



# EURASIA 2016 WASTE MANAGEMENT SYMPOSIUM

## Issues of solid waste management in Almaty City

Zaure K. Kaliaskarova<sup>1</sup>, Zhannat N. Aliyeva<sup>2</sup>, Assel S. Ikanova<sup>3</sup>

---

### Abstract

The article is devoted to the topical issues of the pollution problems of Almaty by municipal solid waste (MSW). The growing population of the city (1.5 million in 2015), the expansion of the city limits, the increase in the growth of consumption of the goods these and other reasons have led to an increase in MSW. The features of the formation and disposal of municipal solid waste in the urban economy and the possibility of improving the management of solid waste, taking into account the peculiarities of the city of Almaty. We consider the efforts of city authorities in solving the problems of flow management of municipal solid waste. One of the main problems today in our opinion is the increase of the share of recycling. As you know, MSW contains up to 30-40% of secondary resource that can be recycled. This issue can be solved by stimulating entrepreneurial activity in this area. It is necessary to fundamentally review the issues of solid waste management, starting with the legal framework ending by the economic incentives to encourage the separate collection of wastes in the households of the country.

**Keywords:** landfill, municipal solid waste, recycling, waste regulations.

---

### 1. INTRODUCTION

Almaty is the largest city of the Republic of Kazakhstan (RK), is located in the southeast of the republic in the northern foothills of Ili Alatau of the northern part of Tien Shan range.

The area of Almaty city is 451.5 square km. The city is divided into seven administrative areas: Alatau, Almaly, Auezov, Bostandyk, Zhetysu, Medeu, Turksib. The city has a large population and labor potential: for example according to the Statistics Committee of the Republic of Kazakhstan on 01.01.2015, the number of its population was 1 548354 people, or about 9% of the total population of the republic. The proportion of the economically active population is 65.8%, the employment rate is 94.3% [1]. The dynamic population growth in Almaty city, increase of consumption, increase of the number of legal entities lead to a constant tendency of growth of manufactured solid waste. The deterioration of the ecological situation of the city is the result of the low environmental awareness of the population, the poor system of collection and processing of waste, spontaneously arising illegal dumps, lack of modern solid waste processing

---

<sup>1</sup> Associate Professor at the Department of Geography, Land management and Cadastre of the Faculty of Geography and Environmental Sciences, Al-Farabi Kazakh National University, Almaty, Kazakhstan, E-mail: [Zaure.Kaliaskarova@kaznu.kz](mailto:Zaure.Kaliaskarova@kaznu.kz)

<sup>2</sup> Associate Professor at the Department of Recreational Geography and Tourism of the Faculty of Geography and Environmental Sciences, Al-Farabi Kazakh National University, Almaty, Kazakhstan. E-mail: [azhn99@mail.ru](mailto:azhn99@mail.ru)

<sup>3</sup> PhD student of the Department of Geography, Land management and Cadastre of the Faculty of Geography and Environmental Sciences, Al-Farabi Kazakh National University, Almaty, Kazakhstan, E-mail: [Asel.Ikanova@kaznu.kz](mailto:Asel.Ikanova@kaznu.kz)

infrastructure. A particular problem is the solid waste management because the amount of waste has increased significantly over the past few years. In this regard, to solve current and future problems the analysis of the solid waste management of the city is urgent.

## **2. MATERIALS AND METHODS**

This article mainly used theoretical methods of the analysis of official sources, as well as the records of the akimat (city administration) of Almaty. The analysis of statistical data on the subject is carried out.

## **3. RESULTS AND DISCUSSION**

The Akimat of Almaty city is developing the programs to solve the problems of solid waste. Thus, in the "Program of the development of Almaty for 2011 - 2015 " the task is set: "To create the system of waste management in Almaty that can meet modern requirements in waste disposal and to provide the proper sanitary conditions in urban areas"; one of the points of the Program is to bring the percentage of recycling of solid waste up from 5. 5% in 2011 to 7% in 2015 [2]. According to the Statistics Agency of Kazakhstan in 2013 in Almaty, the percentage of solid waste disposal amounted to 0% [3].

According to the Act of Almaty Akimat № 8/1514 on 20.12.2006 "On approving the estimated rate of accumulation of solid waste" in Almaty since January 1, 2007 the estimated rate of accumulation of municipal solid waste per a person living in a comfortable apartment house in size of 2.55 cubic meters per year and per a person living in the private sector in size of 2.9 cubic meters per year has been acting. The total amount of waste in the city is 1000 - 1300 tons per twenty-four hours. Since April 13, 2015 the changes in the estimated rate of formation and accumulation of municipal waste in the city of Almaty have been introduced, and according to this rate the calculation of the estimated rate of accumulation of municipal waste by housing developments, regardless of their conveniences have been presented in a united rate of 2.9 m<sup>3</sup> per year per a resident[4].

The evacuation of solid waste (MSW) from the city is carried out by 27 waste removing enterprises. The city territory is divided into 73 sections, 70% of the city is served by JSC "Tartip." The place of storage and disposal of municipal waste generated in Almaty city is a city landfill, located in Karasai area, which is full. Part of the waste (up to 400 - 500 tons per day) goes to the current mini-landfills in the suburban area (LLP "Asar-C" SCE "Tazar", s. Karasu, LLP "Enbek"), as a result of which the threat of the ecological and sanitary-epidemiological pollution of the environment has been created. Due to this, the city authorities decided to establish a new unified city landfill.

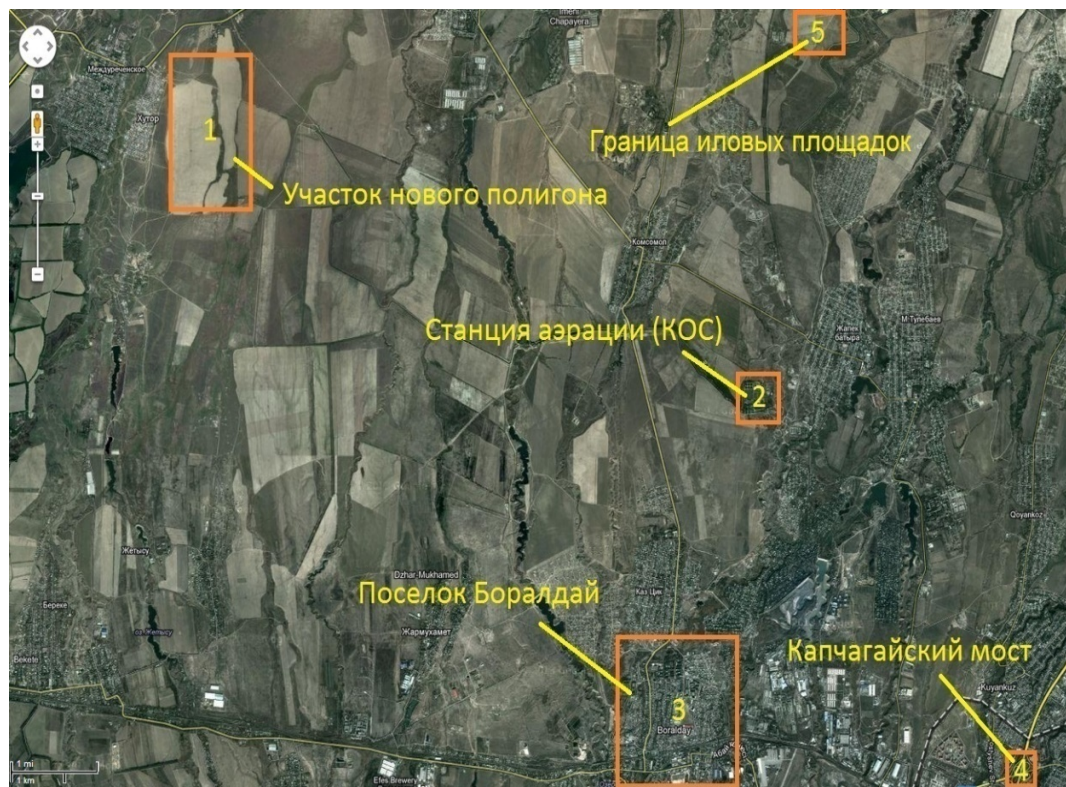
The Act of Akimat of Almaty region on June 19, 2009 № 112 "On granting the right of permanent land use to the state institution" Board of akim of Almaty city" allocated the land area of 245 hectares for the construction of the landfill for municipal waste of Almaty city in Mezhdurechensk rural area of Ili district of Almaty region which should meet to the international standards.

The memorandum on the preparation of project on management of solid waste in Almaty city is signed between the akimat of Almaty and the EBRD; EBRD is given a grant of 300 thousand euros, a competition for the adjustment of previously developed TER (technical and economic rationales) for the construction of a new landfill in Mezhdurechensk rural area of Ili district of Almaty region (245ga) was held (Figures 1, 2).

In 2012 the International consulting company «COWI Lietuva» carried out some work to make corrections in the existing TER (technical and economic rationales) and on the basis of the resulting adjustments an investment proposal to find investors for the construction of the landfill will be formed.

Since 2010 in Almaty city the Almaty Akimat has been introducing a new model of municipal waste management - the introduction of the separate collection of waste fractions of municipal waste for their further transferring to SMBs for processing. In 2010 one container site equipped with 5 recessed containers with the capacity of 3 cubic meters for the separate collection of metal, plastic, glass cullet, and other waste was set. In 2011, 80 container sites were set on the territory of Bostandyk administrative area; in 2012 600 containers on 120 container sites were established in Auezov (110 container sites) and Medeu administrative areas (10 container sites).

In Almaty city and the surrounding suburban areas there are 25 companies engaged in collection, disposal and recycling of waste taken from businesses and individuals, including 6 companies are engaged with waste paper, 1 company is engaged with waste batteries, 1 company with cullet, 1 with textile waste, 3 with plastics and polyethylene, 1 with second-hand tires, oils and oil sludge, 3 with medical waste, 3 with non-ferrous metals, 2 with mercury-containing products and devices, etc. [3].



- > 1 - The site of the planned new sanitary landfill location;
- > 2 - The territory of the Wastewater Treatment Plant (WWTP) in Almaty;
- > 3 - Boraldai village (the nearest town to the WWTP);
- > 4 - Rated border Almaty (motorway interchange between "North Ring" and the route Almaty-Kapchagai);
- > 5 – The border areas of sludge aeration station Almaty

Figure 1 - Situational location Wastewater Treatment plant scheme (CBS) in Almaty and a new landfill in the Ili district of Almaty region [5].

The complexity of solving the problem of solid waste is that, being integrated, it requires the solution of many system-related problems - environmental, economic, technological, legislative, social, scientific, information and others. Specialists who can solve these problems in a complex are sorely lacking and that greatly complicates the problem. The officials working in the field of sanitary cleaning of the city cannot professionally solve the problems of solid waste and they do not have any funds to direct to it, so they limited themselves by very simplistic approach that is by mainly collecting and removing solid waste from the places of their formation [6].

Nowadays in the cities of Kazakhstan there is most intense accumulation of solid waste, which, because of untimely and improper removal and disposal can seriously pollute the environment.

The fundamental difference between the European practice of waste disposal and the Kazakhstani one is that in Almaty all waste is thrown away "in a heap", and in the city, of course, a huge stream of solid waste is produced. The basic principles of optimizing the management of solid waste include the criteria for conservation of resource and avoiding environmental hazard. The issues of minimizing the amount of deposited waste should begin at the stage of collection of solid waste by allocating recyclable resources and isolating hazardous waste.



Features of land for construction of the plant MPBO perspective:

- The site is located on the territory of sludge beds Wastewater Treatment plant (industrial purpose land);
- The plot area is about 10 hectares, which is sufficient for the construction of a plant designed capacity;
- The distance from the property line to the nearest settlements is much higher than 1000 m, so that sanitary protection zone (SPZ) of the future of the enterprise corresponds to sanitary-epidemiological norms.

Figure 2 - Location of land for construction of the plant of solid waste perspective on the territory of sludge beds Wastewater Treatment plant [5].

Today, the proportion of waste collection and its recycle in Kazakhstan is less than 5% of its total accumulation. However, due to the new political course of the country, the transition of Kazakhstan to "green economy", and the adoption of new regulations the proportion of separately collected waste will grow.

Diagram 1 - The number of companies and organizations for the collection and disposal of municipal waste of the Almaty city

Years	Total	including					
		by ownership			on the dimension of organizations		
		public	private	foreign	large	medium	small
2009	49	-	49	-	2	1	46
2010	49	1	48	-	2	1	46
2011	44	1	43	-	2	-	42
2012	46	-	46	-	7	-	39
2013	44	1	43	-	7	-	37
2014	32	1	31	-	7	-	25

units

Diagram 2 - The amount of collected municipal waste exported of the Almaty city

Years	Total waste collected	including						Total waste exported	tonnes
		household waste	park waste	waste from construction sites	manufacturing waste (equivalent to household)	street sweepings	waste of markets		of them
2009	906 303	857 044	47 109	1 861	20	9	260	906 303	906303
2010	693 458	651 540	41 918	39 628	2 275	10	5	693 458	693458
2011	672 173	659 746	12 427	4 477	7 950	-	-	672 173	672 173
2012	672 693	644 869	-	-	15 827	5 095	6 902	672 693	672 693
2013	672 591	634 884	-	49	10 961	19 912	6 600	672 591	672 082
2014	600 565	540 308	-	-	13 357	41 600	5 300	600 565	600 565

In 2013, in the collection and transportation of municipal waste in Almaty 44 organizations (among them: the state ones – 1, the private ones - 43) were engaged.

During 2013, 672, 591tons of waste were collected and removed, of which the major part (2%) fall on the manufacturing waste (equivalent to household), 94% - household waste. While debris collected from the streets is 2,96%, including debris from unauthorized rubbish dumps, 0,98% - waste of markets, 0.007% - waste from construction sites (Figure 3).

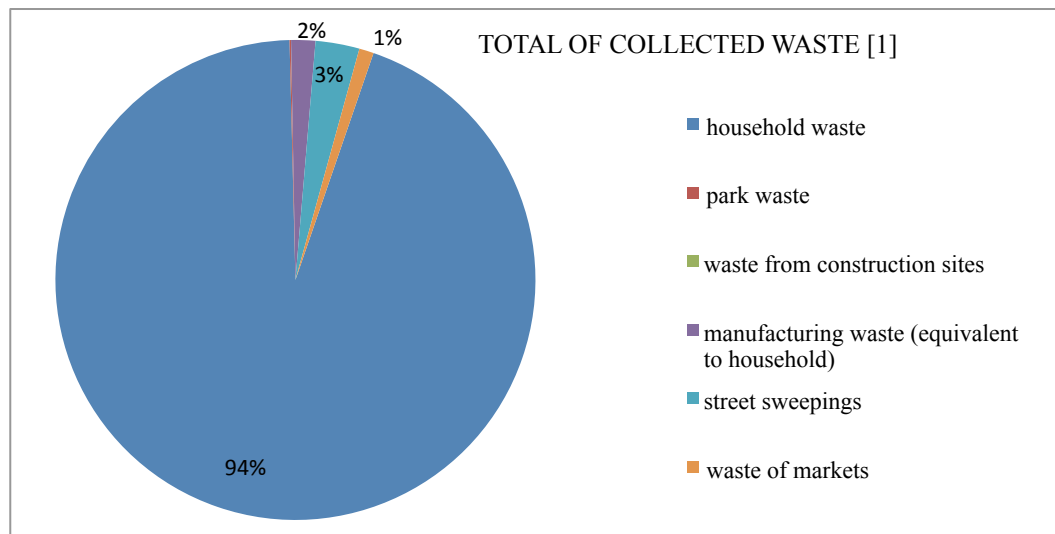


Figure 3 – Structure of formation and accumulation of solid waste in Almaty city

All removed waste was sent to landfills for solid waste. Of the total amount of the collected and evacuated waste 24% were collected by state enterprises, 76% by private enterprises. The number of enterprises engaged in the sorting, recycling and depositing of waste is 7.

As it is shown in Figure 4 for 2014 in view of the morphological composition of municipal solid waste (MSW) in Almaty 24% of food waste, 16% of paper and cardboard, 17% of polymers, and 11% of glass are thrown away.

It should be noted that in recent years in the composition of MSW the proportion of packaging materials (polystyrene, polyethylene, cardboard, paper, foam rubber, and so on) has increased.

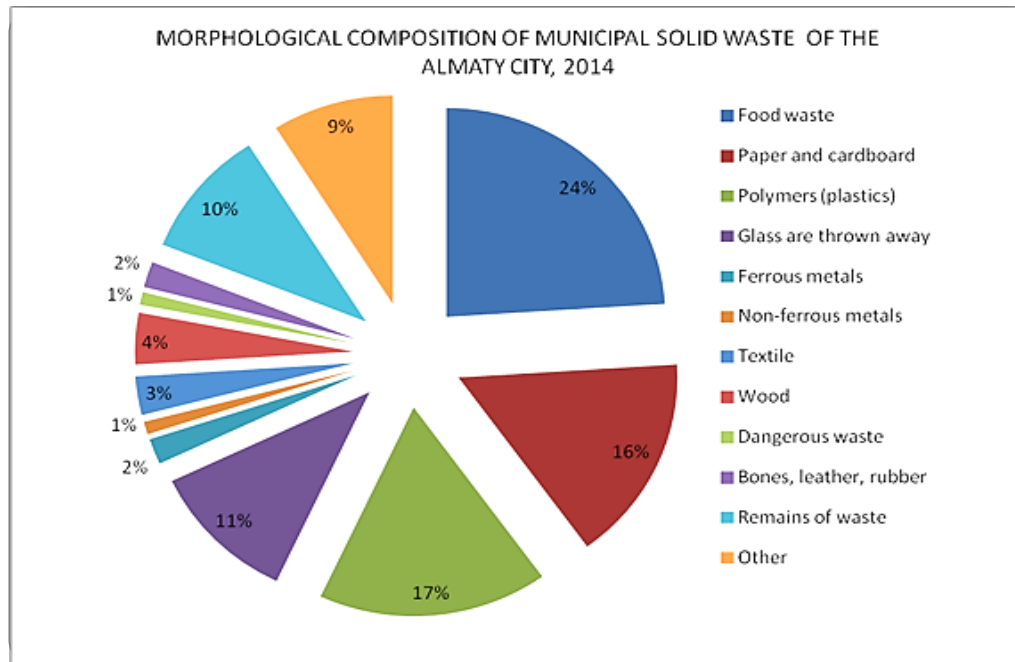


Figure 4 - Diagram of morphological composition of MSW of Almaty [1]

As we know, in markets and shops of the city all products are mainly packed in cellophane and plastic containers. Furthermore, the proportion of paper and cardboard in the composition of MSW is decreased. Presumably this is due to the reduced demand for printed products and that the media have moved on electronic media.

From the above it can be concluded that the morphological composition of MSW has undergone the significant changes in the following components: the proportion of recycled paper (paper, cardboard) is reduced; the proportion of plastic, glass, metal, etc. is increased [7].

Waste removing enterprises according to the scheme approved on collection and disposal of municipal waste evacuate daily solid wastes from the container sites without prior separation of the components to the landfill, which is located in Karasai district of Almaty region, 34 km far from Almaty city, 2 km north of the road of Almaty - Bishkek, 1.2 km to the west of v. Aytey. At the present time the Karasai landfill, which receives the waste of Almaty city is filled to capacity.

The landfill is located on the plot of LLP «KAZ Waste Conversion», a total area is 64.3776 hectares, including 57.7276 hectares for waste disposal.

The landfill is designed for centralized storage of solid waste, providing the rapid isolation from the environment by covering each layer of laid and compacted waste with local ground.

The annual amount of received waste disposal is more than 580.0 thousand tons/year.

#### 4. CONCLUSIONS

1. On the one hand, waste is a major environmental pollutant (annually hundreds of millions of tons of waste are produced), on the other hand, they are often valuable products potentially suitable for reuse and recycling.

2. Landfills occupy huge areas, poisoning the groundwater and air with decay and fermentation products.

3. Karasai landfill already accumulated in total about 10 million tons of solid waste. And this is not the limit. [7].

4. Many kinds of recyclable materials are not applied in Kazakhstan and their exportation abroad is associated with high economic costs, so they have to be stored here. Meanwhile, in the city there is an acute problem of occurrence of spontaneous dumps. This stems from the fact there is no recycling.

5. The second reason for the formation of spontaneous dumps is the lack of special equipment for the removal of solid waste. The provision of special transport is 35-40 per cent.

6. In this case the most effective method is the separation of waste into components and their subsequent use in the secondary market. To do this, every family should sort out the municipal solid waste on glass, paper, metal and food before throwing them away.

7. In Almaty separate collection of waste in households does not apply, however, the foreign experience of such waste disposal is justified. The life cycle of waste in foreign countries usually starts with the separate collection, which does not apply in the cities of the Republic of Kazakhstan due to the lack of

incentives for the population and the lack of regulatory and legal framework for the introduction of separate waste collection.

From the above it can be concluded that the decrease in the amount of solid waste can be attributed to a change in approaches to waste treatment, more in-depth development of the legal and regulatory framework, which is directly related to the attitude of the state supervisory authorities to this issue, as well as the attitude of the general public, financial possibilities of the population living in a particular area. An integrated approach to this problem only can allow avoiding increase of the amount of solid waste in the future [8].

However, the absence of the appropriate legislative base inhibits the stimulation of business in the collection, storage and processing of solid waste. Also the old and limited system of tariff and estimated rate of waste negatively affects the work, the lack of proper control and incentives for their collection and recycling.

#### **ACKNOWLEDGEMENT**

We are grateful to the staff of the department of municipal solid waste management of the akimat of Almaty city for the cooperation and provision of the necessary information.

#### **REFERENCES**

- [1]. Agency on Statistics of the Republic of Kazakhstan Bulletin "Official statistics" Electronic resource: // <http://stat.gov.kz>
- [2]. [http://almatytourism.kz/downloads/PRT\\_rus.doc](http://almatytourism.kz/downloads/PRT_rus.doc) The Program of the development of Almaty city for 2011 - 2015
- [3]. Agency on Statistics of the Republic of Kazakhstan Bulletin "On the collection, transport, sorting and depositing of municipal waste for 2013" Electronic resource: // <http://stat.gov.kz>
- [4]. "Vecherny Almaty" №54, 04.30.2015.
- [5]. Waste management project in Almaty, Feasibility Study, JSC "Center of Almaty", Ltd. "COWI Consulting" 2012-2013gg.
- [6]. Nurkeev S.S., Argancheeva A.G., Utegulov N.I. Kembayev B.A. Erguzhieva G.B., Karabayev J.A. Problems of disposal and recycling of solid waste: Analytical Review. - Almaty KazGosINTI. 2005 – 128p.
- [7]. Report on the research work on the theme: "Defining the estimated rate of accumulation of solid waste" KSU "Department of Natural Resources and Environmental Management of Almaty." 2014.
- [8]. Suleev D.K., Nurkeev S.S. Utegulov N.I. Argancheeva A.G., Absametov M.K. The new model of solid waste management in Kazakhstan (Almaty city, as an example). - Almaty: KazNTU. 2005 – 49p.

#### **BIOGRAPHY**



*Associate Professor **Zaure K. KALIASKAROVA** is Candidate of Geographical Sciences works of Department of Geography, Land Management and Cadastre at Al-Farabi Kazakh National University.*

*In 1995 Kaliaskarova graduated with honors from the Faculty of Geography of Al-Farabi Kazakh National University on the specialty "Geography". In 1999 she defended candidate's dissertation. She is still is the scientific director of a research project entitled "Development of the economic mechanism of solving the problem of pollution buffer zones by municipal solid wastes of the cities (on the example of Almaty city)" in the Al-Farabi Kazakh National University.*

*Her research interests focus on issues of Nature Management economy; - Economic geographic assessment of natural resources. She may be*

*contacted at [Zaure.Kaliaskarova@kaznu.kz](mailto:Zaure.Kaliaskarova@kaznu.kz), [roza.08@mail.ru](mailto:roza.08@mail.ru)*

#### **BIOGRAPHY**



***Zhannat N. ALIYEVA** - candidate of geographical sciences, associate professor at the Department of Recreational Geography and Tourism of the Faculty of Geography and Environmental Sciences at Al-Farabi Kazakh National University*

*In 1993 Aliyeva graduated with honors from the Faculty of Geography of Al-Farabi Kazakh National University on the specialty "Geography". In 2001 she defended candidate's dissertation. Aliyeva Zh.N. published more than 100 scientific works. Aliyeva Zhannat conducts the researches by the project "Development of the economic mechanism of solving the problem of pollution buffer zones by municipal solid wastes of the cities (on the example of Almaty city)".*

*She may be contacted at [atazhn99@mail.ru](mailto:atazhn99@mail.ru)*

## **BIOGRAPHY**



*Assel S. IKANOVA works as Senior Lecturer of Department of Geography, Land Management and Cadastre at al-Farabi Kazakh National University.*

*Ikanova received her BSc of Geography in 2003 from at Al-Farabi Kazakh National University, from Almaty, Kazakhstan and her MSc in Master of Natural Science in 2006 at Al-Farabi Kazakh National University, from Almaty, Kazakhstan.*

*She is still a PhD student of the 1st course of specialty «6D060900-Geography» in the Al-Farabi Kazakh National University, the thesis of her research is "Economic-geographical estimation of management of municipal solid waste of Almaty city." She may be contacted at*

*[Asel.Ikanova@kaznu.kz](mailto:Asel.Ikanova@kaznu.kz), [dis-asel@mail.ru](mailto:dis-asel@mail.ru)*