



## Solid Waste Disposal at the Uralsk Landfill

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## Section 2. Climate change and sustainable management of natural resources

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#### Abstract

Environment problems associated with the generation of waste are part of societal changes where household solid waste play an important role. For the effective planning of solid-waste handling infrastructure, it is essential to know the quantity of waste generation and its composition. This study of purpose is the problem of recycling and recycling of solid household waste using new technologies. The solid waste disposal site of the city of Uralsk was investigated for the collection and subsequent disposal of solid waste. According to the regional Department of ecology, the mass of accumulated household waste throughout the WKO at the beginning of the year reached 6.3 million tons. And the total area of landfills is already more than 550 hectares. During 2018, more than 108 thousand tons of household waste were placed in landfills and village dumps. If we take into account that the population of the region is 649,460 people, then 178 kg of household waste per West Kazakhstan citizen. Were investigated in 6 points of waste collection and disposal site. The studied parameters were the formation and composition of waste, technologies used at the Uralsk landfill for waste disposal and disposal. Municipal solid waste consists of ten categories of waste and has the largest component (35%). Accordingly, the use of alternative measures, accompanied by awareness-raising activities and investments in solid waste management, will further improve and preserve the cleanliness of the environment.

*Keyword:* solid household waste, recycling, environmental problems, environment, landfill.

#### Introduction

Environment problems associated with the generation of waste are part of societal changes where households play an important role. (Al-Khatib, I. A., Monou, M., Abu Zahra, A. S. F., Shaheen, H. Q., & Kassinos, D. (2010)). Waste that is discarded into a municipal solid waste management system can be managed in several different ways: it can be directly disposed of, it can be recycled, it can be reused, or it can be processed prior to disposal, recycling, or reuse. These activities are done at sites other than the generation site (Melosi MV (2005), Pittsburgh, Tammemagi H (1999), Vesilind PA, Worrell W, Reinhart D (2002)). Recycling involves processing a waste for use in manufacturing a new product. Reusing waste means using it again, either directly or after repair or improvement. Finally, source reduction involves not making waste in the first place. Humans have disposed of waste since the creation of the species. Initially, this involved discarding an object at the point it became waste, in time and space. Where population centers developed, disposal became more involved. Waste had to be disposed of by combustion and/or deposition in an out-of-the-way place. In modern times, high population density, high waste generation, and toxic waste characteristics resulted in the need for sophisticated (Iriarte A, Gabarrell X, Rieradevall J (2009), Shapek R (1995), Hackett S (2006), USEPA (2009)). Increasing concern about the environment, food and feed shortages, and hike in the price of petroleum has stimulated interest in the new ways of producing more bioenergy. The interest is rapidly increasing toward converting agricultural and industrial wastes to commercially valuable products. Waste disposal and pollution are inextricably linked. Unwanted residues that are usually perceived to be of negative value are described as waste. The majority of waste disposal situations involve pollution of various kinds. Thus, the solid wastes and its disposal is one of the serious problems in developing countries, which require eco-friendly treatment options (Beede DN, Bloom DE (1995), Beukering PV, Sehker M, Gerlagh R, Kumar V (1999)). With the rapid economic growth and urbanization in China, municipal solid waste (MSW) generation and management is becoming a major social and environmental issue (Li et al. 2009; Chen et al. 2010; Cheng and Hu 2010.; Zhang et al. 2010.; Abduli et al. 2011; Ghanbari et al. 2012; Che et al. 2013; Song et al. 2013). Since the reform and opening up in 1978, China's per capita income has increased annually. However, environmental pollution and waste generation is also growing rapidly. According to the China Statistical Yearbooks, the volume of MSW generation in 1997 was approximately 109 million tons; in 2011, the volume reached approximately 164 million tons, an increase of nearly 50 %. Environmentally sound strategies for MSW—generally known as the waste management hierarchy—place source reduction at the top of the hierarchy, followed in descending order by recycling and composting, energy recovery, and treatment and disposal (U.S.EPA 2013.). In the early stages of dealing with MSW generation, efforts were devoted to harmless treatment (the disposal of MSW by recycling, composting, waste-to-energy, and sanitary landfilling).

The current challenges in developing countries is selecting the most suitable area for disposing municipal solid waste (Kharlamova et al. 2016). Increased urbanization and expanded use of disposable products in the past decades have generated greater demand for landfill space. Currently, world cities generate about 1.3 billion tons of solid waste per year (Orhorhoro and Oghoghorie 2019). This volume is expected to increase to 2.2 billion tons by 2025 (Kharlamova et al. 2016) and by 2050 to raise 3.40 billion tons annually (World Bank 2018). Landfills throughout Kazakhstan will be subject to space monitoring. The Ministry of energy has signed an agreement with JSC NC Kazakhstan Garysh Sapary on space monitoring of natural landfills in the country. For example, on the territory of Uralsk and two adjacent districts, satellite imagery recorded 503 natural landfills. Since 2019, in accordance with article 301 of the Environmental code, it is prohibited to bury plastic, plastic, polyethylene, waste paper, cardboard, paper waste, mercury-containing lamps and cullet devices, non-ferrous and ferrous metal scrap, lithium, lead-acid batteries, electronic and electrical equipment in landfills. And from January 1, 2021, a ban will also be imposed on the disposal of food and construction waste on MSW. "A year ago, we approved the tariff, which was calculated for 2016. During this time, everything has become more expensive. 195 tenge is now the rate in Uralsk for one person.

In Almaty, for example, 550 tenge per individual. Only with a good tariff, you can build this business, " the entrepreneur concluded. (<https://kursiv.kz/news/vlast-i-biznes/2019-06/v-zko-khotyat-privlech-biznes-k-pererabotke-musora>). The biggest headache of the local government is the village dumps. According to the Department of ecology, there was never any project documentation for their construction. As a rule, this is not a fenced-in or collapsed plot of land where household waste is removed. The burial technology is not observed, and there are no proper soil quarries. At the same time, out of 318 official landfills in the region's districts, only 247 have permits from akimats to allocate land plots. The municipal services of the districts are the operators of landfills, but they do not have technicians to maintain these facilities. Landfills are trying to transfer to a competitive environment, but entrepreneurs avoid them because of its economic disadvantage. It is necessary to build at least three new landfills in the region, and this task is still assigned to local Executive bodies-to organize measures to reduce biological waste, including measures for their composting and biogas production. The solution is to give all the landfills to the business.

In European countries, the waste management system starts working already at the stage of packaging production. The manufacturer is initially responsible. It includes the cost of recycling in the cost of packaging, and the state obliges the manufacturer to dispose of this packaging. That is, the company produces the product and already plans and knows how to dispose of this packaging or how to accept it from the public.

### **Methods**

The following main works are used at the landfill: reception, storage, compaction and isolation of waste. Waste is received in an uncompressed state. Method of waste disposal – a "thrust". In this method, the waste is laid in layers, the height of the waste storage should not exceed 2 meters. Shifting and compaction of waste is carried out by a heavy bulldozer weighing 12-16 tons. Compaction of waste is made in layers of 0.5 m and is achieved by two -, four-time passage of the bulldozer in one place, i.e. each subsequent track of the caterpillar overlaps the previous one by  $\frac{3}{4}$  of the track width. The compacted layer of waste is isolated with a layer of soil 0.25 m high.

The procedure for receiving and classification of waste accepted for disposal is established by the landfill owner and agreed with the authorized body in the field of environmental protection ("Environmental code of the Republic of Kazakhstan" dated 09.01.2007, No. 212-III of the ZRK).

### **Results and Discussion**

For the effective planning of solid-waste handling infrastructure, it is essential to know the quantity of waste generation and its composition. This paper presents the findings of a study carried out in an urban municipal area in Uralsk to determine the household solid-waste generation rate and waste composition based on field surveys and to determine the related socioeconomic parameters.

Waste incineration is not allowed on the territory of the landfill, and measures must be taken to prevent spontaneous combustion of waste. The organization of work on receiving, storing, compacting and isolating waste is determined by the technological scheme and schedule of operation of the landfill, approved by the Director of the enterprise.

Waste is stored in specially equipped places (sites, warehouses, storage facilities) for the period specified in the project documentation for each type of waste for subsequent disposal, processing or final disposal. Landfills for solid waste disposal belong to class 3. Waste disposal is carried out in specially equipped landfills.

The place of long-term storage of waste is the place of their permanent placement with possible subsequent movement and (or) with the need for constant monitoring of their impact on the environment. Long-term waste storage facilities are subject to the environmental requirements that are established for landfills, and the technical capability for their recovery, transportation, subsequent disposal or final disposal must be provided.

It is prohibited to dispose of waste containing persistent organic pollutants provided for by the international treaties of the Republic of Kazakhstan on persistent organic pollutants. The export and import of such waste is permitted only for the purpose of destruction.

Kazakhstan has accumulated so much solid household waste (MSW) that since 2019, the authorities have banned the disposal of plastic, paper and glass in landfills without pre-sorting. With this measure, the Ministry of energy is trying to increase the level of waste processing and introduce separate garbage collection among the population.

Table 1. The rate of formation and composition of solid waste in Uralsk.

Name	Formation rate, kg/day	Average density, t / m <sup>2</sup>	Quantity	
			%	t / year
Paper, cardboard	4,7	0,06-0,09	35	40700
Food waste	3,1	0,31-0,5	28	26400
Wood, branches, wooden packaging	0,6	0,17-0,19	6,9	5390
Metals	0,5	0,18-0,39	2,4	4830
Leather, rubber	0,2	0,18-0,23	1,5	1650
Textile	0,7	0,17-0,22	5,5	6050
Glass fight	0,7	0,37-0,52	6,5	6050
Polymeric material	0,7	0,01-0,1	5,3	5830

There are no plastic products in the composition of solid household waste, since special metal containers for collecting this waste are currently installed. Paper and food waste account for the largest percentage of solid household waste.

In Uralsk, construction of a waste processing plant began, but due to lack of funds, construction was suspended, and only a waste sorting shop works on the territory of the landfill, where 300 jobs are involved.



Picture 1-View of an unfinished waste processing plant at the landfill in Uralsk

The landfill of Uralsk was transferred to the trust management of icnrecycling LLP for a period of 10 years. On February 16, 2019, a waste sorting line was launched at the landfill. The project cost -1.7 billion tenge (investor's funds).The project implementation period is 2017-2023. There are 16 private business enterprises in the region (oraltazaservice LLP, Talap JSC, Antey LLP, Turanpromresurs LLP, Guber IP, Kama center LLP, Glukhova IP, Kuksova IP, Borisov IP, Gamma real LLP, Arcturus LLP, VTS-Uralsk IP, Usenova IP, Mega-Zhazira LLP, Fostiss XXI LLP).Activities: receiving waste paper, cardboard and other types of paper waste, polyethylene waste, used automobile oils and liquids, used air and fuel filters, rubber (car tires), batteries, mercury-containing lamps and appliances. According to the system of separate collection, information and explanatory work is carried out on an ongoing basis with the population with the participation of public organizations, enterprises of collectors and processors.



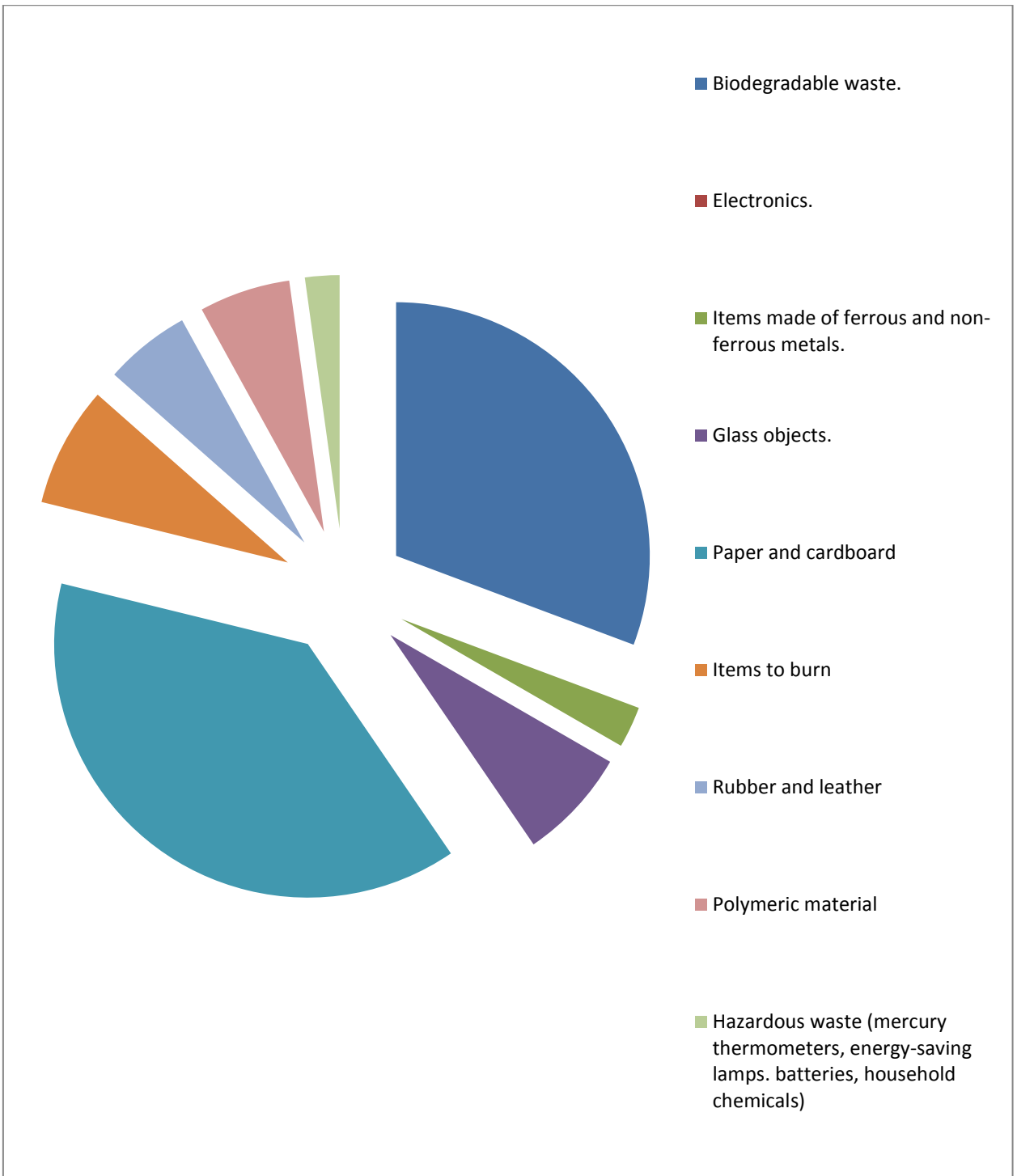
Picture 2 – The condition of the garbage containers in the city of Uralsk on the street of New Orda

As we can see, the containers are not marked with a color for separate garbage collection, garbage is taken out daily, but there are also elements of spontaneity, garbage is not always brought to the containers (picture 2).

Currently, approaches to resource assessment of municipal solid waste have changed. Municipal solid waste is no longer a simple mix of different materials. This is a more complex stream consisting of various items.

As long as the composition of urban waste was dominated by organic components, their disposal was not a big problem. Organic waste is naturally decomposed in nature and has no toxic substances. Therefore, organic waste was not a threat.

The development of civilization changed the composition of household waste. There were more non-degradable components: glass, ceramics, metals, rubber, plastics. More and more toxic substances appeared: mercury, batteries, expired medicines, etc. (picture 3)



Picture 3 – Modern gradation of solid waste composition

With this gradation, the directions of possible disposal of individual MSW components are immediately visible. This gradation will help to justify the need for separate accumulation of household waste.

To date, one of the alternative solutions to MSW problems is the project "Eco-evolution", which was proposed by the Deputy Chairman of the NGO of the Turkestan region V. Golyarko. The idea of the project is based on the sale of waste by the citizens themselves. Entrepreneurs engaged in the processing of household waste will buy sorted garbage from citizens themselves. Pilot projects have already been launched in some cities of the country, and the proceeds are used by residents to improve their courtyards, and the interest of residents will be compensated by improving the environmental situation.

### Conclusions

1. In the context of this study, we tend to believe that it is necessary to promote separate garbage collection. We do not have any signs or billboards anywhere that you can not throw, for example, batteries or mercury lamps in the

General trash. Although it is very dangerous. It is necessary to speak and cultivate environmental awareness from kindergartens and schools. To introduce special lessons in ecology. Bet on a new generation of eco-responsible people.

2. We also came to the conclusion that determining the rate of garbage formation leads to the need to sort solid household waste

3. The results of the study showed that the problem of garbage, especially in large localities, can be solved and the use of preventive measures, accompanied by awareness-raising activities and investments in waste recycling, will help to reduce consumption, that is, not to buy extra garbage.

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