

UDK 911.2.502.1(476)

UDC 911.2.502.1(476)

ASSESSMENT AND PROSPECTS FOR THE DEVELOPMENT OF A SOLID MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM IN THE REPUBLIC OF BELARUS

АЦЭНКА І ПЕРСПЕКТЫВЫ РАЗВІЦЦЯ СІСТЭМЫ ПА ЗВАРОЦЕ ЦВЁРДЫХ КАМУНАЛЬНЫХ АДХОДАЎ У РЭСПУБЛІЦЫ БЕЛАРУСЬ

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Received on 7.02.2019.

Паступіў у рэдакцыю 7.02.2019.

The article assesses the current status of solid municipal waste circulation and secondary material resources in the Republic of Belarus. Based on international experience, it reveals the main directions of development of the system of management of solid municipal waste and secondary material resources aimed at improving the environmental safety of existing and future solid municipal waste disposal sites, increasing the level of solid municipal waste processing, improving infrastructure and selecting efficient technological solutions for solid municipal waste and secondary material resources management and improving the efficiency of activities providers of services for the management of solid municipal waste and secondary material resources.

Keywords: national strategy, solid municipal waste, secondary material resources, RDF-fuel.

У артыкуле праведзена ацэнка бягучага стану ў галіне абыходжання цвёрдых камунальных адходаў (ЦКА) і другасных матэрыяльных рэсурсаў (ДМР) у Рэспубліцы Беларусь. На падставе міжнароднага вопыту вызначаны асноўныя напрамкі развіцця сістэмы абыходжання з ЦКА і ДМР, накіраваныя на паляпшэнне экалагічнай бяспекі існуючых і будучых месцаў пахавання ЦКА, павелічэнне ўзроўню перапрацоўкі ЦКА, дасканалеўне інфраструктуры і выбар эфектыўных тэхналагічных рашэнняў па абыходжанні з ЦКА і ДМР і павышэнне эфектыўнасці дзейнасці пастаўшчыкоў паслуг па абыходжанні з ЦКА і ДМР.

Ключевые слова: нацыянальная стратэгія, цвёрдыя камунальныя адходы (ЦКА), другасныя матэрыяльныя рэсурсы (ДМР), RDF-паліва.

Introduction. The need to address the waste problem has led to the emergence of an independent field of environmental policy aimed at developing methods for organizing waste collection, processing (incineration), incineration, disposal, as well as stimulating measures to involve waste in economic circulation and prevent waste generation in their sources of generation. To denote this trend, the term

«waste management» has emerged and is widely used in the world, which indicates the regulation and regulation of all processes related to the formation, storage, transportation, processing and disposal of waste [1–3].

At the same time, in international practice, the theoretical and methodological foundations for the formation of an integrated environmental management and rational use of natural resour-

ces, including waste management, have not been fully developed, but practical approaches to the creation of such a system, including mechanisms and tools for implementing the optimal politicians in this field are still far from perfect and differ significantly in different states.

In the European Union, the legislative framework for the management of garbage is established through two main directives – the Waste Directive and the Hazardous Waste Directive. The EU also adopted separate directives regulating the handling of special types of waste – packaging, used oils, waste treatment plants, batteries, obsolete vehicles, and electronics waste. The requirements of the EU directives are met through the national systems of legislation of the participating countries [8].

Currently, in the countries of the European Union, the Waste Directive legislatively approves the following hierarchy of waste management methods (as the priority of the method is reduced): prevention of education; reuse; recycling; energy use, final disposal (storage).

The specific features of handling solid municipal waste in Belarus are shown in Table 1.

Table 1 – Hierarchy of the treatment of solid municipal waste in the Republic of Belarus

Products	Prevention	State program is absent
	Repeat	Only 5 percent of all beverage containers are reused
Waste	Recycling	15,6 percent
	Energy use	None
	Burial	84,4 percent

Disposal of solid municipal waste is carried out by three main methods, the characteristics of which are given below [4–6].

1. Recycling (recycling) – return of individual solid municipal waste components to economic circulation by means of their allocation from the total mass and transfer to use as raw materials and materials for production;

2. Composting – use of organic part of solid municipal waste after its biological treatment (decomposition of organic substances) with the help of various microorganisms;

3. Combustion – the use of mixed solid municipal wastes or the heat-recovering fractions extracted from them to generate thermal and / or electrical energy.

The use of these methods differs significantly across countries, which is due to both the general level of socio-economic development and a number of other factors and features of different countries. Unused solid municipal wastes are disposed of in specially equipped places (landfills), taking into account the requirements for environmental protection.

World experience shows that in the structure of incomes of enterprises for the collection and processing of solid municipal waste up to 90 % are the payments of waste producers (population, enterprises) and packaging producers (suppliers) (the principle of extended producer responsibility). Revenues from the sale of secondary material resources extracted from the solid municipal waste account for only about 10 percent [9].

At the same time, the costs and, correspondingly, the level of tariffs for the population and legal entities significantly increase with the increase in the share of waste used from their total volume of education. Thus, the experience of international companies in EU countries shows that if the volume of waste use is within 30 percent of the volume of solid municipal waste formation, export tariffs amount to 20–30 euros per 1 ton. With the increase in the use of solid municipal wastes to 70–80 percent of the volume of their formation, the tariff level increases to 100–120 euros per 1 ton [11].

The level of collection of recyclable materials in Belarus corresponds to such countries as Spain, Portugal, Finland, Latvia, Slovakia, Russia, Ukraine. At the same time, the National Strategy for Sustainable Social Economic Development of the Republic of Belarus for the period up to 2030 was adopted, in which it is determined that by 2030 the level of solid municipal waste use should increase by 2.5 times and make up at least 40 percent.

The experience of the countries of the European Union shows that such an indicator can not be achieved only through a collection, the average level of which is within 25 percent. Obviously, without new ways of involving waste into economic circulation, it is impossible to increase the level of waste use.

Assessment of the current status in the area of solid municipal waste and secondary material resources management in the Republic of Belarus. Over the past decade, the system of handling municipal waste in the country has been constantly improving. At the same time, the republic retained the infrastructure and

controllability of the system for collecting, harvesting, exporting and disposing of waste.

The Law of the Republic of Belarus «On Waste Management» dated July 20 2007 № 271–3 in general meets international standards. The beginning of systemic work in the sphere of secondary material resources was made in 2009 with the adoption of the State Program of Collection and Harvesting for 2009–2015. This allowed in the first years of the State Program to increase the collection rate from 173 thousand tons in 2008 to 340 thousand tons in 2010. Then, growth slowed down, and a new push was required. Such an impetus was the introduction in 2012 of the principle of extended liability of producers. In this we were the first in the CIS [4].

Currently, there is another stage of slowing growth and the need for another push. The established system of handling solid municipal waste in the republic allows to provide the necessary level of sanitary cleaning and to extract from municipal waste and process about 16 percent of recyclable materials.

According to the report on sanitation of settlements, in 2015 about 21.4 million cubic meters were removed to solid municipal waste disposal facilities. meters solid municipal waste, of which about 80 percent, or 17.2 million cubic meters, accounted for consumption wastes. The entire amount of waste directed to the disposal is located at 165 polygons and 1 thousand 706 mini-ranges [5].

The system of waste management in the republic is aimed at observing the principle of priority use of waste in relation to their disposal or burial and on involving solid municipal wastes related to secondary material resources in civil circulation [12].

Currently, the following mechanisms for collecting secondary material resources from solid municipal waste are in place:

- procurement of secondary material resources through the system of receiving (procurement) points;
- separate collection of solid municipal waste from the population by installing special containers for certain types of secondary material resources and their sorting;
- sorting of mixed municipal waste at waste processing plants (hereinafter - waste processing plants) with subsequent recovery of secondary material resources;
- purchase of secondary raw materials under sales contracts from legal entities, in the process of economic activity of which such wastes are generated.

As of January 2016, more than 100 sorting and sorting facilities for separately collected municipal waste with a total capacity of about 360 thousand tons per year have been created. In addition, there are 5 sorting complexes in the waste processing plants, built in the cities of Gomel, Mogilev, Baranovichi, Brest and Novopolotsk, with a total capacity of 300 thousand tons per year. In 2016, the construction of a mechanical waste sorting facility in Grodno with the capacity of 120,000 tons of solid municipal waste per year was completed [4].

The technologies used in the waste processing plants constructed in the Republic are based on the sorting of incoming solid municipal wastes for the purpose of extracting secondary material resources. The experience of their work shows that the volume of recovery of secondary material resources suitable for reuse from mixed solid municipal waste is up to 10–15% of the total volume of incoming waste, depending on the season, the rest of the waste forms a ballast and is transported to the disposal site [8].

In 2015, all collection systems were harvested and sent to processing about 593.1 thousand tons of secondary material resources. The level of use of solid municipal waste reached 15.6 percent. At the same time, the volumes of the collection (harvesting) of certain types of secondary material resources meet the European level. Thus, the volume of waste collection of paper and paperboard is more than 70 percent of the volume of education, glass waste - more than 60 percent, and polymer waste - less than 20 percent [8].

In general, assessing the current state of the solid municipal waste and secondary material resources treatment in the Republic of Belarus, we can say that the country has developed basic legal documents that determined the basic principles of waste management that meet international standards. State policy on the evolutionary reform of housing and communal services allowed to preserve the infrastructure and manageability of the system of collection, removal and placement of solid municipal waste.

For the period from 2003 to 2015 conditions and infrastructure have been created for the collection, removal and placement of solid municipal waste in accordance with sanitary and hygienic requirements and standards. In general, the country has a relatively high level of sanitary condition of settlements, which is supported by the majority of the country's population [4, 7].

The system is manageable, there is a steady growth in the collection and harvesting of material resources (from 192.5 thousand tons in 2007 to 593.1 thousand tons in 2015).

In addition, the principle of expanded responsibility of producers and suppliers of goods and packaging was introduced, thanks to which the secondary material resources collection system underwent fundamental changes, and now most of the secondary material resources is collected through the procurement system (more than 90 percent).

The low effectiveness of separate collection of solid municipal waste is caused by a number of factors, among which [10, 12]:

- urban policy in cities, which does not take into account the new requirements for a separate collection system for solid municipal waste (high specific gravity of multi-apartment buildings, high density of construction, orientation of design decisions for the construction of houses with more than 5 floors with garbage chutes);
- insufficient supply of containers for separate collection;
- insignificant investments in the work with the public, weak awareness of the population.

Prospects and directions of the development of the system of treatment of solid municipal waste and secondary material resources in the Republic of Belarus. In February 2014, at a meeting on the management of waste and secondary material resources, the Head of State set the task of forming an effective system of handling solid municipal waste in the country and achieving a West European level of their use [4, 7].

On behalf of the Council of Ministers of the Republic of Belarus, the Ministry of Housing and Communal Services developed a draft National Strategy for Solid Waste Management and Secondary Material Resources for the period up to 2035, which provides:

- minimization of the burial of solid municipal waste at landfills, and reduction of their harmful impact on the environment and human health;
- the maximum possible use of waste with recovery of secondary raw materials.

The solution of the set tasks is provided by:

- improving the system of separate collection of solid municipal waste and involving in the economic circulation of the secondary resources contained in them;
- introduction of a deposit system for collecting beverage containers;
- use of solid municipal waste energy potential;

- introduction of composting technologies for organic solid municipal waste.

For this, it is necessary to ensure the phased implementation of a number of regulatory, legal, organizational, technical and investment measures. As a result of their implementation, by 2035 it is planned to reach a 50 % level of use of solid municipal waste generated in the republic [4].

At the same time, the National Strategy has a socio-ecological character and does not have a pronounced economic effect. In this case, environmental benefits are priority over economic ones. The indirect economic effect will be to create conditions, including economic ones, that stimulate the development of business processes in the sphere of waste management and secondary material resources, and this is investment in the industry, additional jobs and deductions to the budget.

In addition, through the introduction of technologies for the energy use of waste (the use of RDF fuel in the cement industry and the construction of an incineration plant in Minsk), it is planned to replace imported energy resources in an amount equivalent to 170 thousand tons of standard fuel per year.

The program activities of the National Strategy are divided into five modules according to their target character. For each module, the framework economic legal conditions and the sequence of implementation of the investment program activities are defined. At the same time, modules 1 and 2 are projects of the republican level, and modules 3–5 are already projects of regional level.

Module No. 1 is a basic module that presupposes the improvement and development of the existing system for handling municipal waste. It implies the improvement of the system of weight accounting of landfilling at landfills, the development of professional schemes for waste management and the modernization of waste disposal sites, with a reduction in their number from 1800 to 130.

At the same time, all this work should be supported by legislation. It is necessary to pass from the generally prohibitive norms to indicators of recovery of recyclables and create economic incentives for separate collection and sorting of waste. In this direction, there is a positive experience of the European Union. Its directives do not prohibit the disposal of waste from secondary material resources, but establish obligations to return recyclables to economic circulation.

An integral part of the module No. 1 is the training and retraining of specialized specialists who will deal with this topic, and, of course, work with the public.

Module No. 2 provides for the introduction of a deposit collateral package collection system. As shown in the Concept calculations on the implementation of the deposit system in the Republic of Belarus, at the same cost, it is possible to collect up to 80–90 percent of glass, plastic and aluminum packaging, and reduce the total volume of waste disposal by 10 percent. Almost the entire population will participate in this system, which will have the right stereotypes for handling waste. The deposit collateral system will complement the existing system of separate collection of secondary material resources.

Module No. 3 provides, at the first stage, the production of RDF fuel for cement plants in the cities of Mogilev and Grodno based on the already existing capacities for the sorting of solid municipal waste.

Mechanical sorting of waste in the production of RDF fuel makes it possible to use the selected organic fraction after its biological treatment as

a material for reclamation of the landfill, treated soil, organic material (module No. 4). This will extend the service life of the landfills by an average of 10 percent and get an economic effect by reducing greenhouse gas emissions.

The problems of the city of Minsk in the part of the secondary material resources are proposed to be solved by creating a plant for the incineration of mixed wastes with an estimated capacity of 500 thousand tons with the production of heat and electric energy (module No. 5). The commissioning of such a plant as a whole will reduce the volume of solid waste disposal in the country by 10–15 percent [5, 11, 12].

The conclusion. The conducted assessment of the level of development of the solid municipal waste handling system in the Republic of Belarus can be considered representative, as it includes the main indicators characterizing the state of the industry, allows a comprehensive assessment of its functioning and enables comparative analysis to be made to determine the level of development of the solid municipal waste handling system in the country in relation to other countries.

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