

Contemporary problems of municipal solid waste management in the Republic of Kazakhstan

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Abstract

Different countries have their own characters in waste management, including municipal solid waste generated in settlements and cities. This article analyzes the current situation in the Republic of Kazakhstan. At the same time, modern problems of municipal solid waste management in the Republic of Kazakhstan can be divided into three parts: 1) institutional and legal problems, 2) problems related with the recycling, 3) problems of solid waste disposal. Research methods: historical-geographical, comparative-geographical, statistical analysis

Key words: Municipal solid waste, landfills, Republic of Kazakhstan, solid waste management

Introduction

Municipal solid waste, significant amounts of which are generated in large settlements is a serious problem for Kazakhstan. Thus, according to official data, about 100 million tons of municipal solid waste has been accumulated in Kazakhstan, and it increases by 3-6 million tons annually [1]. According to individual experts, more than 43 billion tons of solid industrial and municipal wastes have accumulated in Kazakhstan. Of these, 600 million tons are toxic. At the same time, only 3-5% is processed. The rest part is transported and stored in open air landfills without sorting into components. There are 4 525 landfills in Kazakhstan. Constantly increasing volumes of stored waste are creating new technogenic landscapes. The growing waste heaps and terricones become more intense sources of dust formation. Thus, the accumulation of industrial and consumer waste becomes one of the major environmental problems in Kazakhstan. The paper will show the main aspects of municipal waste problem in the regional context.

Inefficient management, a lack of economic incentives for the development of historical and newly formed wastes, as well as an inadequate regulatory base and a special law regulating the terms in the field of waste management are the main causes of waste accumulation. Despite the adoption of the Ecological Code of the Republic of Kazakhstan (EC RK) on January 9, 2007, which regulates, among other things, issues related to environmental requirements when managing industrial and consumer wastes, and subsequent introduction of appropriate amendments and additions to it, many problems related to management of municipal waste remain unsolved. Some norms of this Code are declarative, since there is no effective mechanism for their implementation, and some are not feasible at all. In particular, both monitoring the compliance with environmental requirements when managing municipal waste, and the organization of an effective and environmentally friendly system for collecting municipal waste, are assigned to the same entity - local executive authorities (part 1 and part 2 of article 292 of the EC RK). In accordance with Part 5 of Article 139 of the EC RK, local executive authorities are supposed to take measures that comply with environmental requirements when managing municipal waste. However, in fact, none of the provisions can be implemented because of the lack of real resources and powers. Generally, administrative penalties (fines) are applied in the form of claims for damages for unauthorized disposal of waste - which are ineffective and cannot solve the accumulated problems as a whole.

In fact, no effective measures are taken and activities on efficient management in the MSW processing and recycling are practically not carried out, explanatory and propagation work is poorly done. Kazakhstan does not have a national strategy for the waste recycling, therefore, measures implemented locally are often point-like, fragmented and do not solve the problem of safe disposal of waste. Along with this, there are still no comprehensive studies of the institutional foundations of environmental policy in the field of recycling management. It should be emphasized that the issues of municipal solid waste management are mainly considered from economic and environmental positions [3-5]. Most environmentalists are exploring the potential of using technological methods for recycling industrial and consumer waste [6-7], and only a few, mostly foreign scientists, are exploring the institutional issues of public policy in municipal solid waste management and the possibility of investing in projects that ensure economic efficiency and preservation of the environment [8 -10]. Meanwhile, some researches were

carried out in Kazakhstan. In 2008-2009, the Republican Scientific Research Center for the Protection of Atmospheric Air, commissioned by the Ministry of Environmental Protection, carried out a research on "Development of long-term regional management systems for municipal solid wastes of Kazakhstan". As a result, it was concluded that the increasing volume of economic and other activities led to the intensive accumulation of industrial and consumer waste, which made the problem of municipal solid waste management in the domestic and world practice one of the priority tasks in creating healthy environment [11]. The doctoral thesis of Sh.Sh. Bekbasarov, in which along with the development of resource-saving technologies, a functional model of solid waste management and a waste flow management system based on a separate collection of preliminary sorted wastes were proposed. In addition, regulatory documents for the management and effective use of technogenic resources were developed [12].

In B.E. Nurseitov's research work, along with the development of mechanisms for improving the municipal solid waste recycling, the ways of involving the resulting products into economic turnover in order to reduce the negative impact on the environment were considered. In addition, he studied the world experience of their recycling, defined economic criteria for waste disposal and suggested recommendations for the use of waste in the creation of the recoverable resources market [4]. We can also note the thesis of an economist A.B. Sironov, who along with the technological, economic, environmental estimation of disposal methods, studied the international experience in managing municipal solid waste flows and analyzed the possibilities of its adaptation in Almaty [13].

In January 2014, the Government of the Republic of Kazakhstan approved a program for the modernization of solid waste management [1]. Within the framework of this program, it is planned to build a vertically integrated system. Basically, this problem is expected to be solved through administrative measures. First and foremost is the centralization of power and system management. At the first stage, this is a necessary condition. But right now, it is necessary to think over the economic mechanisms of MSW management. The lack of adequate infrastructure for collection and transportation of waste is one of the reasons for the formation of spontaneous dumps in settlements and the annual costs from the local budget for their elimination. In this connection, despite the significant amount of useful components in the waste, the extraction of which will reduce the environmental burden, more than 97% of MSW in Kazakhstan without separation into components is transported and accumulated in open air landfills.

Materials and methods. The state program documents in this field were used for writing the paper. The analysis of the latest statistical data on the republic is also made. To achieve the set goals, various research methods: historical-geographical, comparative-geographical, statistical analysis, cartographic extrapolation, expert evaluation were used in the work.

Results and discussion

The main state regulator in the field of MSW management is the Ministry of Energy of the Republic of Kazakhstan, which was established in August 2014 after the reorganization of the Ministry of Environmental Protection. The department for waste management is in its organizational structure. The Ministry monitors the national policy in the field of municipal and industrial waste management.

In accordance with the Conception on the transition of the Republic of Kazakhstan to a "green" economy approved by the Decree of May 30, 2013, Kazakhstan's policy in the field of waste management is aimed at developing the sector of waste recycling to obtain products from recyclable materials.

In order to implement the adopted policy, the activity on the attraction of investments and new technologies in the field of waste management is under way. Thus, the Ministry of Energy signed memorandums with the Ministry of Environmental Protection of the Republic of Korea, the Technical Institute of the Republic of Korea (KEITI), a memorandum on waste management with Edmond de Rothschild Bank, which envisages the investment of projects for the construction of waste treatment facilities.

Since January 2016, Kazakhstan has introduced the principle of expanded obligations of producers (importers) (hereinafter - RRP) for vehicles and their components. It is planned to introduce step-by-step RRP into other types of products (goods). At present, the LLP "Operator RRP" together with specialized enterprises has worked out the issues of compensation of expenses for collection, transportation, treatment and utilization of automobile tires. Negotiations with enterprises on the disposal of used batteries and motor oils are ongoing. In the second half of 2017, LLP "Operator RRP" plans to build and put a car processing plant into operation.

In order to regulate and systemize the work of the recyclable material market, the Environmental Code has been amended. In particular, the concept of "separate collection of municipal waste", "recyclable materials" is introduced, and the requirements for recyclable materials, separate collection and disposal of certain types of hazardous waste, transfer of waste products to recyclable materials are established, the disposal of certain types of

municipal solid waste (Further - MSW) is banned, mandatory national standards that establish qualification requirements for the entities that perform operations for the collection, transportation, utilization, treatment and disposal of waste are introduced, and the requirements for separate collection and disposal of certain types of hazardous waste (electronic and electrical equipment, mercury-containing waste, batteries, accumulators) are also established. Also, the Ecological Code of the Republic of Kazakhstan and the Law of the Republic of Kazakhstan "On Local Government Administration and Self-Government in the Republic of Kazakhstan" entrust the local executive authorities with the responsibility of organizing separate collection at the source, utilization and municipal solid waste recycling.

According to the data of World Bank, in Western Europe over the past 15-20 years, there have not been constructed facilities for mixed wastes recycling because of poor quality of the resulting products and small profits that do not cover the costs.

In this regard, for the development of the sector of solid waste recycling with obtaining products from recyclable materials and energy production, it is necessary to introduce separate waste collection and establish market infrastructure. This will increase the amount of recyclable materials, return more than 48 billion tenges to the economic turnover, as well as give an additional impetus to the development of small and medium-sized businesses. Because of the insufficient development of the infrastructure, the sorted recyclable material is mainly sold outside Kazakhstan, in particular to Russia, Uzbekistan, China, only about 2% is recycled in Kazakhstan, and the rest is sent to landfills. The construction of waste recycling plants is unprofitable without sufficient amount of recyclable materials.

Thus, the projects on construction of waste-recycling treatment facilities in Almaty, Ust-Kamenogorsk, Semey, Taraz, Karaganda despite the agreements concluded between the akimats(local executive authorities) and potential investors were stopped by investors because of the economic unattractiveness of projects due to insufficient amounts of waste, low tariffs, insufficient level of incentive measures.

In this connection, the Ministry of Energy sent the proposals to the Ministry of Investments and Development on including collection, sorting, recycling and disposal of waste in the list of priority activities for the implementation of investment projects, and to the Ministry of Finance for the draft tax legislation the proposals on incentive measures for individual enterprises and legal entities, whose main activity is the collection, transportation, sorting, recycling and disposal of waste in terms of reducing the tax burden, in particular, the exemption of legal entities and individual entrepreneurs from corporate income tax, from value added tax, from land tax and property tax; the application of lowering coefficients to the profit from the sale of products produced with the use of recyclable materials; granting tax holidays, etc.

In the period of June 14-15, 2016 in Karaganda city, in order to share experience in the field of introduction of separate collection, sorting and recycling solid waste, a seminar-meeting on the municipal solid waste management in the Republic of Kazakhstan was held. Within the framework of the seminar, the experts presented and discussed Kazakhstani and international experience of MSW management, credit facilities of financial institutions and terms of project financing, implementation of RRP for cars and their components, as well as the prospects for introducing RRP for electronic and electrical equipment, packaging, etc., in Karaganda they visited the facilities for sorting, recycling and disposal of waste using efficient low-cost technologies.

More than 140 representatives of enterprises specializing in waste management, business associations, public associations, local executive authorities, international organizations, and international financial institutions took part in the seminar.

The participants of the seminar shared experience of business development in the solid waste management, they discussed the possibilities of implementing joint projects and attracting investments. The seminar allowed forming a platform for the sharing experience, establishing cooperation between enterprises specializing in the transportation, sorting and recycling of municipal solid waste. Similar regional seminar-meetings were held on July 14 and 15, 2016 in the cities of Petropavlovsk and Kokshetau.

A number of meetings were held with the representatives of the Ministries of Education and Science, Information and Communications to organize explanatory work among the population, to introduce amendments and additions to the state compulsory education standards in terms of incorporating subjects in the curricula and disciplines on waste management and environmental management in order to form in society environmental awareness and culture among the population, as well as at all levels of education and formation of personality.

For the step-by-step formation of the recycle materials market through the introduction of separate collection, utilization and recycling of municipal solid waste, the Ministry together with the local executive authorities coordinated and approved Road maps programs envisaging the following activities till 2020:

- step-by-step introduction of separate waste collection, which will allow obtaining better quality of recyclable materials;
- installation of sorting lines with press compactors in major cities and district centers, which will allow developing the recyclable material market and reduce the amount of waste located at the landfill, extend the service life of the landfills;
- construction of facilities for recycling and disposal of waste and obtain products, material and energy resources (biogas, electricity, compost);
- establishment of cooperation between the enterprises engaged in sorting and recycling of waste, development of internal and interregional cooperation of the participants in the recycle materials market with the processors;
- organization and conduct of public agitation (meetings, brochures, leaflets, video clips, lectures in educational institutions, actions, etc.) to increase the environmental awareness of the population and involve them in the separate collection of municipal solid waste.

According to the Road maps programs, separate collection (2 fractions - "wet" and "dry" for cities, "hazardous" and "non-hazardous" for rural settlements), sorting, recycling and disposal of waste through the installation of containers, construction of waste sorting lines and waste treatment enterprises is gradually introduced in the regions.

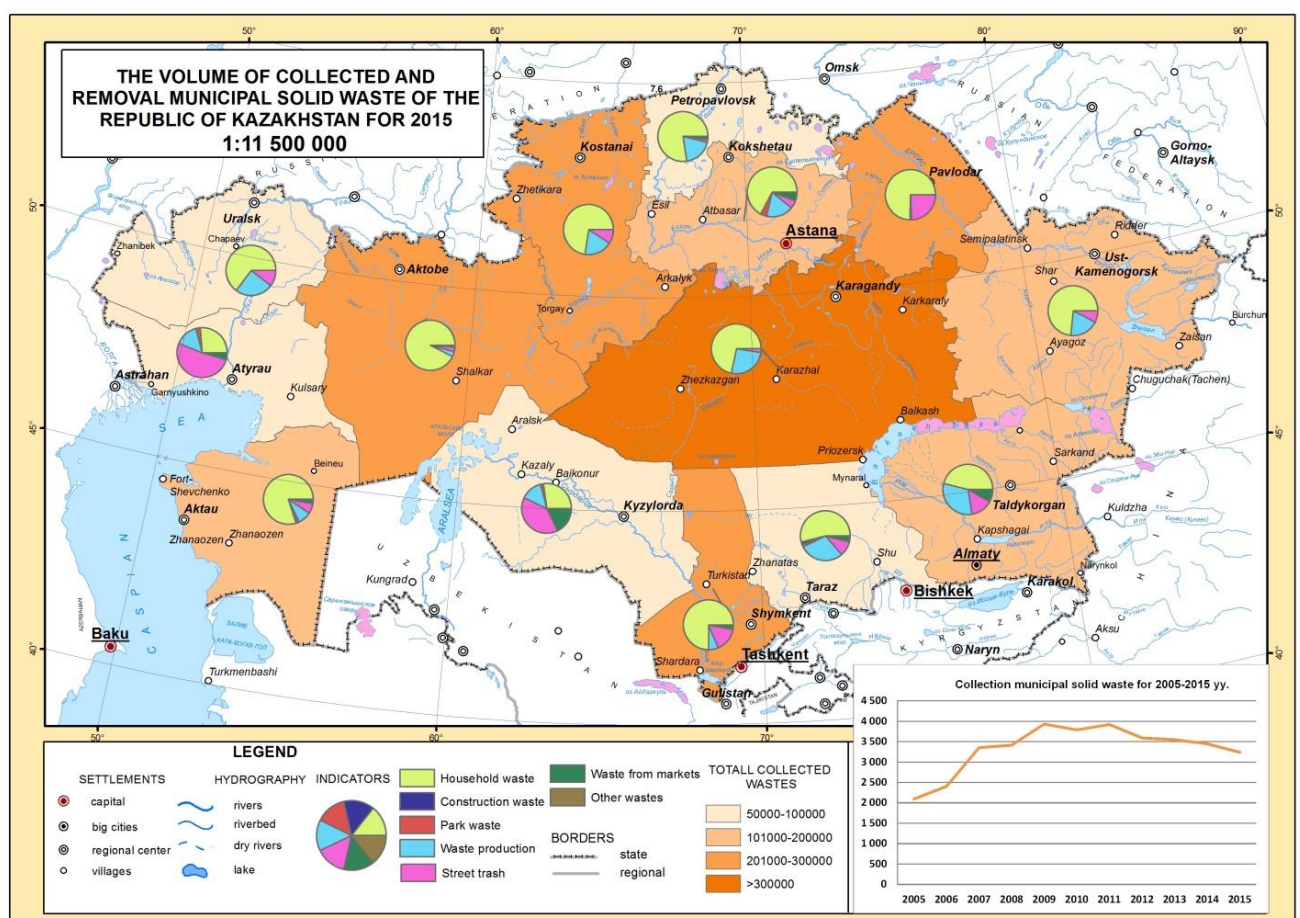


Fig. 1 - Collection and composition of municipal solid waste in the regions of the Republic of Kazakhstan for 2015.

We analyzed the statistical data for 2015, 2016 years. The following factors affect the overall accumulation of municipal solid waste: the degree of comforts of buildings, i.e. availability of garbage chutes, heating systems, thermal energy for cooking, water supply and sewage system. A map of MSW generation and collection in the Republic of Kazakhstan for 2015 was made on the analysis of the basic data. The analysis shows that more than 350 thousand tons of waste was generated in Central Kazakhstan (Karaganda region) (Figure 2). At the same time, it should be noted that in 2016 in Karaganda, Almaty and Pavlodar regions the amount of municipal solid waste increased more than 2 times (Figure 3).

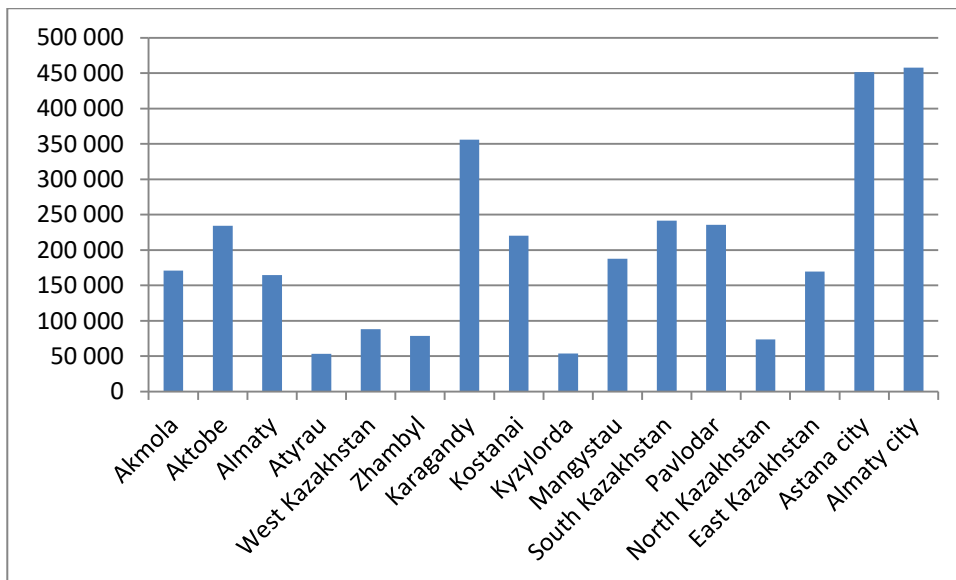


Fig. 2 Diagram of the amount of collected municipal solid waste in the context of regions for 2015

In 2015, 3.2 million tons of waste was collected and transported, of which the main share of 71.7% was municipal waste, and 28.3% - separately collected waste. At the same time, 14.4% was industrial waste (equated to municipal), 10.6% - garbage collected from the streets, 1.9% - market waste, 1.3% - park waste and 0.1% - waste from construction sites.

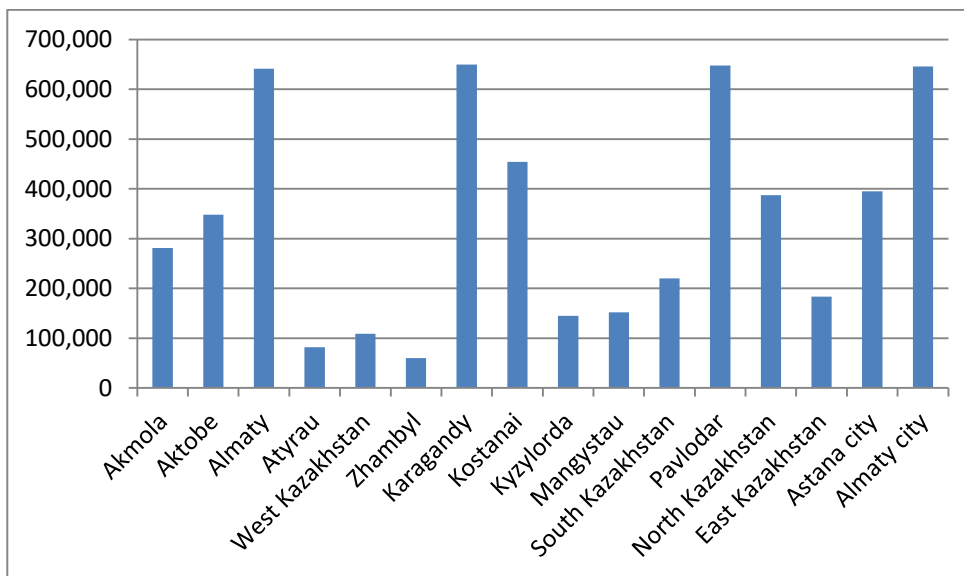


Fig. 2 Diagram of the amount of collected municipal solid waste in the context of the regions for 2016

In 2016, according to statistical data, out of the total amount of collected and transported waste, the main share of 70.7% was municipal solid waste, 29.3% was separately collected waste. Of the volume of separately collected waste, 13.0% was industrial waste (equated to municipal waste), 11.9% - garbage collected from the streets, 2.3% - market waste, 1.5% - park waste, 0.3% was waste from construction sites and 0.3% other wastes. Comparative analysis of indicators shows a sharp increase in the volume of waste generation in almost all regions in 2016.

Problems of recycling and disposal of solid waste

In administrative terms, Kazakhstan is divided into 14 regions and two cities of republican subordination (Astana and Almaty). Geographically, the territory of Kazakhstan, depending on its specialization, is divided into 5 economic districts: North, East, South, Central and West. The analysis of the current situation in consumer waste recycling was considered in the framework of these economic districts.

The North district includes 4 regions: North Kazakhstan, Pavlodar, Kostanay and Akmola. A two-container system of separate collection for packaging wastes and residual biodegradable garbage was introduced in the cities of Kokshetau and Burabai of **Akmola region**. In the region, there are 4 companies specializing in separate collection, sorting of municipal solid waste, which are sorted into five fractions: soft plastic, hard plastic, waste paper, packaging polyethylene waste, cullet, various types of plastic, tin cans.

The design and estimate documentations for the construction of a new landfill with a waste sorting center in the city of Kokshetau have been developed. The projected cost of construction is 2.2 billion tenges (about \$ 7 million).

In Kostanay region in the cities of Kostanay and Rudny, separate collection of waste polyethylene, PET bottles and plastic containers is realized. In the city of Kostanay, 219 mesh containers are installed, in the city of Rudny, 126 mesh containers are installed. It is planned to install special containers in the cities of Arkalyk and Jitikara.

In the region, there are 14 enterprises that collect, sort and recycle waste with output from recycled materials. Thus, in Kostanay, LLP "Tazalyk-2012" recycles plastic waste (70 tons / year) and produces well hatches, pavers and geogrids. LLP "EcoLinesport" collects and recycles worn tires and produces rubber crumbs. The branch of LLP "KagazyRecycling" collects waste paper (about 250 tons / year) and transports it for recycling in Almaty. In the city of Kostanay, LLP "Atameken 4+" installed 70 containers for collecting waste glass and glass containers; a step-by-step increase in the number of containers is planned. Since August this year, the volume of collected waste glass was 20 tons. LLP "Factory of non-woven materials" S.M.F.SYSTEM" collects waste plastic (300 tons / year).

In the cities of Arkalyk and Jitikara, the purchase and installation of containers for separate collection of paper, waste paper, and glass is under way. In all cities of the region, the collection of mercury-containing lamps was introduced.

At present, there are no established and operating waste sorting lines on the territory of the region. In this regard, the akimat of the region is working on the design and estimate documentation for the construction of a sorting line (manual sorting) in the city of Kostanay, as well as on the possibility of financing the project by the World Bank within the framework of the concluded partnership agreement with the Government of the Republic of Kazakhstan.

In Pavlodar region, separate collection of MSW at the source was not realized. In the region there are 8 enterprises that collect, sort and recycle waste with output from recyclable materials. JSC "Pavlodar Cardboard and Ruberoid Plant", LLP "Gofrotara Plant" recycle waste paper and produce rolled, roofing materials and cardboard and paper products. LLP "Inter Rubber Recycling" produces rubber crumb by recycling tires and rubber waste. LLP Firm "Rezon" realizes demercurization of mercury-containing lamps.

A meeting with the representatives of the Italian company ATENA Environment Management was held, at which the intention to build a plant for recycling municipal solid waste in the city of Pavlodar was confirmed.

In North-Kazakhstan region in the city of Petropavlovsk, 472 containers for the collection of PET packing materials, aluminum cans, waste paper, packaging polyethylene waste, cullet, and various types of plastic are installed. In the region, 14 enterprises are engaged in separate collection; the production of polyethylene packing films and bags, mud protection coatings, consumer goods made out of low and high pressure polyethylene wastes, and PET packing materials is established. Waste collection points were built. The issues of construction of a waste treatment plant with potential investors are being studied.

West economic district includes 4 regions: West Kazakhstan, Atyrau, Mangistau and Aktobe. In Aktobe region, 310 mesh containers were installed in Aktobe city for separate collection of municipal solid waste, 14 enterprises are engaged in the collection and recycling of waste fractions of municipal solid waste. The collection of used fluorescent lamps and mercury-containing instruments, worn tires, waste paper, PET packing materials and plastic, waste oils, batteries, glass, scrap metal is being realized. The sorted recyclable materials are sent for utilization and processing to enterprises of other regions and for export.

In 2015, a memorandum between the Akimat of the region and the financial holding company "RenTeh B.V." (Netherlands) on the construction of a waste recycling plant in the city of Aktobe was signed. The estimated designed capacity of the plant is about 200 thousand tons of solid waste per year with the production of construction materials. The depth of processing is 80%. The project financing consists of 30% of private capital, 70% of borrowed funds: European Investment Bank (Luxembourg), approximately 63 million euros.

In addition, the issue of further transfer of the existing Aktobe municipal solid waste landfill to the investor for the long-term management and reclamation is being considered.

Waste management issues are also solved at the region level. Thus, in the city of Emba, Aktobe region, LLP "Bolot" developed the project for the installation of a waste sorting line with a press-packing of waste products, a glass container crushing workshop, eco-wadding paper production, and a shop for yard brooms production.

In Atyrau region, separate collection of municipal solid waste at the source was implemented. LLP "Vest-Dala", LLP "Spetsavtobaza" accept and sort municipal solid waste (recycled materials: plastic, glass, waste paper, polyethylene, tires, scrap metal, batteries).

70 million tenges out of the local budget was allocated on the development of design and estimate documentation for the construction of a waste sorting complex in Atyrau city. The construction of the complex will be financed by the World Bank in 2018-2020.

In West Kazakhstan region in the city of Uralsk, 150 special containers for collecting plastic bottles are established; the process of gathering from the population, demercurization and neutralization of mercury and luminescent lamps is realized. In the region there are 12 companies specializing in the collection and processing of waste paper, polymer packaging, tires, used oils, office equipment, mercury-containing lamps. The processing of fuel, oil and air filters, computer and office equipment, scrap metal, waste paper are realized. In Uralsk, LLP "Ecoplus" sorts the municipal solid waste.

In 2015, LLP "GreenAksay" scheduled to put into operation the constructed waste sorting line in Aksai city. However, because of financial difficulties, the activity was suspended.

In 2015, the development of a feasibility study for the construction of a new MSW landfill consisting of waste sorting and recycling complexes began. Also, the akimat of the city of Uralsk is negotiating with the representatives of the Finnish company "Doranova" for the realization of the investment project on the production of biogas out of the municipal solid waste landfill in Uralsk.

In Mangistau region, there is demercurization of mercury and fluorescent lamps and their collection from the population. In the city of Aktau, 27 containers for collecting mercury and fluorescent lamps are installed.

Projects are under consideration and negotiations are being conducted with potential investors on the introduction of separate collection of waste at the source: PET packing materials, polyethylene waste, cullet, household chemicals, aluminum cans.

In 2014, a plant for recycling, utilization and disposal of municipal solid waste with capacity of 50,000 tons per year was put into operation in the city of Zhanaozen. The design and estimate documentation (TEO, PSD) for the construction of a waste recycling complex in the city of Aktau and waste disposal points in 6 large settlements of the region (Kuryk village and Zhetybai village of Karakiyasky district, Akshukur village and Fort-Shevchenko city of Tupkaragan district, Shetpe village of Mangistau district, Beineu village of Beineu district) for the amount of 40.0 million tenges out of the local budget for 2017-2018 is scheduled.

Karaganda region is in Central Kazakhstan. LLP "GorKomTrans" installed 480 containers in the city of Karaganda, LLP "TTK" installed 250 containers in the city of Karaganda and 350 containers for collection of waste plastic, glass, waste paper, aluminum cans, packaging materials in the city of Temirtau.

In the region there are 5 enterprises that collect, sort and recycle waste with output from recyclable materials. In the city of Karaganda, LLP "Gorkomtrans" constructed a waste sorting station with capacity of 100 thousand tons per year.

In the city of Temirtau, at the expense of LLP "TKK"'s own funds, a waste sorting line with the capacity of 20,000 tons per year was built with a hatch manufacturing workshop. LLP "Temirtautsvetmet" smelts tinned aluminum cans and produces high-quality non-ferrous alloys; the capacity is 2.4 thousand tons per year.

East Kazakhstan is part of Eastern Kazakhstan region. In the East Kazakhstan region, separate collection of municipal solid waste at the source is not realized. The Akimat of the region plans to introduce separate waste collection in the cities of Semey, Ust-Kamenogorsk, Ayagoz, Zyryanovsk, Shemonaiha. In the region there are 10 enterprises specializing in the sorting and processing mercury-containing lamps, polymer waste, batteries, tires, waste paper, and cullet. In the city of Semey, IE "Khazipov" sorts municipal solid waste at the landfill.

The issues of installation of waste sorting lines in the cities of Ust-Kamenogorsk and Semey are being studied. A land plot of 30 ha for the construction of a landfill and waste treatment plant in the city of Ust-Kamenogorsk was allocated. Currently, investors for the realization of joint projects within the framework of public-private partnership are being sought.

The South economic district includes 4 regions: Kyzylorda, South Kazakhstan, Zhambyl and Almaty. In Almaty region, in the city of Taldykorgan, 73 sites for separate collection of waste paper, plastic, glass and other wastes are installed. In the region, 7 enterprises specializing in glass recycling (JSC "SAF"), waste paper (LLP "Kagazy Recycling"), accumulator batteries (LLP "Kaynar AKB"), tires (LLP "Util Ecoservice"), polymeric waste

(LLP "KazPetPolymer") and they produce glass products, cardboard and paper, accumulators, rubber chips, PET granules.

The joint Kazakh-Turkish company LLP "EcoserviceArman" for recycling solid and liquid wastes was built. The designed capacity of the enterprise is 50 thousand tons of waste per day (rubber, plastic, used oils, tires). Commissioning is carried out at the enterprise.

A project of LLP "ADAL DAMU CAPITAL" for the recycling of municipal solid waste is at the development stage. The designed capacity of the enterprise is 60 thousand tons per year. The project consists of 3 stages: at the 1st stage in 2016, a waste sorting complex for sorting municipal solid waste and a shop for the production of recyclable materials is planned to be put into operation; Stage 2 – the construction of a biogas complex for the processing of organic fractions of municipal solid waste. Production capacity is up to 18 thousand tons of gas per year; at the 3rd stage - the construction of vermifactory for the production of bio humus out of organic waste. The term of project implementation is 2016-2018.

The Akimat of the region has made a list of potential investors who are interested in constructing waste recycling plants and sorting lines ("Taza Zher MPK", "Krintel", "Riza-2006", "Zeymur", "DynexenergyCorp", "Actual Service", "Balis", "Astertas", "EcologyFood", "Loco Engineering").

In Ili region, the investor of LLP "Taza ZherMPK" was allocated 2 hectares of land for the construction of a waste recycling plant, in Talgar region, the investor of LLP "ZeyMur" was allocated 27.0 hectares of land for the project "Construction of a plant for sorting and recycling of municipal solid waste", a memorandum was signed on further cooperation with LLP "ZeyMur".

It is planned to construct 4 industrial complexes for sorting, recycling and eliminating municipal solid waste in Zhambyl, Enbekshikazakh, Esil regions. 20 million tenges out of the local budget was allocated for the design and estimate documentation of the construction of complexes.

In Zhambyl region, separate collection of municipal solid waste at the source was not realized. The Akimat of the region considers proposals of enterprises for installing containers for separate collection of separate fractions of municipal solid waste, waste sorting lines. LLP "Eco Control" plans to install mesh containers for the collection of plastic packing materials on all 307 garbage sites of the city of Taraz in the current year.

In the region, there are 5 companies specializing in the recycling of plastic waste with the production of siding, waste paper with the production of toilet paper, waste tires with the production of rubber chips. The waste oils are treated by pyrolysis. Waste of Electronic and electrical equipment is being collected.

In the South Kazakhstan region, separate collection of municipal solid waste at the source of their formation was not realized. The Akimat of the region studies the issues of installing special containers for the collection of separate fractions of municipal solid waste.

LLP "Ecoshina" realized the collection and recycling of tires and waste rubber with the production of rubber rail shims. LLP "Union Plast" realizes the recycling of waste polymeric materials with the production of recycled granules and agglomerates.

In June of 2015, in the city of Shymkent, the plant for recycling of municipal solid waste of LLP "Technology 21» was put into operation. However, for financial reasons, the plant suspended its activities. The Akimat of the region is discussing with LLP "Technology 21" the issue of resuming the plant's operation.

In order to develop the waste sorting and recycling in the regions of the district, the akimat of the South Kazakhstan region is negotiating with domestic and foreign investors (China, South Korea, Poland) to implement a project that sorts and burns the non-removable fraction of municipal solid waste with the production of electricity.

In Kyzylorda region, separate collection of municipal solid waste at the source was not realized. In the region there are 4 enterprises that collect, sort and recycle waste with output. LLP "Ibraihan and K-LTD" produce paving slabs, tile out of polymer waste. LLP "Smart Rubber" produces hoses for drip irrigation by recycling worn-out tires. LLP "TemirZhas-Group" produces rubber crumb by recycling worn-out tires. LLP "ECO-N Service" implements demercurization of mercury-containing lamps.

The sorting of municipal solid waste is realized only in the city of Kyzylorda. Polymeric waste, plastic, polyethylene, glass containers, waste paper, PET bottles, wooden waste are extracted.

In 2014, the European Bank for Reconstruction and Development signed a memorandum on the joint implementation of the project "Utilization of Solid Waste in Kyzylorda". The project envisages the establishment of mechanical sorting system and biological municipal solid waste treatment, the construction of a new landfill, and the reclamation of the old landfill in Kyzylorda.

In the city of Astana, LLP "Astana-Tazartu" launched a project to implement a separate collection. At the first stage of the project, 686 special containers for collecting plastic, as well as cardboard and paper, glass and other types of waste are planned to be put up, of which 227 containers have been installed. In the city of Astana, the

collection and recycling of worn-out car tires with the production of rubber crumbs (LLP “Kazakhstan rubber recycling”), the collection and demercurization of mercury-containing lamps (LLP “ADAL SERVICE”, LLP “NTP KazEkotech Astana”, IE “Mercury Security”), and also collection and preliminary treatment of recyclable materials: waste paper, PET packaging, aluminum can, packaging polyethylene waste, cullet, various types of plastic (LLP “LS Astana”).

In 2012, the waste recycling complex (hereinafter referred to as the "WRC") was launched using the Spanish waste sorting technology "Imabe Iberika". The depth of waste sorting waste is 7%. There are 2 shops for recycling plastic and waste paper on the WRC. According to the management company LLP “KazRecycleService”, the workshops are scheduled to be resumed till June 30, 2017.

In the city of Almaty, since 2017, JSC "Tartyp" along with PKKS (KSK) is planned a step-by-step realization of selective collection of municipal solid waste with the involvement of small and medium-sized businesses. A memorandum on cooperation and interaction between the Department of Entrepreneurship and Industrial Innovative Development of Almaty and JSC "Tartyp" was signed. LLP "Asia-Util" collects plastic waste in the pilot mode. SCE “AlmatyEkologostroy” opened 10 points for reception of mercury-containing energy-saving lamps and thermometers. 20 more points of reception are planned to open till the end of this year. In the city of Almaty, there are 13 enterprises that collect and recycle waste paper, plastics and polyethylene, ferrous and non-ferrous scrap metal, electronic and electrical equipment, mercury containing devices and products. In addition, JSC "Tartyp" realizes, through investment and own funds (over 6.6 billion tenge), a project for the construction of a waste sorting complex with the treatment of recyclable materials. LLP "Tospa su" is working with the company "Kaukointernational" on the construction of a waste treatment plant at the sludge sites of sewage treatment plants in Almaty with the production of biogas and its processing into heat and electricity. The feasibility study of the project was developed. Negotiations are ongoing with the foreign companies Korea Districh Heating Engineering Co.LTD on the construction of a waste incineration plant (including medical ones) that are not subject to processing at the landfill in the Mezhdurechensk rural district of Ili region. The business plan of the project for the production of energy out of municipal solid waste was developed.

All information on the state of MSW disposal is provided by local executive authorities to the Ministry of Energy [15].

Thus, the analysis of information provided by local executive authorities showed that separate collection of waste at the source was not realized in Atyrau, East Kazakhstan, Zhambyl, Kyzylorda, Mangistau, Pavlodar and South Kazakhstan regions. In the other regions, the measures to introduce separate collection are being taken. The sorting lines are installed only in Karaganda (Karaganda city, Temirtau city), Mangistau (Zhanaozen city), East Kazakhstan (Semey city), West Kazakhstan (Uralsk city) regions, and the city of Astana. The waste treatment plants in the cities of Astana and Zhanaozen realize only sorting of municipal solid waste. The output out of recyclable materials is not cost-effective because of the high cost of production. The waste processing plant in the city of Shymkent temporarily does not operate. The funds on the development of design documents for the construction of complexes for sorting, treatment of municipal solid waste in Almaty, Mangistau, Atyrau, West Kazakhstan, Kostanay regions are envisaged in the local budget. The World Bank, the European Bank for Reconstruction and Development are working to prepare investment projects for the municipal solid waste management in the cities of Atyrau, Kokshetau, Kostanay, Almaty and Kyzylorda.

According to the official data, in 2016, 162 enterprises operated in the republic, mainly small and medium-sized businesses, annually treating over 300 thousand tons of recyclable materials, producing more than 20 types of products: plastic, metal, wood, glass, paper, rubber chips and rubber products, biogas, fertilizers and pyrolysis fuels. Due to the activities of these enterprises, more than 6% of the amount of municipal solid waste generated in the country are recycled. There is a positive trend compared with 2015.

Conclusions

In the current system of MSW management in Kazakhstan, the development of target indicators and indicators (for regions, enterprises) is at the initial stage. To control the processes of MSW pollution and to solve this problem, it is necessary to use not only conventional methods and techniques (such as planning, subsidizing, designing, etc.), but also innovative ones such as payments for ecosystem services (PES), geoinformation systems (GIS), etc. At present, there is no separate collection of municipal solid waste at the source of waste generation at the system level in Kazakhstan. On the territory of Kazakhstan, almost all waste is transported to landfills to be buried, and except for the existing landfill in the city of Astana, most of the landfills do not fully meet the requirements of sanitary regulations and environmental standards of burial (reference).

Practically all landfills have exhausted their validity period; they require reclamation, collection of landfill gas, subject to economic expediency, and construction of new regional engineering landfills. The waste transshipment (sorting) stations (except for Astana city) are not functioning in the republic, where it was possible to conduct deep sorting of waste in order to extract recyclable materials, as well as a biodegradable fraction for utilization of the latter with the production of "green" energy and compost. Finally, the system of separate waste collection and (or) sorting remains practically undeveloped.

At the institutional level, the infrastructure of the MSW management sector has not been fully established, the territories are fragmented in solving this problem and there is no single policy in the field of waste management. To solve the existing problems in the sector, there is a need to introduce a regional approach along the whole technological network of waste management - from separate collection "at source" to disposal of an inert part of municipal solid waste at engineering landfills.

The analysis of the current legislative base in the field of waste management in the Republic of Kazakhstan allows us to draw the following conclusions: it is profitable for enterprises to pay for waste disposal, than to take measures for their utilization and use. The Ecological Code of the Republic of Kazakhstan envisages the economic stimulation of separate collection and waste recycling, but in practice it is not applied. The current methodology for the calculation of tariffs is designed only for the transportation of municipal solid waste and does not include its collection, disposal and burial.

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