

# The organization of municipal solid waste collection, disposal and recycling in Kazakhstan

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**Abstract.** This article analyzes the organization of municipal solid waste collection, disposal and recycling in Kazakhstan based on the National Committee Statistics data - the annual statistical bulletin “On the collection, removal, processing (sorting) and burial (deposit) of municipal waste in the Republic of Kazakhstan” for 2015-2018 years. The article examined the municipal solid waste sources, the main indicators of the municipal solid waste collection, transporting, sorting, disposal and recycling. It is concluded that to solve the problems of municipal solid waste collection, disposal and recycling necessary to solve the following issues: 1) need control over the application of laws in the waste management field; 2) necessary to change people's ecological behavior; 3) important is the availability of secondary resources market.

## 1 Introduction

One of the main factors of modern environmental pollution that affects the ecological situation is the city's economic activity. The growth of industry and population leads to an unconditional increase in the volume of municipal solid waste. Hence the problem of waste disposal. The localization of waste at landfills leads to secondary soils pollution, removal of significant areas from useful turnover.

There are three main options for the municipal solid waste disposal: the organization of landfills; waste incineration; waste recycling [1].

Waste recycling is the most resource-saving way, but not always economically viable. The main problems of recycling:

- waste sorting;
- waste transportation to the place of recycling;
- the problem of non-standard waste as raw material for production [2].

All these problems in total do not allow the secondary use option to develop as fast as we would like, and require new scientific ideas and research [3-5].

The purpose of the article is to analyze the organization of municipal solid waste collection, disposal and recycling based on the official National Committee Statistics data for four years in order to stimulate the activity of legal entities and individuals in this direction.

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## 2 Brief Literature Review

World's developed and fastest-growing countries already have scientific and practical achievements and believe that the organization of municipal waste collection, disposal and recycling should focus on them minimizing and recycling [6-10]. Two programs are needed for this:

- to prevent the waste formation;
- on the waste re-use.

But this requires separate waste collection: paper, glass and organics.

Literature review [11-17] has identified key issues in the municipal waste management system:

- Only in large cities is it possible for the population to access the services of waste collection.
- For small cities, as well as rural areas, the problem of the absence or insufficient degree of services provision for the waste collection and removal is characteristic.
- The lack of solid waste sorting system with the population involvement, as well as specialized sites and the remoteness of landfills, leads to the growth of unauthorized landfills.
- An insufficient number of enclosed container sites, as well as deterioration of containers, lead to an unsanitary situation around multi-storey buildings.

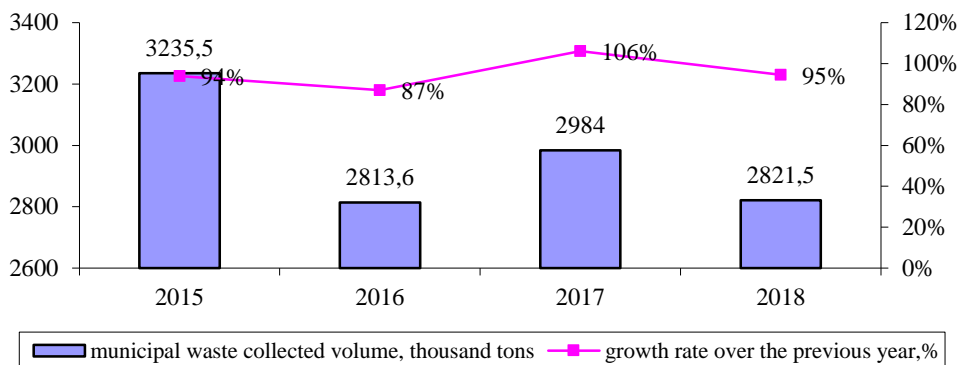
## 3 Materials and methods

The article analyzes the official National Committee Statistics data - the annual statistical bulletin "On the collection, removal, processing (sorting) and burial (deposit) of municipal waste in the Republic of Kazakhstan" for 2015-2018 years. The statistical bulletin contains data of municipal solid waste collection, disposal and recycling in Kazakhstan. Statistical observation data is generated on the basis of initial reports of enterprises collecting and exporting household municipal waste, as well as similar waste of economic entities equivalent to municipal solid waste and enterprises municipal waste sorting [18-20].

Also, information, analytical and expert materials placed in specialized publications, the media and the Internet, analytical materials of industry associations, etc. served as sources of information [21].

## 4 Results and discussion

According to the National Committee Statistics data, the main source of waste generation in Kazakhstan is the mining industry - 68% of the total annual waste volume. Electricity, gas and steam supply enterprises account for 15% of all waste, while manufacturing accounts for 10% of the annual waste volume. Municipal waste accounts for 2.6% of the annual generation of all types of waste. In 2018, the total amount of municipal waste collected, which makes up 2.6% of the country's collected waste, reached 3.6 million tons. Of this volume, 870.9 thousand tons accounted for the volume of waste from self-exporting enterprises (Figure 1).

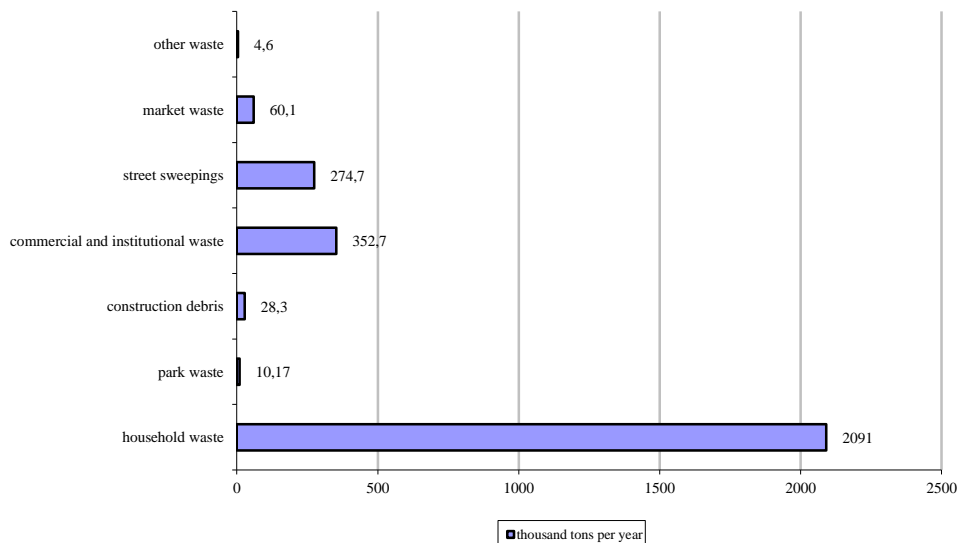


**Fig. 1.** Annual volumes dynamics of municipal waste collected and transported (excluding waste from self-exporting enterprises)

Note - Compiled by the authors

From the data in Figure 1 it can be seen that in 2018 there is a tendency to reduce the municipal waste generation (excluding waste from self-exporting enterprises) compared to 2015 by 12.7%.

Figure 2 provides information on the municipal waste generation sources (excluding waste from self-exporting enterprises) in 2018.

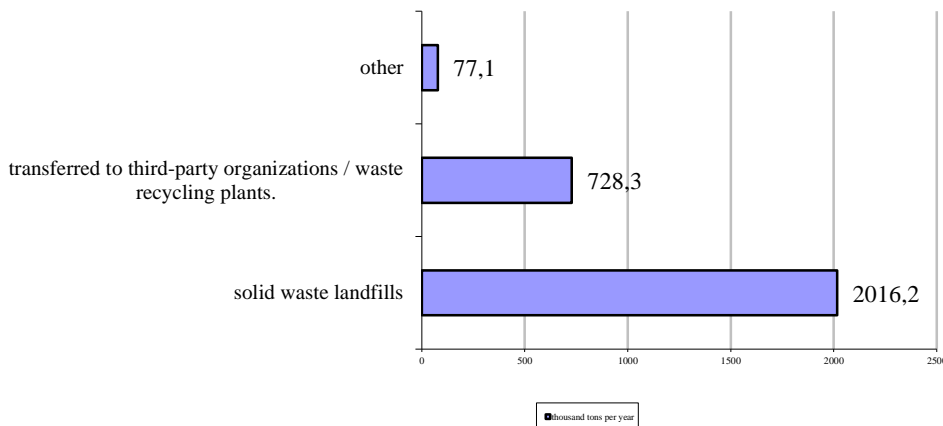


**Fig. 2.** Municipal waste formation sources (excluding waste from self-exporting enterprises) in 2018

Note - Compiled by the authors

Figure 2 shows that in 2018, 74% of municipal waste (excluding waste from self-exporting enterprises) is formatted by household waste, another 9.7% is street sweepings and 12.5% is commercial and institutional waste.

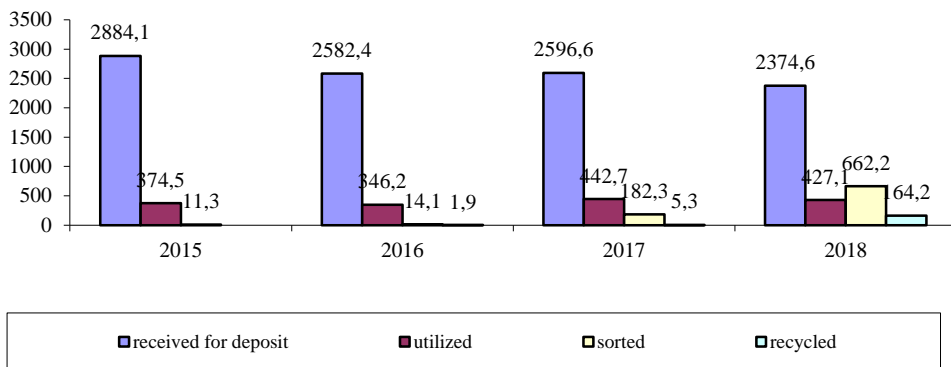
In 2018, 2 million tons (71.4%) of the collected waste was transported to landfills, 0.7 million tons (25%) was transferred to third-party organizations/waste recycling plants (figure 3).



**Fig. 3.** Municipal waste distribution volumes by directions of their transportation in 2018  
 Note - Compiled by the authors

In 2018, 3.4 million tons of municipal waste was received for sorting, recycling and depositing, which is 6.4% higher than in 2015. At the end of 2018, 2.4 million tons of municipal waste was received for the purpose of their further deposition (storage, waste disposal at landfills), which is 70.5% of the waste volume and 17.6% lower than in 2015.

It was utilized 427.1 thousand tons or 12.5% of the incoming waste volume, i.e. they were used as secondary material or energy resources. The volume of disposed waste in 2018 exceeded the level of this indicator of 2015 by 11.4% (Figure 4).



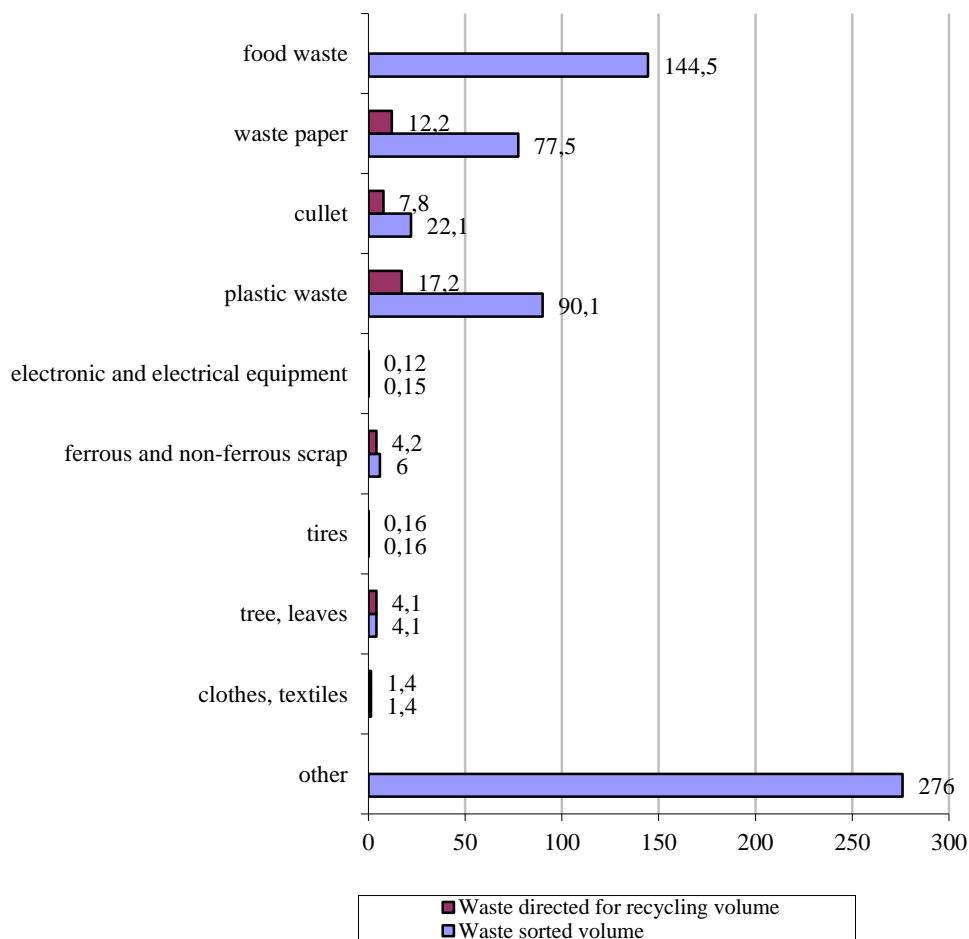
**Fig. 4.** Received waste distribution volume for sorting, recycling, utilizing and depositing, thousand tons  
 Note - Compiled by the authors

Figure 5 provides information about waste sorted and directed for recycling volumes by type in 2018.

622.2 thousand tons of waste (18.3%) was sorted in 2018, which is 58 times higher than the volume of sorted waste in 2015 and 3.6 times the same indicator in 2016. Only 164.2 thousand tons (4.8%) of the received waste was sent for further recycling in 2018, which in turn is 31 times higher than the volume of 2017. According to the results of 2018, the largest share in the sorted waste is held by food waste 21.8% (144.5 thousand tons), plastic waste 13.6% (90.1 thousand tons), waste paper - 11.7% (77.5 thousand tons). The volume of sorted

broken glass reached 22.1 thousand tons in 2018, which is 3.3% of the total amount of sorted waste.

Of the volume of sorted waste for further recycling in 2018, the following was sent: 7.8 thousand tons of broken glass (4.7% of the total volume of waste directed to recycling), 12.2 thousand tons of waste paper (7.4%), 17.2 tons of plastic waste (10.4%), 4.2 tons of non-ferrous and ferrous metal scrap (2.5%).



**Fig. 5.** Sorted and directed for recycling waste volumes by type in 2018, thousand tons  
 Note - Compiled by the authors

## 5 Conclusion

The waste recycling market in Kazakhstan is notable for its low competitive ability. The largest number of companies work in the segments of waste collection, as well as recycling of some types of waste (for example, waste paper or plastic, etc.).

Entering the market for the recycling of household waste requires significant investments both for the opening of a waste sorting complex and for the construction of a waste recycling plant.

To solve the problems of municipal solid waste collection, utilization and recycling it is necessary to solve the following issues: 1) need control over the application of laws in the waste management field; 2) necessary to change people's ecological behavior; 3) important is the availability of secondary resources market.

One of the important directions in the integrated system formation of solid waste management is the need to develop an economic and organizational mechanism to improve the efficiency and quality of selective waste collection services in cities, focused on the separate collection of various types of waste, the allocation of hazardous waste from the general stream of secondary raw materials.

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