environment and increasing the potential for resource-saving development.

The aim of this paper is to investigate the institutional development of waste management and secondary-resource use in Ukraine on the path to European integration. In order to achieve the set goals, the following tasks have been formulated:

- 1) to analyze the dynamics of handling various types of waste in Ukraine,
- 2) to determine the peculiarities of disposal and waste management in Ukraine,
- 3) to carry out a comparative characteristic of the dynamics of waste generation in the European states and Ukraine per capita,
- 4) to form a block-model of the financial system of the waste management sphere in Ukraine,
- 5) to determine the directions of effective waste management in Ukraine.

## 1. Literature review

As part of the implementation of the objectives of the Association Agreement with the European Union on the comprehensive institutional development of the environmental sector, Ukraine faces the task of forming a single EU legal and information platform in the field of waste management. The development of legislation is associated with, first of all, the implementation of a number of target EU directives and the elimination in Ukraine of the deficit in organizational and economic tools for using waste as a secondary resource.

An important step towards reducing harmful emissions into the atmosphere and effective waste management was the adoption of the European Green Deal. The European Green Deal is a set of measures that have been adopted in order to strengthen the sustainability and efficiency of the European Union's economy and transform European Union Countries into climate-neutral by 2050. These measures are aimed at stimulating economic development, improving the quality of life, and transforming climate and environmental challenges to opportunities in all EU countries (European Green Deal 2019). In 2020, Ukraine began internal discussions with business circles on the European Green Deal (Representation of Ukraine to the European Union 2021). Against the backdrop of the economic crisis and the COVID-19 crisis, it is the European Green Deal that is the unifying element that will increase the resilience of a vulnerable world. The European Green Deal is not so much about climate policy as about the green concept of economic modernization and economic growth to ensure human life is in harmony with the planet and its resources.

As noted by MacArthur (2015), most of the economic entities are currently operating under the linear approach. This approach is grounded on the conceptualization of “extract-produce-consume-discard”. Therefore, a linear economy is based on using a notable amount of production with low production costs. This approach is generally grounded on the low-cost accession of the required resources (mainly synthetic materials) for a relatively low cost (Webster 2015). The transition to a circular economy could solve the problem of the inefficient use of resources. A circular economy approach is a complex solution that addresses global challenges as pollution, climate change, waste generation, biodiversity loss and resource depletion (Ellen Macarthur Foundation). The principal operations of circular systems include the total decrease of produced waste, its re-use, recycling, reproduction and repairing (European Commission 2015).

As pointed by Gołowicz and Wojciechowski (2020), the circular economy contains the principle of recycling and recovery from organic waste, and among others, the production of biofuels.

According to Kucher et al. (2022), the number of potential sources of financing the circular economy in the agricultural sector include: own funds of enterprises, loans, borrowed funds (grants, sponsorship contributions, crowdfunding, venture capital, impact investments), budget funds (financial support, partial compensation of loan rates), funds raised as a result of public-private partnership, direct foreign investments, mixed (“circular”) financing and other sources.



Considering the importance of the diversification of the Ukrainian energy sector and the selected direction of Ukraine's economy towards European environmental standards, issues of effective waste management have been considered in their works by leading world and Ukrainian scientists.

As noted by [Kowalczyk-Juško et al. \(2020\)](#), the usage of the agricultural biomass waste enables the enhancement of the energy security and can also have a positive impact on the sustainable development of the agricultural sector and rural areas. [Czekała \(2018\)](#), indicates that utilizing waste in the agricultural biogas digesters is a advantageous solution. This will allow to organize waste management within the plant and minimize the debate in the food-energy system in the context of full-value agricultural production. [Kulyk et al. \(2020\)](#), have proven the efficiency of using agricultural waste as a potential resource for the production of biofuels. At the same time using agricultural waste for biofuel production does not compete with the food security debate ([Berezyuk et al. 2021](#); [Tokarchuk et al. 2022](#)).

As noted by [Kravchenko et al. \(2020\)](#), each country is an insurer of food, social, economic and ecological security. Each country's institutions shall promote the creation of such levels of consistency, sustainability, coordination, balance, equability, orderliness, and the manageability of economic relations between all sectors of the economy that shall guarantee the provision, objective and result of the inclusive sustainable development of the country.

A valuable contribution to the study of the features of waste-free production and directions of the secondary use of agricultural waste was made by scientists from the Vinnytsia National Agrarian University. The research of [Tokarchuk et al. \(2021\)](#), is devoted to the analysis of the origin of agricultural waste, its classification and the possibilities of its subsequent use for bio-energy production.

Previous studies of the authors have been devoted to the investigation of the economic and environmental importance of biofuel production from agricultural waste and residues ([Pryshliak et al. 2021](#)) and the importance of environmental safety in terms of sustainable development ([Khvesyuk et al. 2018](#)). It is important to perform a logical study of the institutional development of waste management and secondary-resource use in Ukraine on the path of European integration, which will accumulate previous experience and contain current proposals for improving waste management in the long term.

## 2. Materials and methods

The methodological approaches used in the article concern the institutional development of waste management in general and biofuel production in particular. They include a set of instruments, procedures and results of information generalization. The institutional development studied in the paper has been performed with the use of specific approaches, which particularly concern the functioning of the public administration system. The hypothesis of the research

is based mainly on its main task – the investigation of the tools, measure and instruments for enhancing the institutional governing of waste management with the possibility of using it as a secondary resource in Ukraine.

### 3. Results and discussion

The issue of waste management in Ukraine is distinguished by its particular significance; from one side this is as a result of the impact of resource-intensive multi-waste technologies on the national economy, and from the other side it is due to the lack of an sufficient reaction to its challenges for a long time.

Ukraine, as a modern rule-of-law state, has chosen for itself one of the priority development directions – focusing on the EU, in particular, by harmonizing Ukrainian legislation to European and international standards, adapting the provisions of regulatory legal acts, including those related to waste. Therefore, the solution to the problem of waste management at the state level should be conducted primarily through the introduction of effective legislative regulation which should take into account national characteristics and the positive experience of foreign legislation.

Agricultural waste contains many nutrients, such as carbon, which can provide energy, and nitrogen and phosphates, which are necessary to support plant growth. The use of waste for energy and nutrient production needs to be considered when defining various waste specifications.

As for the terminology, the Law of Ukraine “On Waste”, 1998, contains the main terms in the field of waste management, which give a fairly generalized concept of the types of waste and the methods of their disposal. According to the Law “On Waste”, 1998, waste includes any substances, materials and items formed in the process of production or consumption, as well as goods (products) that have completely or partially lost their consumer properties and have no further use at the place of their formation or detection.

Developed countries widely adhere to the internationally accepted concept and definition of “waste”. A holistic approach is also used, which implies that environmental management is more effective if political and regulatory control is exercised, and the agencies responsible for the relevant controls are integrated through pollution (air, water and land) control and waste management. Consequently, the 2008/98/EC waste framework directive defines waste as any substance or object that the owner disclaims, intends or must discard.

Legislation of Ukraine in the field of agricultural waste management also includes such regulatory documents as the Law of Ukraine “On Ensuring Sanitary and Epidemic Welfare of the Population”, 1994, Law of Ukraine “On Protection of Population from Infectious Diseases”, 2000, Law of Ukraine “On Production and Circulation of Organic Agricultural Products and Raw Materials”, 2013, Law of Ukraine “On Food Safety and Quality”, 1997, Law of Ukraine

“On Withdrawal from Circulation, Processing, Disposal, Destruction or Further Use of Substandard and Dangerous Products”, 2000, Law of Ukraine “On National Target economic program for monitoring residues of veterinary drugs and contaminants in live animals, products of animal origin and feed, as well as in food products controlled by the veterinary service, for 2010–2015”, 2009, as well as a significant number of bylaws.

It should be noted that the national legal regulations in Ukraine in the sphere of agricultural waste management has practically been passed but has not yet become a fully functional system of regulatory and legal support for the greening of the national path of development. A priority solution is needed for the problem of the viability of this system, its provision with effective mechanisms for fulfilling the requirements of the current legislation on waste.

In the process of forming Ukrainian legislation on agricultural waste, international experience should be taken into account in solving the relevant problems.

In the EU legal system, about 300 legislative acts (directives, orders, proposals, etc.) regulating activities in the field of environmental protection have been adopted and successfully implemented. In accordance with the scope of their application, they can be divided into the following categories: general legislation, protection of water resources and atmospheric air from pollution, protection of the local environment and natural resources from the hazardous impact of waste, measures to prevent the depletion of the ozone layer, chemicals, industrial risks and biotechnology, protection nature, the fight against noise emissions, etc.

The following problematic aspects related to the definition of terminology in the field of education and waste management in Ukraine can be highlighted:

- ◆ inconsistency between Ukrainian and European definitions and classifications of waste – Ukrainian classification of waste is based only on toxicity indicators (I–IV hazard classes);
- ◆ Ukraine uses a waste list that does not correspond to the EU waste list and changes in this area are expected soon as one of the actions stipulated by the obligations under the Association Agreement with the EU;
- ◆ the definition of waste management operations mentioned in the Law of Ukraine “On Waste” differ from the EU definitions; in the short term, changes are expected here as actions envisaged by the adopted National Waste Management Strategy. Formally, waste incineration is considered a renewal operation; no calculations have been made here against the index established by the requirements of Directive 2008/98/EC to clarify whether incineration can be considered recovery or disposal.

The increase in waste generation and the increased hazard associated with waste have a significant impact on the state of the local economy, natural resources, the environment, public health and living conditions, which widens the gap with the goals of sustainable development. It is not an exaggeration to note that the improvement of the ecological and resource situation in Ukraine as a whole depends on waste management. The content of scientific research is the scientific substantiation and determination of optimal ways to harmonize the socio-economic and environmental needs of society regarding the formation, disposal of waste and their use as secondary resources with the aim of establishing sustainable development.

Today in Ukraine and its regions, the following problems are obvious:

- ◆ inconsistency of the institutional structure of the sphere of public administration with the needs of a systematic solution of the waste problem, the needs of business as well as the internal priorities of the state and its regions;
- ◆ lack of an end-to-end system for monitoring and controlling waste in the cycle from their generation to their final disposal and destruction (separate waste streams);
- ◆ insufficient regulation and manageability of the institutional conflict of interests of the parties related to the solution of the waste problem;
- ◆ inadequacy of the current organizational and economic mechanism for waste management in relation to the tasks of financial development and budgetary planning of the waste sector;
- ◆ lack of a sufficient number of waste-management specialists formed on the basis of qualifications.

Over the last ten years, the dynamics of waste generation is cyclical, but has tended to increase (Fig. 1). Thus, since 2014, there has been a decline in waste generation connected with the unstable political, economic and military situation in the country. Since 2019, production processes in Ukraine have stabilized, and waste generation has begun to grow.

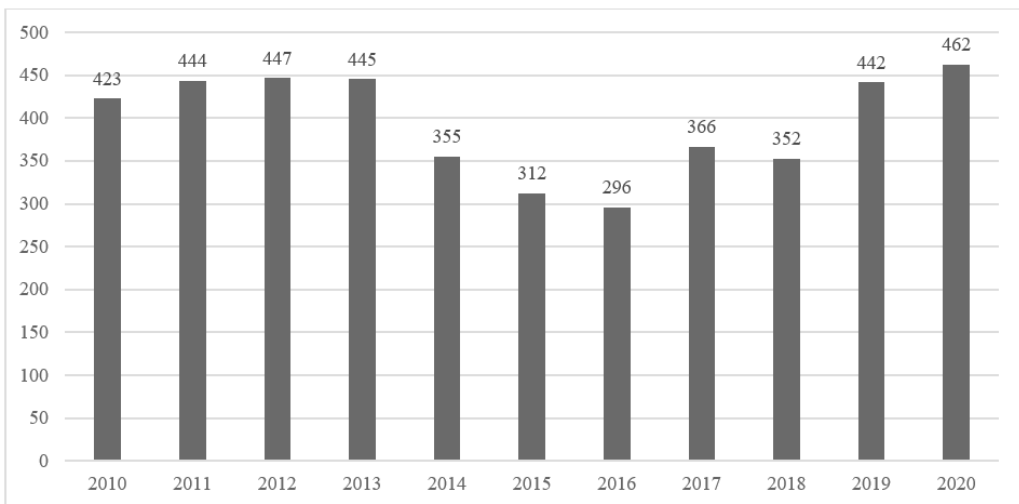


Fig. 1. Dynamics of waste generation of all types in Ukraine [million tons]

Rys. 1. Dynamika wytwarzania wszelkiego rodzaju odpadów w Ukrainie [mln ton]

Regardless of the fact that the total volume of waste generation in 2020 increased compared to 2010, the growth was not for all categories of waste (Table 1). In particular, the volumes of waste from agriculture, forestry and fisheries decreased (by 3,252.8 thousand tons), waste from electricity, steam, gas and air-conditioning supply (–3,307.3 thousand tons), waste from water supply; sewerage, waste management (–11,360.4 thousand tons), construction waste (–14.9 th-

TABLE 1. Waste generation from economic activities and in households [thousand tons]

TABELA 1. Wytwarzanie odpadów z działalności gospodarczej i gospodarstw domowych [tys. ton]

	2010	2015	2018	2019	2020	2020 to 2010
Total waste generation	425,914.2	31,267.6	352,333.9	441,516.5	462,373.5	36,459.3
Agriculture, forestry and fisheries	8,568.2	8,736.8	5,968.1	6,750.5	5,315.4	-3,252.8
Mining and quarrying	347,688.1	257,861.9	301,448.9	390,563.8	391,077.9	43,389.8
Manufacturing industry	50,011.7	31,000.5	31,523.2	30,751.8	52,311.0	2,299.3
Supply of electricity, gas, steam and air conditioning	8,641.0	6,597.5	6,322.7	5,959.2	5,333.7	-3,307.3
Water supply; sewerage, waste management	1,698.7	594.2	397.4	411.8	338.3	-1,360.4
Construction	329.4	376.2	378.8	188.7	14.5	-314.9
Other economic activities	2,254.7	1,047.2	751.3	994.0	2,033.0	-221.7
Household waste	6,722.4	6,053.3	5,543.5	5,896.7	5,949.7	-772.7

Source: formed by the authors according to the [State Statistics Service of Ukraine 2021](#).

usand tons), waste from other economic activities (-221.7 thousand tons) and household waste (-772.7 thousand tons). On the other hand, waste from the extractive and quarrying industries, as well as from the processing industry, has had a positive upward trend.

In general, the waste management situation in Ukraine needs to be improved. In 2020, 100,454.4 thousand tons were utilized, processed or recycled, which was 22.8% of the total waste generation (Table 2). Waste incineration, which in 2020 amounted to 1,008.5 thousand tons, falls primarily on household, animal and plant residues and wood waste. Regarding enterprises that have waste incineration plants for energy production, the largest number are concentrated in the western regions of Ukraine: Lviv, Ivano-Frankivsk, Zakarpattia. Also in these regions there are many enterprises that have facilities for waste incineration for thermal processing (Ivano-Frankivsk, Lviv, Ternopil and Zakarpattia region), due to the development of the woodworking industry, waste which is disposed of mainly by using them as secondary energy resources.

Ukraine is also among the dominant countries in the produced amount of waste associated with the extractive industry (mineral). In this context, a paradox is revealed: if the Dnipropetrovsk region (the center of mining activity) is conditionally excluded from the total volume of waste generation, then the rate of waste generation per person in the rest of the territory will immediately decrease to the level of prosperous European countries. The same applies to indicators such as the generation and accumulation of waste per 1 km<sup>2</sup>.

The volumes of the accumulation of solid household waste have an upward trend. In 2020, the total volume of solid waste accumulation amounted to 12.64 million tons, which is 2.28 million tons more than in 2011 (Table 3). At the same time, there is an upward trend in the direction of burning household waste in order to obtain energy. The volume of waste incineration without generating energy has decreased by a factor of ten, which is an extremely positive trend.

TABLE 2. Management of certain types of waste in Ukraine, 2018–2020 [thousand tons]

TABELA 2. Gospodarka niektórymi rodzajami odpadów w Ukrainie, 2018–2020 [tys. ton]

Indicator	Formed		Disposed, processed (recycled), total		Burned		
	2019	2020	2019	2020	2019	2020	
					total	including for the purpose of receiving energy	
All categories of waste by material	441,516.5	443,438.7	108,024.1	100,454.4	1,059.0	1,008.5	902.2
Used oils	14.4	17.2	15.3	11.9	2.1	2.5	0.3
Chemical sludge and residues	1,019.9	1,052.7	102.9	98.8	6.3	4.6	0.3
Sediment of industrial effluents	3,346.1	3,434.1	491.6	252.5	0.1	0.1	0.1
Medical and biological waste	0.9	2.3	0.1	0.1	0.8	1.4	–
Metal waste	2,842.2	2,492.95	2,135.7	1,929.7	0.1	1.5	0.0
Wood waste	827.9	760.8	58.6	55.6	370.7	354.5	359.2
Waste batteries and accumulators	4.5	3.7	24.8	29.0	0.0	0.0	0.0
Animal and vegetable waste	11,369.2	12,820.6	2,582.1	1,669.8	472.9	484.8	526.9
Animal excrement, urine and manure	3,612.9	3,261.9	2,407.0	2,309.1	0.0	0.0	0.0
Household and similar wastes	6,618.0	6,727.1	0.1	4.5	199.5	163.9	150.0
Mixed and undifferentiated materials	9,940.3	7,157.0	1,488.9	1,312.5	3.6	2.0	0.1
Sorting remnants	69.2	35.1	7.0	5.3	0.0	0.0	44.0
Ordinary sediment	563.3	332.9	132.3	80.0	0.0	0.0	0.0
Waste rock from dredging	101,361.9	11,947.5	75,74.5	9,279.2	0.0	0.0	0.0
Mineral waste	287,705	387,130.8	85,322.3	79,636.2	0.6	1.0	0.0
Combustion waste	12,661.5	10,842.5	5,490.5	3,233.6	0.0	0.2	0.0

Source: formed by the authors according to the State Statistics Service of Ukraine 2021.

TABLE 3. Treatment of household waste during 2011–2020

TABELA 3. Przetwarzanie odpadów z gospodarstw domowych w latach 2011–2020

Indicator	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2020 to 2011
Collected household waste [million tons]	10.36	13.88	14.50	10.75	11.49	11.56	11.27	11.86	11.79	12.64	2.28
Removed household waste [million tons]	7.03	9.36	9.50	5.89	6.23	6.09	6.47	7.17	7.10	7.52	0.49
Incl. to specially equipped dump	4.32	5.18	5.18	3.40	4.19	4.21	4.42	4.89	5.04	5.13	0.81
Incinerated household waste for energy recovery [thsd. tons]	154.0	149.9	147.6	149.0	254.3	257.3	244.4	205.5	198.5	163.7	9.7
Incinerated household waste without energy recovery [thsd.t]	98.5	78.6	2.9	3.8	2.1	2.0	1.2	1.0	1.0	0.7	-97.8
Utilized household waste [thsd. tons]	74.5	57.4	9.4	3.8	4.0	6.5	16.5	16.7	0.1	4.5	-70

Source: formed by the authors according to the State Statistics Service of Ukraine 2021.

In 2020, there were 782 waste management facilities in Ukraine with an installed capacity of 15,902.9 thousand tons (Table 4). It should be noted that during the analyzed period (2017–2020), the amount of working facilities have significantly decreased (by 1,377 units). This is due to the consolidation of waste management facilities and increase their capacity.

In 2019, 303 kg of household waste was collected in Ukraine (State Statistics Service of Ukraine). According to this indicator, Ukraine ranked second among the EU countries (Fig. 2). High rates of solid waste generation were recorded in Denmark (844 kg), Luxembourg (791 kg) and Malta (694 kg). The lowest are in Romania (280 kg).

The dynamics of solid waste generation in Ukraine has an increasing trend (Table 5). In 2020, more than 54 million m<sup>3</sup> of household waste was generated in Ukraine. This amount equals more than 10 million tons, which have been disposed of in 6,000 landfills with a total area of over 9,000 hectares. Biogas generation systems have been installed at twenty-six landfills in Ukraine, and the capacity of power-generation units has reached 30 MW. In 2020, the amount of produced biogas was 64 million m<sup>3</sup>. After cogeneration, the amount of produced electricity equaled 112.3 GWh.

Compared to the experience of European countries, waste recycling in Ukraine is at an early stage of development. The key reason is the imperfect legislative base in general and the weak level

TABLE 4. Number of waste management facilities, designated sites and waste disposal facilities

TABELA 4. Liczba obiektów zagospodarowania odpadów, wyznaczonych miejsc i obiektów unieszkodliwiania odpadów

Indicator	2017	2018	2019	2020		2020 to 2011
				number of units	installed capacity [thsd.t]	
Total number of installations for waste management	2,159.0	2,119.0	1,023.0	782.0	15,902.9	-1,377.0
for the waste combustion for the energy recuperation	556.0	584.0	520.0	334.0	1,780.2	-222.0
for the waste combustion for the thermal processing of wastes	140.0	143.0	117.0	105.0	152.4	-35.0
for the waste utilization (treatment)	429.0	402	328.0	316.0	13,848.7	-113.0
for other waste removal (other than combustion)	1,034.0	1,061.0	58.0	27.0	121.6	-1,007.0

Source: formed by the authors according to the State Statistics Service of Ukraine 2021.

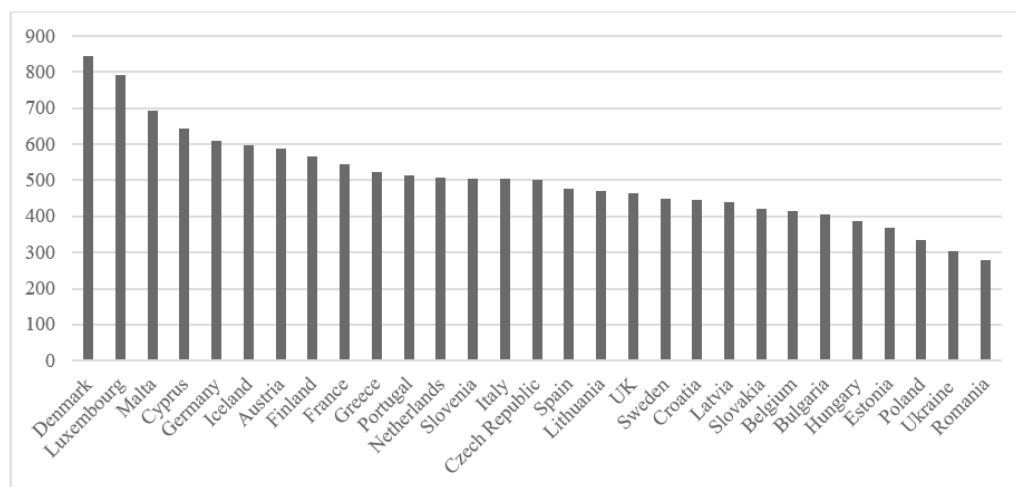


Fig. 2. Waste generation in European countries and Ukraine per capita in 2019 [kg/year]

Rys. 2. Produkcja odpadów per capita w krajach europejskich i w Ukrainie w 2019 r. [kg/rok]

of implementation of the already adopted laws and regulations. European integration processes have had a very positive influence on the changes that have already taken place in Ukraine. The Association Agreement with the EU has become the main catalyst for the more effective work of



TABLE 5. Solid waste management in Ukraine

TABELA 5. Gospodarka odpadami stałymi w Ukrainie

Wastes per capita										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Collected solid household waste [kg]	226.6	304.3	318.7	250.0	268.5	271.0	265.3	280.5	280.6	302.7
Removed solid household waste [kg]	153.8	205.3	208.9	137.1	145.6	142.7	152.3	169.7	168.9	180.2
Including to specially equipped dump	94.6	113.5	113.8	79.0	98.0	98.6	104.0	115.6	120.0	123.0
Incinerated solid household waste for energy recovery [kg]	3.4	3.3	3.2	3.5	5.9	6.0	5.8	4.9	4.7	3.9
Incinerated solid household waste without energy recovery [kg]	2.2	1.7	0.1	0.1	0.05	0.05	0.03	0.02	0.02	0.02
Utilized solid household waste [kg]	1.6	1.3	0.2	0.1	0.1	0.2	0.4	0.4	0.00	0.1

Source: formed by the authors according to the *State Statistics Service of Ukraine 2021* and *Eurostat 2021*.

all authorities in the direction of waste recycling because the document contains a list of the main directives that must be legislatively implemented in order to comply with European legislation.

There is still no legislative provision for the responsibility of waste processing enterprises in Ukraine, although, as the experience of European countries has shown, this is a fairly common practice. In developed countries, manufacturers of containers and packaging must be responsible for the full life cycle and provide conditions for its processing (install containers for waste collection, etc.).

Another reason for the insufficient level of waste recycling in Ukraine, is the weak information campaign for its promotion among the population. If in large cities there are some changes and measures taken to inform about the topic of reuse of certain types of waste, in small towns and villages it is absent. Therefore, we believe that a national program to promote and implement recycling in the country should be approved.

In recent years, the issue of improving the procedure of waste management in Ukraine has been constantly on the agenda of both local and central authorities. This problem is becoming more acute and new aspects are emerging, so its solution requires a proper financial basis.

The integrity and efficiency of the structure of financial support in terms of waste management is characterized by its ability to accumulate adequate financial resources for the progressive solution of the problem.

These problems determine the need for the creation of a financial strategy for waste management in Ukraine, which would ensure the implementation of an integrated approach to solving the waste problem. Such a strategy should be based on a renewed waste financing system that

will maximize the balance between potential revenue and financial resource requirements, ensuring the financial security of waste management. Financial security of the waste management sphere is understood as the security of its financing and the ability to effectively form and rationally use financial resources for further development and solving urgent problems.

In the context of the formation of a monetary strategy, it is advisable to structure and consider its three components of the subsystem: receipts (sources of formation) of funds, their accumulation and costs (expenses). This structuring indicates the presence of a number of flows of funds, each of which is largely autonomous, but together they create a complementary system (Fig. 3).

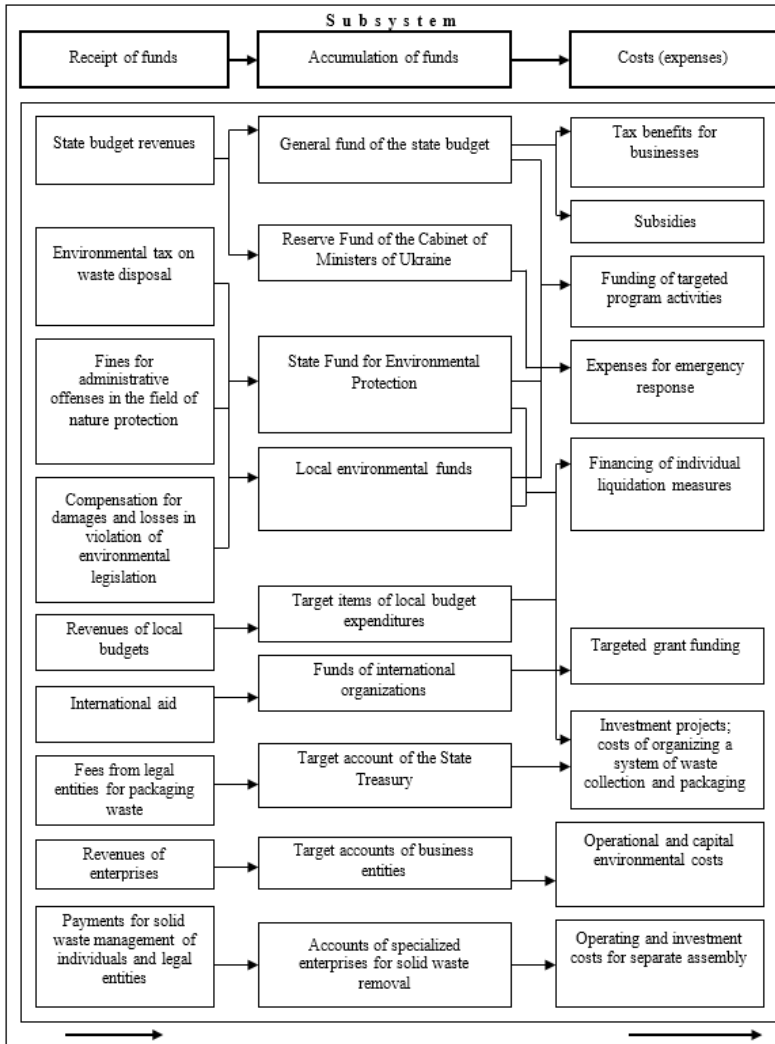


Fig. 3. Block model of the waste management financing system in Ukraine

Rys. 3. Model blokowy systemu finansowania gospodarki odpadami w Ukrainie

Autonomous flows of funds are formed primarily for the intended purpose – for the management of certain types (or groups) of waste. This is most obvious in the case of solid household (municipal) waste. However, at the stage of costs (within the relevant subsystem) there is a significant diversification of sources of funding for certain areas.

The key in the system of financial support should be considered to be budget revenues as part of its general and special funds and revenues of enterprises. As for the special fund, it is a question of state and local funds of environmental protection, which are formed mainly at the expense of the ecological tax. In our opinion, the national financial strategy should be based on the development of these sources of funding and the assessment of real opportunities for this.

## Conclusions

It can be concluded that in the modern world, there is a tendency of transition to a circular economy that is aimed at preserving and protecting natural resources. Foreign states are developing measures to change the national economy and industry in accordance with the concept of “zero waste”, which should solve the problem of a lack of necessary resources and waste recycling.

Now Ukraine is not only the vanguard of Europe on the front of the struggle for democratic values in confrontation with the aggressor. Ukraine is potentially interesting for the implementation of state-of-the-art technological investment projects, especially in the field of effective waste management with extended biofuel production.

The analysis showed that the situation in Ukraine in terms of waste management requires improvement. The existing legislative framework does not have sufficient further implementation in practice. According to foreign experience, the processing industry is not only environmentally friendly but also financially profitable. Ukrainian entrepreneurs have started to take the first steps towards more environmentally friendly entrepreneurship, but this is not enough for global changes in society. The state should devote more resources to reorienting the existing economic model, which will create new business projects and increase the flow of investment into the country.

Ukraine should join the EU Circular Economy Package as soon as possible and accept key points with regard to the pre-treatment of waste before disposal and provide for liability for non-compliance. Priority policy measures for waste management and recycling in Ukraine should include:

1. The development of a complete system of standards and regulations, conducting a comprehensive energy audit and expertise, forming a transparent system of incentives and benefits.
2. Incentives from the government towards the use of waste and secondary resources for the production of biofuels (state support, an increase in the “green” tariff for electricity for biomass and biogas, and the extension of tax incentives).

3. The adoption in Ukraine at the legislative level of the EU Circular Economy Package, which will include the basic requirements for the pre-treatment of waste before disposal and the provision of liability for waste producers for non-compliance with the requirements.

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# Budowanie zdolności instytucjonalnych w zakresie gospodarki odpadami jako drugorzędного zasobu w Ukrainie na drodze do integracji europejskiej

## Streszczenie

Porównanie europejskich doświadczeń w gospodarce odpadami w kontekście dyrektyw, decyzji i rozporządzeń przyjętych w ostatniej dekadzie w Unii Europejskiej, a także stanu ram organizacyjnych, ekonomicznych i regulacyjnych z ukraińskimi wykazało systemowe opóźnienie rozwiązywania problemu odpadów w Ukrainie we wdrażaniu nowych podejść koncepcyjnych, metodologicznych i praktycznych do kształtowania odpowiedniej polityki państwa.

Przeanalizowano dynamikę postępowania z niektórymi rodzajami odpadów w Ukrainie. Zidentyfikowano cechy unieszkodliwiania i gospodarowania odpadami w Ukrainie. Przeprowadzono charakterystykę porównawczą dynamiki per capita wytwarzania odpadów w krajach europejskich i w Ukrainie.

Powstał blokowy model systemu finansowania sektora gospodarki odpadami w Ukrainie i wyznaczono kierunki jego efektywnej gospodarki. Sformułowano priorytetowe środki polityki w zakresie gospodarki odpadami i wykorzystania zasobów wtórnych. Priorytetowo potraktowano szereg przeszkód na drodze efektywnej gospodarki odpadami w Ukrainie. W kontekście kształtowania efektywnej strategii gospodarowania odpadami zalecono uporządkowanie jej trzech elementów składowych podsystemu: wpływów (źródeł powstawania) środków, ich akumulacji oraz kosztów (wydatków). Zaproponowana struktura wskazuje na obecność wielu przepływów środków, z których każdy jest w dużej mierze autonomiczny, ale razem tworzą komplementarny system.

Zaproponowano ulepszenia ram prawnych. W szczególności zaleca się przeznaczenie większych środków na reorientację istniejącego modelu gospodarczego, co stworzy nowe warunki biznesowe i zwiększy napływ inwestycji do kraju.

SŁOWA KLUCZOWE: gospodarka, odpady, instytucje, integracja europejska, zasoby wtórne