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## **Management of secondary raw materials in Ukraine. Challenges and opportunities**

**Abstract**

Subject of the study. In recent years, the concept of circular economy has become an integral part of European development strategies. It emerged as a result of society's understanding of the importance of efficient use of resources in economic activity and the growing anthropogenic pressure on the environment. The purpose of the study is to determine the status and prospects of development of the secondary raw materials market in Ukraine. Methodology. The methodological basis of the study are the principles of systematic scientific analysis. The systematic method implies a holistic study of the secondary raw materials market as an integral system. The analytical method reveals the peculiarities of collection and procurement of secondary raw materials from the households of Ukraine, the specific material balance of secondary resources, in which a significant proportion is the import of secondary raw materials. Methods of observation, description and analysis are also used. Studied the current state of education and management of solid waste and secondary raw materials market in Ukraine. The practical significance of the results is to identify barriers to the development of the secondary raw materials market and ways to eliminate them. Among the practical advantages of developing a market for secondary raw materials is the need to reduce the state's resource dependence on external sources of raw materials and the excessive use of its own primary resources. In the future, access to inexpensive, environmentally friendly and high-quality products will be an advantage for consumers.

**Keywords**

Circular economy, secondary raw materials market, municipal solid waste

**JEL:** Q01, Q53**DOI:** <https://doi.org/10.30525/2500-946X/2021-4-4>**1 Introduction**

The scale of the use of primary natural resources is now so great that it threatens to exceed the real capacity of our planet. The transition to a circular economy could affect this process. It is this transition that will reduce the burden on the environment and increase the use of primary resources, including through the involvement of more and more secondary resources in the economy, reducing waste generation and designing products using recyclable materials.

In recent years, EU countries have put a lot of effort into moving to a circular economy. Studies by scientists show that there are about 45 strategies that help move towards a circular economy (Kalmykova, 2018). These strategies can be applied at various points in the value chain, such as recovery/recycling and consumption/utilization, among others. At the same time, the main ideas behind these strategies are stock optimization, environmental efficiency, waste reduction, and so on.

Work is currently underway to develop approaches to monitor the progress of the transition to a circular

economy. For example, material flow accounting allows tracking changes over time as a way to analyze the effectiveness of circular economy programs. The recently developed Hybrid MFA-LCA method allows environmental monitoring (Kalmykova, 2018). In addition, one of the important indicators is the utilization rate of round material. It is this indicator that is already being regularly monitored at this stage. Scientists evaluated the annual data from 2010 to 2019 for 19 countries of the European Union (Neves, 2022).

Studies show that the use of waste as secondary raw materials opens the way to sustainable development, because it saves both primary resources and the environment. Despite some progress in this direction, Ukraine today needs to significantly improve the situation in the field of waste management, in particular, to improve the use of secondary raw materials. Ukraine's economy is increasingly confidently entering the globalized commodity market. Therefore, it needs to take into account the problem of expanding resource opportunities. After all, Ukraine is experiencing a steady increase in waste

generation and its gradual accumulation. It is also necessary to consider the importance of ensuring the competitiveness of domestic products while saving resources (Makovetska, 2018).

The relevance of the study is determined by the generalization of information about the collection and use of certain types of secondary raw materials, including paper and cardboard, glass, recycled polymers, etc. On the one hand, these types of materials are the most in demand in the Ukrainian market of secondary resources, and on the other hand, the potential of their use is not fully used. The purpose of the study is to identify barriers to the expansion of the use of secondary resources in Ukraine.

## **2 The current state of solid municipal waste management**

In 2020, more than 54 million m<sup>3</sup> of solid waste (or more than 15 million tons) was generated in Ukraine. Most of it is placed on 6,000 landfills and dumps with a total area of almost 9,000 hectares. 78.5% of the population of Ukraine is covered by the service of solid municipal waste collection.

It should be noted that in rural areas (especially in the mountainous regions of the Carpathians), waste collection services cover only 10 to 30% of the population. That is, a fifth of Ukrainians (and actually more) are forced to solve the issue of waste disposal on their own. And as a result of the lack of civilized waste management or attempts to save money on their own economy, solid municipal waste enters the environment, forming unauthorized landfills, as well as incinerated MSW on the territory of households. That is why more than 20,000 unauthorized dumpsites are identified each year. In particular, in 2020, 22.6 thousand unauthorized dumps were identified, most of which were eliminated (Ministry of Communities and Territorial Development of Ukraine, 2021).

As a result, only 6.3% of municipal solid waste was recycled and disposed of in 2020, of which 1.7% was incinerated, and 4.6% of MSW went to sorting and recycling lines (Ministry of Communities and Territorial Development of Ukraine, 2021).

## **3 The systems of collection of secondary raw materials from households**

Ukraine has historically developed two parallel systems of collection and accumulation of secondary raw materials.

The first is the purposeful collection and accumulation of waste (paper and cardboard, recycled plastics, glass, scrap metal, tires, etc.) through recycling points on a fee basis, inherited from the Soviet system. Residents can collect and bring certain

types of recyclables, such as paper and cardboard, glass, polymers, metal cans, etc., to collection points and receive a monetary reward for doing so. This is very often used by the informal sector, which extracts valuable materials from solid waste containers (including for separate collection). In this way certain types of secondary raw materials are accumulated.

The Ukrainian Production and Ecological Association for the purchase and use of secondary material resources "Ukrvtorma" is the largest association in this market. It unites about 100 entities. In the beginning, the association enterprises collected waste through collection points, but over time, the activities have expanded through separate collection of containers and collection of solid waste. Some members of the association also recycle some types of solid waste.

There is also a network of procurement companies that are not members of the association "Ukrvtorma".

The second system can be called the formation of separate waste streams from municipal solid waste. This process is going slowly in Ukraine. In most settlements the separate collection remains at the level of pilot projects. Therefore, it is too early to talk about possible significant provision of enterprises with raw materials on this basis.

According to the Ministry of Communal and Territorial Development, the separate collection of solid waste has been introduced in 1,725 settlements of Ukraine<sup>1</sup>. The share of the population covered by the separate collection from the total population of Ukraine is 27.6%.

It should be noted that in these localities, the percentage of the population covered by the separate collection varies greatly. In addition, some localities declare the separate collection of only one type of material (mostly plastic). If to take into account two indicators, namely the percentage of coverage of the population of more than 50% and collection of at least two types of materials, then only about 500 settlements meet these criteria.

According to the ministry, about 11% of recyclables are captured through separate collection. However, many localities do not provide information on the amount of recyclables received from the separate collection of solid waste. Also, the calculation is made in cubic meters, which is not quite correct for different types of materials. Accordingly, it is difficult to assess the efficiency of resource extraction in separate collection.

In general, we can conclude that two fractions are often collected: "dry" recyclables (plastic, glass, paper, metals) and other residual waste. Where separate containers are installed, this is firstly done mainly for plastic, very often separately for PET, often for glass and much less often for paper.

<sup>1</sup> There are about 28,000 settlements in Ukraine, of which 461 are cities.

TABLE 1 Collection and processing of certain types of secondary raw materials in Ukraine in 2020

Indicators	Type of secondary raw materials			
	paper and cardboard	polymers	PET-bottles	glass
Approximate number of enterprises engaged in recycling of secondary raw materials, units	22	50	19	11
Available capacity of enterprises, thousand tons	1,200	260	77	800
Purchases of secondary raw materials, thousand tons	668.2	116.6	-	449.5
Import, thousand tons	311.1	39.5	-	18.8
Export, thousand tons	10.1	2.3	-	2.2
Balance of secondary raw materials, thousand tons	969.2	156.1	50	468.3
Working capacity of the enterprises, %	80.8	60.0	65	58.5

According to the ministry, it is difficult to assess the fleet of containers, as many localities do not indicate the number and for what components of solid waste.

In the last few years, collection points for some types of secondary raw materials have started to open without any monetary remuneration, but they are very few. However, such points are envisaged in the National Waste Management Strategy in Ukraine until 2030. Perhaps these intentions will be transferred to the regional waste management plans and such points will be created.

Association "Ukrvtorma" assessed the market collection and processing of certain types of secondary raw materials on the basis of information received from members of the association, enterprises that use secondary raw materials, and data on the export and import of secondary raw materials (Table 1).

#### 4 Export-import of secondary raw materials

As can be seen from Table 1, a significant basis of the material balance of secondary raw materials (paper and cardboard, secondary polymeric materials,

glass) is its import. According to the State Statistical Service of Ukraine, it especially concerns paper and cardboard and polymers (Table 2) (State Statistical Service of Ukraine, 2021).

Import of waste paper and cardboard significantly prevails over its export, mainly due to the cost of procurement in Ukraine, where there is no mechanism for implementing the principle of extended producer responsibility for packaging waste, and the EU countries, where this mechanism has been in place for many years. In recent years, import of waste paper and cardboard has stabilized at the level of about 300 thousand tons per year.

Imports of waste glass show unstable dynamics. In the period from 2010 to 2020, there were jumps and fluctuations, with minimum figures in 2017 and 2020.

Since 2015, imports of polymer waste increased many times and reached an absolute peak in 2016, when 68.4 thousand tons of polymers were imported into Ukraine.

Secondary raw material export volumes do not have a significant impact on the resource balance, as shown in Table 3.

TABLE 2 Dynamics of imports of certain types of secondary raw materials in Ukraine

Years	Type of secondary raw materials					
	paper and cardboard		polymers		glass	
	Amount, thousand tons	Cost, million US dollars	Amount, thousand tons	Cost, million US dollars	Amount, thousand tons	Cost, million US dollars
2008	159.3	29.0	2.7	1.4	30.7	2.3
2014	329.4	71.4	6.5	4.3	25.2	2.1
2015	336.9	60.8	16.1	7.6	54.7	3.7
2016	271.8	47.6	68.4	89.9	54.6	2.7
2017	346.4	70.0	38.6	14.4	19.5	0.8
2018	392.3	76.6	53.4	18.6	32.5	2.2
2019	290.6	51.8	63.7	21.1	47.3	3.2
2020	311.2	48.3	39.5	12.6	18.8	1.5

TABLE 3 Dynamics of export of certain types of secondary raw materials in Ukraine

Years	Type of secondary raw materials					
	paper and cardboard		polymers		glass	
	Amount, thousand tons	Cost, million US dollars	Amount, thousand tons	Cost, million US dollars	Amount, thousand tons	Cost, million US dollars
2016	5.0	1.1	0.7	1.4	0.4	0.03
2017	12.2	2.9	0.7	0.5	1.8	0.12
2018	8.9	2.3	1.3	0.6	0.2	0.02
2019	10.2	3.0	1.2	0.44	1.3	0.1
2020	10.1	3.1	2.3	0.8	2.2	0.3

## 5 Challenges and opportunities

In a circular economy, secondary raw materials are replacing more and more primary resources, eliminating the concept of waste. Therefore, it is now important to determine what barriers arise in the market of secondary resources in Ukraine in order to identify ways to eliminate them.

Among the key issues are the following:

- insufficient infrastructure for separate collection and sorting of solid municipal waste. Not only are there not enough waste-sorting complexes, but also not enough containers for separate waste collection;
- as a result of the weak export of secondary raw materials, there is not enough of it for those companies already engaged in recycling to load their lines to full capacity;
- the economics of separate collection of municipal solid waste is unprofitable; the introduction at the legislative level of the principle of extended producer responsibility will provide adequate financial resources for this;
- increasing requirements for the quality of secondary raw materials;
- the lack of reliable data on the production and disposal of municipal solid waste;
- low rates do not provide an incentive to raise operating standards or achieve higher levels of recycling. The relatively "low cost" of recycling creates distorted incentives for operators and local authorities to choose between landfilling and recycling (Makovetska, 2021).

At the same time, increased attention to attracting secondary resources will provide significant benefits for Ukraine. In particular, it will provide business with a stable supply of materials against the background of their shortage. Reducing dependence on imported raw materials, guaranteeing the preservation of existing jobs and creating new markets. Reducing waste reduces the "footprint" and external effects on the environment.

## 6 Conclusions

The assessment and use of the potential of secondary resources should be seen as an important component of the overall problem of the country's resource prospects, particularly in the context of sustainable development and the transition to a circular economy.

Generalization of existing trends allows us to note that in Ukraine there is an active formation of the market of secondary raw materials. The study of the peculiarities of formation and use of some of their types shows that the best of the studied types are waste paper and cardboard, recycled glass and polymeric materials. However, the growth rate remains insignificant.

Analysis of the potential for the use of secondary raw materials shows both the idle production capacity of plants that use secondary raw materials to produce new products for all types of secondary raw materials, and the possibility of significant expansion of the recycling system in the future (subject to the collection and harvesting of secondary resources from household waste). According to the author, in the coming years, Ukraine will retain the existing system of solid waste collection (without sorting and with subsequent disposal in landfills). Although in recent years, work in this direction has intensified.

As a result, a situation arose when Ukraine, having a stock of its own secondary resources, imports some of these types of secondary raw materials. The most significant share is the import of waste paper (up to 250 thousand tons per year). Waste export volumes do not have a significant impact on the balance of resources.

The insufficient level of involving of wastes in an economic turnover is caused, not least of all, by imperfection of the normative-legal maintenance. The development of appropriate legal regulation in the sphere of waste management becomes an urgent need.

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