

THE ECONOMIC ESSENCE OF THE WASTE RECYCLING SECTOR.
CONCLUSIONS AND RECOMMENDATIONS

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Abstract

This article describes waste and its generation, the global experience in recycling hazardous waste, and methods for its neutralization. It also provides information on measures for preventing waste generation.

Keywords

waste, waste recycling, solid and municipal waste, secondary raw materials.

Introduction.

The article highlights issues related to waste management and the provision of environmental safety in economically developed countries and in the Republic of Uzbekistan. At present, the state of waste recycling and management in our country cannot be assessed as satisfactory. In addressing this issue, Uzbekistan is lagging behind developed countries. In recent years, the rapid growth of waste generation worldwide, along with the problem of limited resources, has become one of the most pressing challenges. Therefore, the waste problem is increasingly becoming one of the most urgent environmental issues at the global level.

One of the most effective ways to address these problems is recycling waste in order to obtain raw materials and products with functional properties required for various sectors of the economy.

In managing waste recycling activities, relevant measures are being implemented worldwide, including in the Republic of Uzbekistan, to develop alternative energy sources from waste.

In this regard, a number of recommendations have been provided for state bodies responsible for waste management in Republic of Uzbekistan. On January 28, 2022, the President of Uzbekistan issued Decree No. PF-60 “On the Development Strategy of New Uzbekistan for 2022–2026” [1]. This decree outlines a roadmap for improving the payment system for services related to waste management, further supporting sanitation enterprises, and introducing public-private partnerships in the sector.

In this context, a number of recommendations have been provided for state bodies responsible for waste management in Republic of Uzbekistan. On March 24, 2025, the President of Uzbekistan issued Decree No. PF-56 “On Further Improvement and Comprehensive

Systematization Measures in the Waste Recycling Sector.” This decree establishes a roadmap for improving the payment system for services related to waste management, organizing the activities of eco-industrial zones, further supporting sanitation enterprises, and introducing public-private partnerships in the sector.¹

Formulating recommendations for the proper organization of the management system in the collection and recycling of household and industrial waste involves finding solutions based on global experience in the disposal of industrial and consumer waste. This includes identifying the most effective methods of waste management and recycling, exploring how their utilization can maximize economic benefits, and implementing measures to minimize environmental impacts when using recycling technologies.

Various methods such as landfill disposal, placement in technically equipped sites, incineration, and recycling exist in global practice. Among these methods, recycling is considered the most effective. In comparison, storage and incineration cause greater environmental harm. Despite the availability of modern technologies for waste neutralization, utilization, and recycling, many countries continue to store waste in landfills without sufficiently employing these advanced methods, making it a common practice.

Waste recycling is carried out in two main directions:

- Production of secondary materials
- Energy generation

In developed countries, waste is used as a strategic resource for the production of heat and electricity, as well as for recycling metals, plastics, glass, and other materials. In economically developed nations, energy generation from waste is one of the widely practiced directions. It is considered important to promote waste recycling, implement modern technologies, equip production facilities with filters, and utilize waste as a raw material.

It should be emphasized that environmental protection, particularly the transformation of waste into an important component of the economy, is receiving special attention under the initiative of our country’s leadership. In this regard, the goal is to achieve effective management of the sector and gain public approval by reducing the number of landfills. In accordance with the relevant instructions of the President of the Republic of Uzbekistan, a waste supply agreement was signed between the Waste Management and Circular Economy Development Agency and the leading companies of the People’s Republic of China, “Wangneng Environment” and “CHSET,” for the implementation of modern projects based on waste recycling and energy recovery.

According to the agreement:

- In Bukhara region, with the participation of the People’s Republic of China company “Wangneng Environment,” a plant will be constructed in the Guliston neighborhood of Kogon district with a total direct foreign investment of 165 million USD. The plant will process 547,500 tons of municipal solid waste per year and will have a capacity to generate 230 million kWh of electricity. Upon the project’s launch, an additional 150 new jobs will be created.
- In Surkhandarya region, with the participation of the People’s Republic of China company “CHSET,” a plant will be constructed in the Bahor neighborhood of Angor district with a total direct foreign investment of 150 million USD. The plant will process 438,000 tons of municipal solid waste per year and will have a capacity to generate 75 million kWh of electricity. Upon the project’s launch, an additional 150 new jobs will be created.

At present, similar plants are actively being constructed in six regions of the country — Tashkent, Andijan, Namangan, Fergana, Kashkadarya, and Samarkand. Furthermore, in the future, the construction of such plants is also planned in the Republic of Karakalpakstan and Khorezm region.

¹ <https://lex.uz/uz/docs/7445858>

In short, such initiatives not only improve the waste management system but also align with the principles of the “green economy,” contributing to environmental sustainability, the development of a circular economy, and the promotion of renewable energy sources in our country.²

Literature Review:

According to A.B. Osipov and A.V. Sergeeva, the main obstacle to achieving a favorable economic situation for proper disposal, storage, and collection of waste in a country is the lack of disposal sites that fully comply with environmental requirements. In many countries, there is a lack of a legislative framework, environmental awareness, and necessary recycling technologies. Moreover, countries often do not prioritize selective waste collection or implement it only on a limited scale; the number of containers for selective collection is insufficient, and there is little attention to systems for systematically collecting and transporting waste from rural areas. They also point out that the presence of numerous unauthorized dumping sites and the lack of technical oversight exacerbate the situation.

According to G.P. Panasyuk, there is a direct relationship between a country’s level of economic development and its waste management. In his research, he highlights that in Japan, the proportion of recycled waste reaches 100%, while in several European countries, the share of waste recycling exceeds 60%. Panasyuk’s studies indicate that developed countries recycle a large portion of their waste, whereas less developed countries in Southern and Eastern Europe primarily rely on landfill disposal, which in turn reflects the underdevelopment of recycling practices in those regions.

All plastic waste can be classified into flexible packaging (bags and films) and rigid plastics (cans, bottles, and containers). Among recyclers, the most common and widely collected waste is polyethylene terephthalate (PET) containers. In his research, K. Rizayev identified that, in terms of recycling volume, polyethylene waste occupies the first place, followed by films in second place.

Research by F.D. Mubarakshina and A.A. Guseva shows that modern technologies simultaneously solve the problem of waste disposal and provide the opportunity to generate additional local sources of energy and heat. They emphasize that waste should not be viewed as ever-growing landfills and polluted water, but rather can be transformed into electricity through wires, heat in radiators, or vegetables and fruits produced in greenhouses.

Research Methodology.

The analysis of approaches to the utilization of municipal solid waste focuses on identifying and describing the most widely used methods of household waste recycling that are currently being developed or can be applied. It aims to present the methods of waste processing and recycling, as well as to identify the factors influencing household waste recycling. The production of raw materials through various methods of solid waste recycling is significant due to its relevance and practical importance.

Analysis and Discussion of Results.

Every year, humanity generates more than two billion tons of municipal waste, posing a threat of turning our planet into a massive landfill. In Uzbekistan, the issue of waste disposal is particularly urgent, as there are currently no available opportunities for waste recycling. However, the situation is expected to change significantly in the coming years. In recent years, the global increase in waste generation and the problem of limited resources have become among the most pressing challenges. One of the most effective ways to address these problems is

² <https://gov.uz/oz/sanitation/news/view/126884>

through the neutralization, utilization, and reuse of municipal and industrial waste, especially those containing significant amounts of valuable components. By recycling such waste and reusing it, raw materials with functional properties required for various sectors of the economy can be obtained, allowing their use for secondary purposes.

In our country, it is important to implement measures for the recycling and reuse of municipal and industrial waste in a manner that does not lead to environmental pollution. Within the framework of waste recycling, considering the sensitivity of industries and regions to climate change, it is essential to promote environmentally sustainable economic growth, ensure the development of a “green economy,” and implement adaptation measures along with relevant investment projects.

Table 1

Global Waste Recycling Rankings³

Rank	Country	Recycled Waste (%)
1	South Korea	67.1 %
2	Samoa	57.6 %
3	Benin	56.9 %
30	Uzbekistan	31.6 %
94	Turkmenistan	15.3 %
106	Kyrgyzstan	14.6 %
111	Tajikistan	13.9 %
175	Kazakhstan	3.8 %

One of the most pressing issues in Uzbekistan in the 21st century is related to waste management. Moving away from the conventional system of waste disposal and recycling, the development of a new system is required, demanding significant changes in this sector. In recent years, more than one-third of municipal waste is being given a “second life”: waste is transformed into raw materials for new useful products. For example, 400 aluminum cans can be used to manufacture a children’s bicycle; 25 plastic bottles can produce a wool sweater; 1 kilogram of newspapers can be converted into ten rolls of toilet paper; and one car tire can cover 1 square meter of playground surface. However, to date, only five to seven percent of waste in the country is being recycled.

The growth of the world population is closely linked to urbanization. According to many researchers, 80% of the global population lives in cities. This implies that if the current patterns of production and consumption remain unchanged, humanity will face a massive waste crisis.

The waste problem does not arise spontaneously; it develops over the years and gradually intensifies. This means that it is urgent to take necessary measures not only in Uzbekistan but also worldwide.

³ Prepared by the Author.

At the beginning of the 21st century, the world achieved significant success in industrial production. Developments were implemented to improve scientific and intelligent technologies, and the introduction of digitalization in the production sector brought about necessary changes in waste recycling practices.

Before the use of modern technologies, waste was disposed of in landfills using human labor, where it naturally decomposed without harming the ecosystem. Paper, glass containers, and scrap metal were often not thrown into general waste bins but were instead delivered to specialized collection points. From the data in Table 2, we can observe the decomposition periods of different types of waste.

Table 2

Decomposition periods of waste.⁴

№	Type of Waste	Decomposition Time	№	Type of Waste	Decomposition Time
1	Glass container	1 million years	10	Cigarette butts	10–12 years
2	Plastic beverage bottles	450 years	11	Wool clothing	1–5 years
3	Aluminum cans	80–200 years	12	Milk cartons	5 years
4	Batteries	100 years	13	Ropes	3–14 months
5	Rubber boots	50–80 years	14	Cotton gloves	3 months
6	Plastic cups, cans, tins	50 years	15	Cardboard	2 months
7	Nylon fabric	30–40 years	16	Orange or banana peels	2–5 weeks
8	Leather shoes	25–40 years	17	Paper towels	2–4 weeks
9	Wood	10–15 years			

The emergence of synthetic materials has brought many conveniences to human life but has also created a serious waste problem. Plastics decompose very slowly, resulting in all packaging materials, industrial waste, and other polymer waste accumulating into large waste heaps. It should be noted that organic waste decomposes quickly, whereas plastics decompose very slowly. Apart from the primary problem, the generated waste gives rise to two additional issues:

- It contaminates soil and groundwater;
- It releases harmful gases into the atmosphere from landfills.

During the decomposition of waste in landfills, fires and unintended chemical reactions can occur, which may lead to various mutations in nature, including viral epidemics. Therefore, to stabilize ecosystems, it is necessary not only to properly dispose of waste but also to carry out recycling and obtain raw materials from it.

In many economically developed countries, energy generation from waste is used as an important element of the waste management system. For example, according to the

⁴ Prepared by the Author.

Confederation of European Waste-to-Energy Plants (CEWEP), in 2018, the share of waste incinerated for energy production in European Union countries averaged 28%. Among the leaders in waste-to-energy utilization are countries known for their high environmental responsibility: Finland (57%), Sweden (53%), and Denmark (51%).

In addition, the overall volume of waste is quite large, and the waste problem can no longer be ignored. Overfilled waste bins look unsightly and emit unpleasant odors, especially in summer. Lightweight fractions of waste are scattered by the wind across different areas, and the bins attract rats, birds, and unattended animals. For these reasons, the level of secondary raw material recycling in our country cannot be considered satisfactory. When city residents dispose of waste into a single bin, mixed valuable fractions become unsuitable for recycling. Installing separate containers for different types of waste would facilitate the recycling process to a certain extent.

Conclusion and Recommendations.

One of the primary ways to address these problems is to promote a “green economy” by fostering environmental awareness and changing people’s attitudes toward waste. If the issues related to waste are not addressed, a waste crisis is inevitable. As a solution, it is necessary to reform the system of waste management in the country by improving the quality of sanitation services in different regions and actively involving business entities in the collection and removal of municipal waste. However, several serious shortcomings and problems currently exist in the sector, including:

- Currently, the existing landfills do not meet environmental and sanitation standards; due to the lack of proper disposal, utilization, and incineration systems, as well as an ineffective management structure, some landfills are irregularly organized.
- The fees for waste management services have not been reviewed over the past four years, which has negatively affected the financial condition of sanitation enterprises considered as business entities. As a result, the collection, removal, sorting, and recycling of waste have not been carried out fully and effectively.
- The predominance of the human factor in implementing payments for sanitation services, along with the incomplete introduction of a centralized electronic payment system and lack of integration with inter-agency systems, has led to the emergence of accounts receivable for the provided services.
- Contracts for waste collection and removal services have not been concluded with legal entities, and the responsibilities of legal entities in this regard have not been clearly defined.

Based on the above, it is considered appropriate to implement the following measures regarding waste recycling:

- Pay special attention to ensuring that waste disposal is carried out without exceeding established regulatory limits. Implement additional charges for enterprises that exceed these limits and provide incentives for those that recycle waste.
- Establish limits for the utilization of solid and municipal waste.
- Impose mandatory recycling obligations on large companies in sectors such as oil refining, automotive manufacturing, and chemical industries.
- Provide various incentives and benefits to business entities engaged in waste utilization and encourage their activities.
- Promote environmental literacy and foster ecological culture among the population.
- Encourage business entities that follow “green” principles in the recycling of solid and municipal waste through government support.

To fully develop the waste management infrastructure, it is important to instill in people's minds that waste is a strategic resource that brings real economic benefits. This, in turn, will help improve the situation related to waste recycling and utilization in our country.

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