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Municipal Solid Waste Management in the Households

The Case Study of Ashgabat, Turkmenistan

Aleksey Grehov

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Author's Declaration

No portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

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ABSTRACT OF THESIS submitted by:

Aleksey GREHOV for the degree of Master of Science and entitled: Municipal Solid Waste Management in the Households. The Case Study of Ashgabat, Turkmenistan.

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This research discusses and analyses the undesirable impacts on the environment of municipal solid waste in Ashkhabad; its generation, collection and further possible solutions to resolving these problems. The need of this research is proved as it has very little been done. The municipal wastes used to be burnt in the streets what contributed into air pollution, health adverse impacts on humans and poisoning the surrounding area. The worst side of it was that the wastes without segregating were in the same containers thus causing tremendous pollution while being burnt.

The research questions addressed here are:

1) *What can be done do reduce the accumulation of wastes and the ways of sorting and recycling?*
2) *What consensuses would be and how much time it would take for city population to change their behaviour and attitude toward treating solid wastes?*

3) *What are adverse environmental impacts?*

In order to answer these questions, various approaches have been used in the research. The theoretical part contains literature review of past and current situation and possible mitigation measures. Experiences of other countries especially the Commonwealth States (CIS) have been studied in details. The background of the problem was discussed with the officials and other stakeholders. The author also analyzed the ration between consumption and disposal in the city. There is a lack or insufficient laws to respond to this problem. The author attempted to realize why this problem has not been announced as an acute one. The results show that illegal dumping, poor or absent segregation and disposal sites, weak public participation lead to obstacles to implement new law or modify the old ones as the problem itself is not considered as a problem.

Keywords: municipal waste management, solid, Ashkhabad, landfills, incinerator

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1. INTRODUCTION

With increasing speed of household activities, developing sphere of consumption, social sector, the more serious and sharp problem occurs with the industrial and household wastes.

Collection and especially utilization is the significant task for averting from pollution of the environment. 1.3 tonnes of wastes including industrial and household have been accumulated in Turkmenistan in 1998.

Turkmenistan belongs to the Commonwealth Independent States (CIS) which economy is in transition to the market economy.

As in many developing countries as in CIS, due to lack of awareness, weak public participation, ability and poor separation of domestic and municipal wastes, toxic wastes are frequently mixed with domestic and municipal wastes and disposed together in an uncontrolled manner. After this and other operations, it has resulted in contamination of underground water. Moreover, it poses health problems to humans.

Solid waste in Turkmen towns and nearby country side is maintained, collected and delivered to the dumps and incinerator in Rukhabad. The worse situation is in remote villages where solid waste from household activities is generated and disposed around residential areas. The only way to get rid of the wastes is burning in open areas. As urban population grows, it becomes more of a challenge to handle increasing quantities of waste in more congested cities.

2. METHODOLOGY

2.1 Research Design

The case study method is used as an approach to carry out this research due to ecological problems caused by the accumulation of the municipal solid waste in the households of Ashkhabad. The population of the city tremendously grows as in many countries of Commonwealth Independent States (CIS) owing to migrating rural civilians to the cities especially to capitals.

Research assessing the impact of solid wastes on the environment has not been undertaken yet. In this thesis, the author tends to define such posed questions as how to reduce the accumulation of solid wastes from the households, the possible ways of sorting, further recycling, and reusing the wastes. The source of data collection will be libraries, interviews, questionnaires, primary and secondary data.

As Yin (1994) identified a case study *"an empirical inquire that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident".*

Yin (1994) divides case studies into three categories: exploratory, descriptive and explanatory, which could be either single or multi-case studies. (1) Exploratory, studies an introduction to social research and aims t guide the development of research questions and hypotheses (Nova South Eastern University, 1997). Descriptive case studies require that the investigator begin with a descriptive theory, or risk the possibility that problem will occur during the project (*Ibid*). Explanatory case studies fit more into the study on causal relationships. As only

very little has been done about municipal waste in Turkmenistan, the author uses descriptive method to describe existing problem and most likely obstacles during the research. The author has chosen to write about namely municipal waste management not industrial waste due to probable problems, which can appear during the research.

2.2 Data Collection

2.2.1 Interviews

a) Interviewing specialists

Arslan Amangeldiyev, the Chief of the Municipal Service of Ashgabat City Hakhimlick (City Administration) and Jakhan Sariyeva, the Specialist of the household wastes. These persons were selected to be interviewed due to their professionalism, knowledge in the field of study, and being the managers of the whole municipal ongoing projects. They receive the data directly from the Municipal Service, which is supervised by them. Open up questions were made up. These questions can be found in Appendix 1.

Sonya Mammedova, the deputy of the director of the Institute of the dessert was interviewed owing to her previous experience at the Ministry of Nature of Turkmenistan as the specialist of Municipal Service in Ashgabat. Another purpose of this interview was to indentify the limitations and obstacles of carrying out the Municipal projects jointly with other Central Asian countries. The same set of open up questions were used while interviewing this expert. Some questions were added up due to indentifying the limitations and obstacles of the projects.

b) Interviewing garbage collectors and street cleaners

Totally 30 people were interviewed by using questionnaires: 8 garbage collectors and 22 street cleaners in the 11th and Mir districts. These districts

were chosen due to comparing two different districts, one is old and there are 4 storied houses (11th district) and a new one with skyscrapers where there are 9-12 storied houses. In the 11th district the household wastes are kept in the garbage bins. Conversely, in Mir district the wastes are kept in the garbage pipes inside of the houses themselves and the garbage trucks come to pick up the garbage directly to the houses. (See the Table 1). The questionnaire consisted of open up questions and can be found in Appendix III

c) Interviewing for common truck garbage collectors and street cleaners

12 people were interviewed by using questionnaires: 6 truck garbage collectors and 6 street cleaners in the district Hitrovka where one-, two-detached houses are located. All garbage is kept in the owners' gardens. The questionnaire consisted of open of questions and can be found in Appendix III.

d) Interviewing entrepreneurs who try to recycle or reuse the wastes directly from the garbage bins

These were more informal talks with the people who possess the own businesses such as cattle and people who seek for things to sell them. The author informally talked to 7 entrepreneurs and 3 collectors. The talks took place in the city centre (Tekhe Bazar) See the Appendix IV.

3. LITERATURE REVIEW

Literature review was undertaken by searching at libraries at Central European University CEU, Library named after Azadi, the Library of Academy Sciences, and Libraries at UNDP, OSCE and UN in Ashgabat. The author has used as electronic as printed materials to assess the past and current situation in the city. Online libraries from CEU and Oregon State Universities have been accessed too.

The literature review consists of

1) **Evaluation of ecological situation in the former Soviet Union countries caused by municipal wastes generated in the dumps;**
2) **Waste recovery and recycling 3) Experiences of other Commonwealth Independent States (CIS).**

3.1 Evaluation of ecological situation in the former Soviet Union countries caused by municipal wastes generated in the dumps

Two events characterize the paradoxical situation of solid waste management in Soviet era: The USSR made great strides in producing many of the complicated and high-technology products of an advanced industrialized society, but developers failed to invent a suitable environmentally sound means to dispose of the associated hi-tech by-products.

In former Soviet Union Republics, solid waste was treated as an afterthought for which very little provision was made and for which only few specialists were trained to responsibility.

Of all the threads to the environment in the region, solid wastes, and particularly hazardous wastes, were the least documented. As a consequence of this ignorance, they may prove to be the most dangerous thread-to humans as well as to the environment (Radio Moscow, 1990).

Despite the magnitude of the problem, the issue of the solid waste disposal has not commanded the level of public attention that other environmental issues, such as water and air pollution, have received. Reporting on waste in the media largely has been limited to stories about discovery of illegally dumped hazardous wastes. One reason may be that the issue of solid waste management does not have the dramatic appeal of, say, desiccation of the Aral Sea or the thread to Baikal Lake. Another factor is that unlike the United States and western Europe, most of the territory of the former Soviet Union has huge expanses of open space that provide great opportunities to conceal discarded wastes, making the problem less visible to public than other forms of environmental problems. Governmental officials themselves often reveal their lack of knowledge of the generation and fate of solid wastes, as appropriate data have not been collected. Commenting on his first months as a chief of the new environmental agency, Fedor Morgun, former chairman of USSR Goskompriroda, observed in 1988: Recently, I asked leading specialists at Goskompriroda what would seem like an elementary question: “What is the volume of, even the approximate amount of

urban household and industrial solid waste in our country?" No one could give an approximate figure, let alone an exact one. No one in the country ever had made such estimate (Vrachevat' rani zemli, No.6, 1989).

Given the lack of available data, it remains impossible to say conclusively how much waste the region's economies produce, how it is treated, or it is disposed. According to a 1988 estimate by economist Nikolai Prirogov, a USSR Gosplan officially responsible for recycling programmes, the generation of solid wastes from all sources was approximately 9 tonnes annually (Pirogov 1988). This estimate probably included all forms of waste-from domestic and commercial refuse to wastes from industry, mining and agriculture.

The most comprehensive official information published on solid waste concerns common household refuse, or *bitovie otkhodi* (BO). Due to the slow innovations and otherwise much-criticized neglect of the consumers' goods and service sectors of the Soviet economy, the USSR did not experience an explosion of waste from surplus goods, elaborate packaging, and disposable products. In fact, persistent shortages of such basics as paper, glass, and even food promoted a tradition of conservation at the individual level. As the result, the Soviet economy produced an average of only 56-57 million tonnes of domestic and commercial waste a year in the late 1980s, (TASS 1990), or about 195 kilograms of waste per capita(USSR Gostkompriroda 1988). Output ranged widely within the USSR-according to one report from, 160-190 kilograms per capita (Ben'yamovskii and Bukreev 1987).

In contrast, the United States (the world's greatest trash producer) created about 163 million tonnes annually, equaling about 655 kilograms per capita (U.S. Bureau of the Census, 1991).

According to Soviet practice, almost all solid wastes were landfilled, yielding an estimated total of over 50 billion tonnes of waste piled up on land occupying 1,400 square kilometers (USSR Goskompriroda, 1989). Yet over half of the almost 6,000 official municipal and industrial landfills monitored by the Soviet government did not meet public health norms at the end of the 1980s. More than three-quarters of the landfills in noncompliance were located in Uzbekistan, Georgia, Moldova, Latvia, and Turkmenistan. (USSR Goskompriroda, 1989).

The Soviet government monitored about 6,000 landfills nationwide, but this clearly raises a question: How many dumps went unregistered or unmonitored? For evident reasons, comprehensive data on illegal waste sites are unavailable, but the number most likely runs into thousands. The number of large abandoned dumps around Moscow alone has been estimated at about 100 (Feldman).

In the 1980s, the Russian capital averaged 6 million tonnes of industrial refuse generated annually; of this, one-sixth was discarded untreated in unlicensed dumps due to the waste did not meet the sanitary norms required for it to be deposited in landfills having proper limits (Izvestiya, 1989).

In 1972, the government began experimenting with waste incineration to a limited extent. Seven incinerators were built in Russia with imported technology and are located in Moscow (two plants), St. Petersburg, Vladimir, Nizhnii Novgorod (former Gorkii), Murmansk, Vladivostok, Sochi, and Pyatigorsk. Three have been

built in Ukraine, in Kiev, Sevastopol, and Kharkov. About 2.3 percent of all solid wastes in the late 1980s were incinerated, compared with 14 percent in the United States (USSR Goskompriroda, 1991).

More incinerators are under construction. Burning waste is a controversial issue, however: Although it helps alleviate the storage problem and can be used to generate steam, the by-products of incineration (fumes and ash), if not controlled, can prove to be more of a pollution menace. Indeed, efforts to burn trash resulted in serious problems: Trud reported that an incinerator located in the resort town of Sochi dumped wastes containing pollutants as high as 3,000 times the legal norms into the Black Sea (Trud, 1989). Associated pollution control technologies were not purchased when the city of Moscow imported its two incinerators from France and Denmark; as a result, public health officials have required the incinerators to operate at low capacity in order to minimize their emissions (European, 1991).

3.2 Waste recovery and recycling

Resource reclamation and recycling under the Soviet regime did not reach the scale found everywhere in the world (Table 1). The reasons for this lag are closely linked with the causes of the Soviet economy's resources intensiveness and inefficiency. Briefly, the extensive input orientation of Soviet development focused on the acquisition of virgin raw materials rather than on the conservation and resource recovery-a policy reinforced by subsidized prices for such inputs that discouraged enterprises from seeking alternative, recycling resources. This practice was sustained by the image of plenty in the minds of planners and managers: of limitless forests and huge, untapped reserves of coal, oil, and other natural resources. Lastly, the cost of waste disposal was insignificant. Laws against illegal dumping were haphazardly enforced, and the maximum fine for violating environmental regulations averaged only 500-600 rubles (Galayatin, 1991). Some enterprise managers found it expedient to pay repeated fines for violation environmental laws rather than handle their wastes properly (Stroitelnya gazeta, 1990).

As the waste generated and accumulated, nevertheless, the inefficiencies dragged down the economy. The Soviet government tried to correct the situation by using administrative means. In 1980, proclaimed the first of a series of resources conservation initiatives, a comprehensive and detailed resolution

entitled “On Measures for the Long-Term Improvement of the Use of Recycled Materials in the National Economy”.

The effort achieved some success: Between 1981 and 1987, the volume of recycled slag, wood, and paper increased 30 percent, recycled petroleum, products grew by 60 percent, and the volume of coal ash put to use increased 80 percent. According to statistic agency, resource recovery efforts saved economy from consuming an additional 55 billion rubles worse of raw materials during the 1986-1989 period.

Nevertheless, disincentives to recycling prevailed, and the increase in resource recovery hardly managed to output growth in consumption. During the 1980x, for instance, the volume of wasted lumber left in the forests increased by 40 percent, in spite of intensive conservation efforts in the logging industry (Vestnik Statistiki, 1991). Hence, the overall “waste content” (otkhodoemkost’) of the Soviet economy declined by a merely 1.8 percent (USSR Goskompriroda).

The modest achievements of the Soviet government’s programme can be ascribed to its “command-administrative” nature that allowed detailed directives to be subverted easily by uncooperative ministries and enterprises. Plan and plan fulfillment frequently were uncoordinated, prompting the omnipresent Soviet-style production bottleneck. One such bottleneck created a “used-paper crisis” in the mid-1980s. In the 1980s law previously mentioned, the government mandated that all enterprises and governmental agencies collect their waste paper for recycling. But by the mid decade, it became obvious that not enough processing capacity could be brought on line in time to handle the mounting quantities of

paper collected. “Every day a bonfire burns in the courtyard of our building,” reported the editor of Mayak Kommunizma (Beacon of Communism), a local newspaper in Perm oblast. “The recycling centre is not accepting paper for recycling and we have nowhere to store it” (Zhurnalist, 1988).

In its attempts to teach good citizenship, the Communist Party drafted its army of youthful aspirants to help the government with its recycling efforts. Again, the command-administrative system took its toll; although marginally effective, the mandatory recycling drives, with their heavy political content, imbued weary participants with faint identity with their Soviet state or Communist Party and scant sympathy for nature.

The challenge of disposing of municipal waste will only increase in the future as economic reform gathers momentum in the post-Soviet era and region’s economies becomes commercialized. The end of governmental subsides for raw materials will help to provide effective stimulation to reduce unnecessary consumption of material inputs and to increase recycling and resource reclamation. After the legislation in 1987, the cooperative movement dramatically expanded the opportunity for recycling and resource recovery. In many cases, entrepreneurial workers at a state enterprise formed cooperatives to make use of valuable goods wasted at their place of work. In 1990, over 3,200 cooperative firms engaged in the production of everything from troughs for livestock farms to plastic packaging materials and toys, grossing over 1.2 billion rubles in the process (Vestnik Statistiki, 1991).

Table1. Comparison of US and USSR municipal solid waste generation, disposal, and recovery, 1988

	United States	Russian Federation
Annual waste generation		
Total (million metric tonnes)	162.9	56.0
Per capita (kilograms)	655	195
Generation of waste by category percent		
Paper and cardboard	40.0	20-36
Glass	7.0	5-7
Metals	8.5	2-3
Plastics	8.0	3-5
Textile	2.1	3-6
Rubber and leather	2.5	1.5-2.5
Wood	3.6	1-4
Food	7.4	20-38
Other	20.9	10-35.5
Disposal methods (percent)		
Recovery	13.1	1.3
Incineration	14.2	2.2
Landfilling	72.7	96.5

Sources: Adapted from U.S. Bureau of the Census, 1991 and USSR Goskompriroda, 1988

3.3 Experiences of other Commonwealth Independent States (CIS)

Industrial and Municipal Waste in Uzbekistan

Slid and liquid wastes are an acute problem in Uzbekistan, affecting the whole society. However, the poor and disadvantaged are specifically affected since they cannot pay beyond basic goods and services. According to the UN Economic Commission for Europe, the amount of municipal solid waste generated per capita is 240 kg per year (Environmental Performance Review: Uzbekistan: 2001). As there are few enterprises to reuse and recycle municipal waste, practically all of it is dumped. Currently, there are around 160 municipal solid waste dumps and landfills in Uzbekistan and they are estimated to receive some 30 million cubic meters of waste annually. Out of 10 million tonnes of industrial waste generated annually, Tashkent Scientific Research Institute "Vodgeo" estimates that some 1,000 tonnes are highly hazardous (first class of toxicity). Nevertheless, Vodgeo admits that only 500 large enterprises out of an estimated 32,000 industrial firms submitted returns and this represents a mere 5 percent of the amount of industrial waste generated. Law on Waste Management was adopted in 2002 and its application should improve the situation. In order to address the problem of collection, recycling and processing of wastes the National Waste Management Strategy of the Republic of Uzbekistan has been developed with the support of UNDP.

Municipal Solid Waste Situation in Yerevan, Armenia

The current Municipal Solid Waste Management (MWMS) System in Erevan provides poor MSW collection as well as disposal services. Yerevan has now reached a point where urgent action for improvement and modernization is required to ensure proper performance and environmental conditions in the future.

The Government of Armenia has proclaimed municipal and industrial waste management to be a priority in the country. However, so far most of the activities have been driven by the commitments and finding within the international environmental agreements and therefore are mainly related to hazardous waste management. The state of MSWM sector does not substantiate the priorities of the Government of Armenia.

Current Execution of MSW Collection and Street Cleaning in Yerevan

Local government bodies contract services for street cleaning and snow removal etc to companies and pay for these services from the local governmental budget. Currently there are 14 companies involved in provision of street cleaning, collection and transportation services in Yerevan. As part of the street cleaning contract, the same company is given the rights and the obligation to collect and transport MSW and to conclude contracts with local commercial and non-

commercial waste generators in the community and to collect appropriate fees for these services.

About half of the companies operating in the MSWM field in Yerevan are privately owned. Joint Stock Company (JSC) or limited liability companies with 100 percent local government ownership. Owing to the current general low quality of services currently provided, it is impossible to make conclusions whether private or communal companies are doing a better job.

The service contracts are not carefully monitored by local government and in fact are used as a source subsidizing the collection and transport services, which are usually in deficit, due to the low fees and low collection rates. Additionally, the lack of supervision and monitoring allows the companies to vary their performance in relation to the fees they can collect. Whilst this is a vehicle to provide finding for waste collection, it also generally precludes any supervision or control over the company's service quality and performance in either service.

4. CHROLONOGY OF EVENTS

Turkmenistan was and is still a country with a small population among Commonwealth Independent States (CIS). During the Soviet Union time there was a collection of waste paper, glass containers (bottles and jars) and metal. The glass was reused again as there was one system of bottle and jar production. Paper served as a second raw material, and people could receive talons and buy rare books for very symbolic prices.

Metal was collected by school students and then transported to the industrial centres of the USSR for further usage. Bottles were used at the beer and vine plants.

There was no need for building an incinerator due to low population in cities and towns. There was no any city in Turkmenistan reached one million citizens.

The first incinerator was created in Leningrad (Sankt-Petersburg) then in Moscow and there was planned to build such incinerators in Tashkent and Baltic countries.

In the cities of the USSR over 20-25 tonnes of municipal wastes were generated which contained much quantity of organic substance with high moisture thus it rotted quickly and excreted unpleasant smell. (Kuzmenkova A., 1972)

In February 1990, *Turkmensya Iskra (Turkmen Spark)* filed the following report on a dump located ten kilometers outside of Ashkhabad, the republic's capital:

The dump for common refuse begins far from its official boundaries. All around in a radius of about one kilometer, trash, scrap metal, and rags are scattered about.

Truck drivers from industrial enterprises and even local residents do not drive up to the dump proper, bus discard the rubbish all about. One and one half kilometers from the site, homes stand in the village of Choganli. However, the dump has no borders, and, therefore, no sanitary zone. Trash is everywhere. It is not simply common trash. People often illegally dump industrial wastes containing toxic substances even though they should be disposed in specially arranged facilities.

At the moment the three processes occur in Central Asia:

1. Waste collection and transport;
2. Waste processing;
3. Final disposal

Landfills in Central Asia lack of protection barriers, safety installation, an organized planning for waste deposition, and fences for the prevention of inadmissible entrance.

4.1. Municipal Solid Waste Management since 1990

Very little or almost no investment has been made since 1990 to modernize municipal waste management systems in many Eastern Europe, the Caucasus and Central Asian countries.

However, in recent years there have been emerging cases of major cities in some countries, such as Tashkent in Uzbekistan and Tbilisi in Georgia, making necessary investments in new waste bins, collections trucks and transfer station (European Environmental Agency, 2007).

5. CURRENT SITUATION IN TURKMENISTAN

Current situation in Turkmenistan that has developed owing to social and economic factors defines the special features of production and consumption of wastes.

The sanitary cleaning in Turkmenistan is one of the most significant sanitary hygienic measures, which promote population's health protection and prevention from air pollution, water and land resources. Issues of sanitary cleaning of urbanized zones for Turkmenistan are extremely urgent, firstly due to climatic conditions long summer period with high temperatures.

Utilizing solid municipal and industrial wastes generated in all centres of etraps[1] and velayats of the country becomes one of the serious problems. Only in Ashkhabad landfill (polygon) 10,000,000 m^3 of solid municipal wastes are generated. This tendency tends to grow. Furthermore, part of the solid municipal wastes and constructive garbage are not taken to the polygon and simply dumped around the city. There are 9 unsanctioned dumps around the capital: southern and western parts of the districts Mir and in the southern part of the district 11, where the author lives, as well as, in Karadamak and other parts. This situation makes the citizens apprehensive. It reinforces the probability appearing epidemic diseases of people and cattle. In the city itself, the municipal wastes from industrial integrated plants of municipal economies of etraps are not

[1] Etrap and velayat-administrative divisions of Turkmenistan

removed. The reasons for that are lack of techniques and details for transport. This is responsibility of Hakimlik (Municipal Administration). Therefore, the street cleaners burn the wastes in the garbage bins what creates unpleasant and hazardous odor. Current administration strongly prohibits to burn wastes in the garbage bins.

Another sharp problem is utilizing and recycling solid municipal wastes. There is no advanced polygon which would require all constructive and sanitary norms. Old dumps are already overfilled. There is an urgent need for building hundreds of advanced polygons in all velayats and in the capital. For this realization, 3000-4000 ha of land is needed. However, there is a solution to not occupying the land, it is a separating collection of wastes at stages of the preliminary accumulation and reusing as secondary materials, building incinerators with the using technology of parolees and output compost fertilizes, high temperature burning garbage with utilizing warmth and obtaining slag and metal. Municipal solid wastes are frequently mixed with the toxic industrial wastes and dumped into the city dumps thus worsening the ecological situation there.

Absence of knowledge about the creation and composition of toxic wastes and dumping the wastes in the polygons assumes the occurring pollution the environment.

Table.2 Accumulation and removal of municipal wastes

	Quantity of creation of municipal wastes	Removed to firing range	Utilized (tonnes)
Total	1085.9	1085.9	0.1
Solid	1051.0	1051.0	0.1
Food	3.2	3.2	0.0
Glass	1.6	1.6	…
Textile	1.1	1.1	0.0
Metal	2.9	2.9	0.0
Wood	1.7	1.7	0.0
Others	1039.5	1039.5	0.0
Liquid	34.9	34.9	0.0

Source: Turkmenstat Prognoz, 1998

At the moment Ashkhabad city is considered to be one of the cleanest cities in the world. Cleaning streets and empting the garbage bins is paid much attention. According to the national programme to turning Ashgabad into the city of white marble, the collective of industrial association carried out numerous activities from January to April 2009.

Table. 3 Report on carried out work on cleaning and well-designing the city from January to April 2009

#	Type of work	Unite of measurement	Plan for January-April 2009	Facts for January-April 2009	Increase
1.	Abduction of garbage and solid wastes from burnt houses.	Thousands of m^3	769,0	922,8	120,0
2.	Catch of homeless animals and corpses with the purposes of fighting diseases.	Numbers	4400	15007	341,0
3.	Repairing water pipe hatches and cleaning ariks	Km	86	210,8	245,0
4.	Processing containers and garbage bins with chlorine at sites	Numbers	7333	7335	100,0

5.	Painting trimming on the edges of the highways	Km	806	944,8	117,2
6.	Collection from the population for providing services	Thousand of manat[2]	440,0	283,4	202,8

Source: Ashgabad Hakimlik (City Administration), June 2009

In February 2009, the first incinerator was opened in Rukhabad etrap (region) of Akhal velayat. According to the decree of the President of Turkmenistan, the construction of the complex on recycling wastes was carried by the Turkish company “SEHIL Inshaat Endustri ve Ticaret Limited Sirketi in the sum of $ 30, 816, 000 US”. This enterprise will specialize on the recycling municipal and medical wastes which is one of the effective measures for solving actual tasks in the sphere of nature protection.

It is common knowledge that incinerating the wastes at the incinerators and keeping them in the landfills does not resolve the problem as the wastes return into the nature under the guise of polluted atmosphere, soil, and water.

According to the requirements of ecological security of utilization of municipal wastes envisages their preliminary sorting for excreting from the mass valuable fractions which can serve as secondary raw materials.

[2] Manat-currency in Turkmenistan. $1=2.84 (Turkmen Manats) TM

This approach allows to comprehensively resolving several tasks at once-reduce ecological load on the region, improve sanitary situation and provide with valuable secondary resources, for instance, literary trash (paper and textile) is an excellent raw material in paper production. Turkmenistan lacks paper and imports from other countries. The same approach is applicable to sorting plasmas for municipal and industrial industries, as well as constructive polymer materials and details.

The Rukhabad incinerator, whose capacity is 750 tonnes per day, will be able to recycle or incinerate all wastes coming form the residential sector, medicine and business organizations.

In the territory of the plant, the special corpus is built for utilizing potentially hazardous medical wastes. There is automatic system of French company “ECODAS” installed which anticipates their sterilization and grinding.

6. ANALYSIS AND DISCUSSION

Ecological situation with the MSW is better in Ashkhabad and the places which are located near the capital and big cities such as Mary, Dashoguz, Turkmenabat, Turkmenbashi and Nebitdag as the wastes are taken away into dumps and incinerator in Rukhabad. Worse situation is in country side where the garbage in not taken away and just burnt or accumulated in the pits. It generates ecological problems such as polluting water, air and land suitable for growing crops.

For the government of Turkmenistan, solid waste does not exist urgently. The wastes are removed in cities and towns in time. For the first time, it might seem that the problem does not exist at all. What happens to the wastes further, it is a question. It is strongly prohibited to burn wastes in the garbage bins opposed to what used to be several years ago. The government pays more attention to other ecological problems such as the problem with Aral Sea, desertification, the sharing the Caspian Sea and its resources. There was a municipal project to be realized in all Central Asian countries at the Ministry of Nature Use of Turkmenistan. But due to some unknown reasons, this project was cancelled and rejected. The author could not find why it was implemented into practice.

The author has come across difficulties getting information from the Statistical Centre, Hakimlik (City Administration) and the Ministry of Nature Use of Turkmenistan.

The current situation is not favourable. The only incinerator which is not functioning properly, where only separation takes place there and basic substances such as paper, glass, metal and toxic elements from medical institutions, enterprises and industries.

Main MSW Generators in Ashkhabad:

Family houses (one-, two- and tree-storey detached houses);

Residential blocks of houses;

Public institutions (schools, kindergartens, universities, hospital, and others);

Commercials organizations (cafes, dukans[3], shops, hotels, bazaars, and others)

6.1 Current sanitary cleaning in Ashkhabad

At the moment much attention is paid to waste collection and transportation in the streets of the city. All these activities are funded by Hakimlik (City Administration). The absence of private municipal waste companies generated or continued "Subbotniks". During these activities, pupils, students and workers of all state organizations are supposed to go out or come on Saturday to clean the nearby territories: collect the waste, sweep the roads, and plant the trees. These measurements have positive sides as there is a lack of street collectors and other staff. Also it saves some amount of money for the Hakimlik (City Administration).

According to Hakimlik (City Administration), there are more than 61,000 family houses on the territory of Ashkhabad which located in the districts Hitrovka and

[3] Dukan-a commercial shop in Turkmenistan

Berezenghi. In Berezenghi private houses are being removed and replaced by the skyscrapers.

There are more than 7,200 low- and high-rise multi-apartment buildings in Ashkhabad with some 396,100 apartments. The multi-apartment buildings have various numbers of floors and are spread unevenly throughout Ashkhabad.

Public Institutions include educational, cultural, medical, governmental, communal and other establishments. They all make a contribution into MSW generation significantly.

As Ashkhabad is the major commercial centre in Turkmenistan, commercial sector is one of the strongest contributors into waste generation. There are about 31, 298 commercial businesses and trade enterprises which make up 57.3 percent of the total number.

In Ashkhabad very few facilities and attempts have been undertaken to monitor waste generation. There are around 150 legal and illegal dumps. There is the largest dump and the burning the wastes used to be taken many times.

Only some ecological initiative groups clean and separate wastes in the city and nearby areas such as Gerkdere (50 km from Ashkhabad) at volunteer base (Pic.1). As we can see from this image, even collection and segregation of wastes, cannot resolve this problem due to the lack of garbage bins and timely removal the landfills and incinerator.

Pic 1. Collection and segregation of wastes along the river Chulinka

Author: Artur Nasimanyan

7. CONCLUSIONS, RECOMMENDATIONS AND FUTURE RESEARCH

7.1. Conclusions

In concluding part, the author summarizes his findings of his research and tries to answer posed questions.

The current situation with solid waste in Ashkhabad is warning. The only incinerator in Rukhabad is only segregating the wastes and does not incinerate them thus is not functioning properly. Some segregated wastes such as paper, glass, metal and some plastic containers are reused for other purposes such as milk, honey, cotton oil and traditional drinks chal[4] and kumis[5].

1. *What can be done do reduce the accumulation of wastes and the ways of sorting and recycling?*

The tendency for growing the municipal wastes is evident. The population of the country still increases. Rural citizens migrate to the cities and towns. Along with this, consumption increases too.

Accumulation can be reduced or at least be the same if the sorting takes place directly in the microregions.[6] Some of segregated materials could have been gone directly to the consumers thus it would take almost no expenses and energy. The rests of food is already used by the businesspeople for feeding worms (biogumus) (See Pic.1)

2. *What consensuses would be and how much time it would take for city population to change their behaviour and attitude toward treating solid wastes?*

[4] Chal-camel's milk
[5] Kumis-horse's milk
[6] Ashkhabad is divided into microregions such as 1, 2…and Mir, Gaudan etc.

The population of Turkmenistan used to live and still lives in one-, two-storey detached houses where municipal wastes have always been outside in their gardens. The same model was used during the Soviet time when skyscrapers were built and the wastes were disposed in the houses themselves. It generated unpleasant odor and decay of food wastes. Illegal disposal still takes place even though dumping is strongly prohibited. The dumping and disposal are caused as by the households as military units and industries.

It would take not only one generation to change the attitude and behaviour of the citizens. The measures have been undertaken to reduce and eliminate the polluting the city and the streets. The first President Saparmurat Turkmenbashy enforced the rules against littering the city. It included as disposing the municipal wastes as simple throwing cans, buds, and other things from the cars and pedestrians.

Creating the competitive recycling companies which would compete at the market and sell secondary raw materials will reduce using natural resources. Introducing economic instruments such as a levy will let intervene measures to address the problems with the municipal waste management. It will force to change citizens' behaviour to re-use the goods such as plastic bags, packets and bottles longer.

Laws should be improved by punishing for illegal dumping and awarding the companies or reducing taxes if they realize the recycling programmes.

Educational programmes at kindergartens and schools on solid waste and further its recycling will change the new generation's behaviour and attitude toward the

municipal solid waste. It will fill in the gaps in consumers' awareness on the environmental impacts of careful usage of mineral resources.

By introducing the separate garbage bins will simplify the work of street cleaners and garbage collectors. Many people who run their own businesses seek for food for their cattle, and other people take old clothes and empty containers for their needs. Separated stuff could be sold for symbolic prices to them. These finances can serve as payment to municipal city administration which would distribute it according to the city's needs.

Pic. 2 Breeding worms on the base of food rests.

Author: Maral Akhmammedova

3. *What are adverse environmental impacts?*

Replacing paper, glass and other resources to plastic ones leads to undesirable effects on the environment contributing to air pollution as burning chemical wastes, plastic (bags, packets and bottles) lead to contaminating the atmosphere as the burning the process requires a careful approach in capturing the chemically harmful substances before letting the smoke go into the air. It generates more investments into purchasing new technologies. Using the plastic is more convenient and easy to use. It is more rational to use secondary products by the means of recycling and reusing. Some recycling and reusing are being done both in Ashkhabad and in the country in the hole. Good examples can serve reusing the plastic and bottles for selling various liquids (cotton oil, honey and traditional drinks such as chal and kumis).

Dumping and storing in the dumps (polygons) affects soil and underground water contamination. It will continue if the segregation is not done. The toxic wastes such as batteries, medical wastes and other things should be kept in a separate designated place.

7.2. Recommendations

The adverse environmental impacts on environment have not been observed due to remote landfills' allocation from the populated areas, absence of big water drainage systems and availability of unoccupied areas.

In order to manage municipal wastes from the households the following should be focused:

- Setting up the database on waste;
- Introducing the monitoring for waste disposal sites;
- Introducing interregional sharing of facilities;
- Increasing recycling share by providing economic support to the relevant enterprises;
- Raising awareness and public participation
- The problems of separation;
- Construction of modern landfills;
- More stricter control over preventing from arson of the wastes;
- Utilization of toxic wastes especially pesticides and wastes from oil;
- Improvement of legislative and normative legal base;
- Detailed inventory of all types of wastes;
- Rational construction of garbage-processing plant in Ashgabat;
- Development of waste management programmes that would define the regulations and statistics reports'

- Introduction of environmental education and awareness raising programmes at kindergartens, schools, colleges, universities and enterprises;
- Development and introduction courses on waste management at Turkmen State University named after Magtumguli and Turkmen Polytechnic Institute where there are environmental departments and specialists;
- Setting up data collection and monitoring on municipal solid waste and their transparency in the media;
- Setting up a separate collection, and recycling of solid municipal waste in the 3 velayats of the city Ashkhabad: Azatlyk, Nyazov and Nebitdag;
- Installing low-waste technologies into production;
- Surveying of existing and functioning waste disposal sites;
- Modernizing existing municipal waste solid landfill sites;
- Rehabilitating territories of closed waste dumps and landfills
- Developing and introducing technologies to utilization of medical and hazardous wastes;
- Purchase the vehicles which work on energy-saved fuel and services of these machines could be done and/ or repaired at places of their location;
- Introducing coloured waste containers for separating waste;
- Replacing waste containers and their production locally;
- Selection of containers which would be appropriate to the regions and districts: on wheels where are regularly paved streets; waterproof when it

rains much; heavy when there are strong winds and other possible features which might be needed in all situations;

- Registration of new landfills and their monitoring;
- Improvement of waste control; deposition of hazardous wastes in separated areas (avoidance of co-disposal);
- Prevention of uncontrolled site access;
- Careful monitoring landfills: extinction of surface and subsurface fires, and their future avoidance (higher waste compaction and covering);
- Collection of leachate in controlled artificial water bodies (ponds etc) and either treatment and re-filtration;
- Capture and utilization of Landfill Gas (CDM) projects

At present, the more available and reliable construction for rendering harmless of solid municipal wastes is the improvement of landfills (poligons) ensuring the normative of sanitary and special technological rules of protection of environment from pollution.

Landfills serve for rendering harmless municipal garbage, wastes from the cultural municipal, commercial, and buildings for administrative purposes, street estimate, constructive garbage, food wastes as well as agricultural wastes.

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Table 4.The reduction of wastes

2001	2005
1287.0 thousands of tonnes	992.7 thousands of tonnes

Source: UNDP Report, 2005

From this table it is noticeably visible the reduction of wastes especially constructive garbage, food wastes, glass, plastic, and metal.

Current expenses on land protection from production and consumption were 2.5 billion of manats (around 10.5 million of US) or 8.4% of all expenses for nature protection. (UNDP Report, 2005)

7. 3. Future Research

In the author's opinion, the further research is needed. One of the research questions will be "Why does the government of Turkmenistan not consider the Municipal Waste" not a problem in Turkmenistan and gives other priorities to environmental problems? At first, the municipal waste problem does not seem evident as the streets and garbage spots are treated well and transported timely. Another moment that could be considered: future possible usage secondary raw materials.

Appendix I

The questionnaire used for the formal interviews.

1. How long have you been working in this position?
2. What projects do you have? Describe them.
3. Are they effective and efficient in your opinion?
4. Why some projects are were cancelled?
5. What urgent problems do you see in MSW in Ashkhabad now?
6. How do you think public participation could be included in decision-making processes in pilot projects?

Appendix II

The questionnaire used for common residents of districts of Ashkhabad.

1. Do you think the wastes in your neighbourhood are treated well? Explain.
2. How do you think why burning wastes in the garbage bins took place and was prohibited now?
3. Have you ever used secondary material for your own purposes? If yes, which ones?
4. Do you think co-operation between public and governmental officials possible?
5. Do you think there is enough attention paid to recycling programmes as in the capital as in the country in the whole?

Appendix III

The questionnaire used for common garbage collectors and street cleaners.

1. What are the current facilities for treating wastes?
2. What sort of wastes dominates more?
3. Where the municipal wastes are generated or disposed most of all?
4. Does the burning process still take place?
5. Will segregation process will be successful or not?
6. What recycling steps should be undertaken?

Appendix IV

The questionnaire used for entrepreneurs who try to recycle or reuse the wastes directly from the garbage bins.

1. What types of materials or products do you use for your needs?
2. What tools or instruments do you use to extract the things?
3. What difficulties do you have while doing it?
4. How safe will the extracted food or materials be for further usage?
5. Do you any problems with the authorities while getting the products?
6. Would you buy the needed things if they were sold at reasonable prices?

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Abbreviations

BO Bitovie Otkhodi (literally, everyday or domestic wastes)

CIS Commonwealth Independent States

Goskompriroda Gosudarstvennii Kommitet Prirodi (State Committee of Nature)

EU European Union

HHW Hazardous Household Waste

MOE [Turkmen] Ministry of Education

MSW Municipal Solid Waste

TM [Local currency] Turkmen Manat

UNDP United Nations Development Programme

UNEP United Nations Environmental Programme