



RESEARCH REPORT

Research Report on the existing policies and processes regarding the recycling sector, waste generation, production and collection in Mongolia

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ABBREVIATION

BDDS	Baganuur District Disposal Site
BkhDDS	Bagakhangai District Disposal Site
BU	Bulgan aimag
EU	European Union
GIS	Geographic information system
HDPE	High-density polyethylene
KU	Khishig-Undur soum
LDPE	Low-density polyethylene
LEC	Local economy
MDDS	Morin Davaa Disposal Site
MNRA	Mongolian National Recycling Association
MNT	Mongolian Tugrik
MW	Municipal waste
NDS	Nalaikh Disposal Site
NEDS	Narangiin Enger Disposal Site
NGO	Nongovernmental organisation
PE	Polyethylene
PP	Polypropylene
PET	Polyethylene terephthalate
PVC	Polyvinyl chloride
TDDS	Tsagaan Davaa disposal site
TUA	Turiin Uilchlgeenii Angi/ Landscaping Service Unit
TUK	Tohijilt Uilchlgeenii Kompani/ Waste Service Providers
UB	Ulaanbaatar

ANALYTICAL PART

1 INTRODUCTION

This report is the output of activity 1.1 of the project “Sustainable Plastic Recycling in Mongolia”. The subject of the report is the elaboration of the analysis of the current state of waste management and a proposal for the modification of the plastic waste management system in three areas of interest. Specifically, these are the capital of Mongolia, Ulaanbaatar (hereinafter referred to as UB), the city of Bulgan (hereinafter referred to as BU) and the village of Khishig Undur (hereinafter referred to as KU). The main objectives of the study are as follows:

- Evaluation of the state of waste management in the three above-mentioned locations regarding plastic waste from the perspective of technical and organizational solutions and economic needs of the system.
- Proposal of measures and tools for the adjustment of the system and individual elements of the three areas of interest leading to waste prevention, maximization of the use of plastic waste and fundamental reduction of its landfilling to achieve economic sustainability and manageability of the entire solution.

The study considers the objectives for the subject of municipal waste, in specific plastic waste. Plastic management objectives for municipalities result from the current legislation of Mongolia. These include the Law on Waste 2017 and other implementing regulations, including the strategies of Mongolia [1] and Ulaanbaatar [2]. These objectives are mainly the following:

- To ensure separate collection of plastics and their recycling,
- To ensure the use of mixed municipal waste regarding the limitation of landfilling.

The Proposal part is a set of measures and tools that should lead to the improvement and streamlining of the existing system of plastics management in the three areas of different sizes (UL, BU, and KU). The Proposal part reflects the efforts to achieve sustainability and circularity in waste management while respecting the environmental safety of the system. It also includes a proposal for a solution for waste from small business within the municipal system. The study contains a proposal to increase the involvement of the public and other producers of plastic waste in the municipal waste (hereinafter referred to as MW) management system in the communities through a suitable communication campaign. The study primarily used data from the field survey conducted by the Caritas Czech Republic, then the strategy of the city of UB [3], the National Report of the Statistical Office of Mongolia [4] and others. Unless otherwise stated, data from field research are used. When preparing the study, other professional studies or materials provided by the Caritas Czech Republic and other project partners were also considered.

2 GENERAL CHARACTERISTICS OF THE AREA

All three monitored areas are located on the territory of Mongolia (Figure 1), which is a landlocked country in North Asia with an area of 1.56 million square kilometres. Mongolia's climate is extremely continental: winters are long and very cold (down to -30 °C or less), while summers are short and relatively hot (over 30 °C). The country experiences an average of 265 sunny days each year. The Mongolian climate is semi-arid because the annual rainfall does not exceed 220 mm and summer droughts are frequent in many areas. The vast steppes that characterize this country covers more than 80% of the territory. Mongolia has a population of almost 3.2 million, of whom 68% live in cities. Of the total number of 897,400 households, 342,400 (38.2%) live in yurts and 547,000 (60.9%) in houses [4]. Administratively, Mongolia is divided into UB and 21 aimags. Aimags are further divided into soums and baghs.

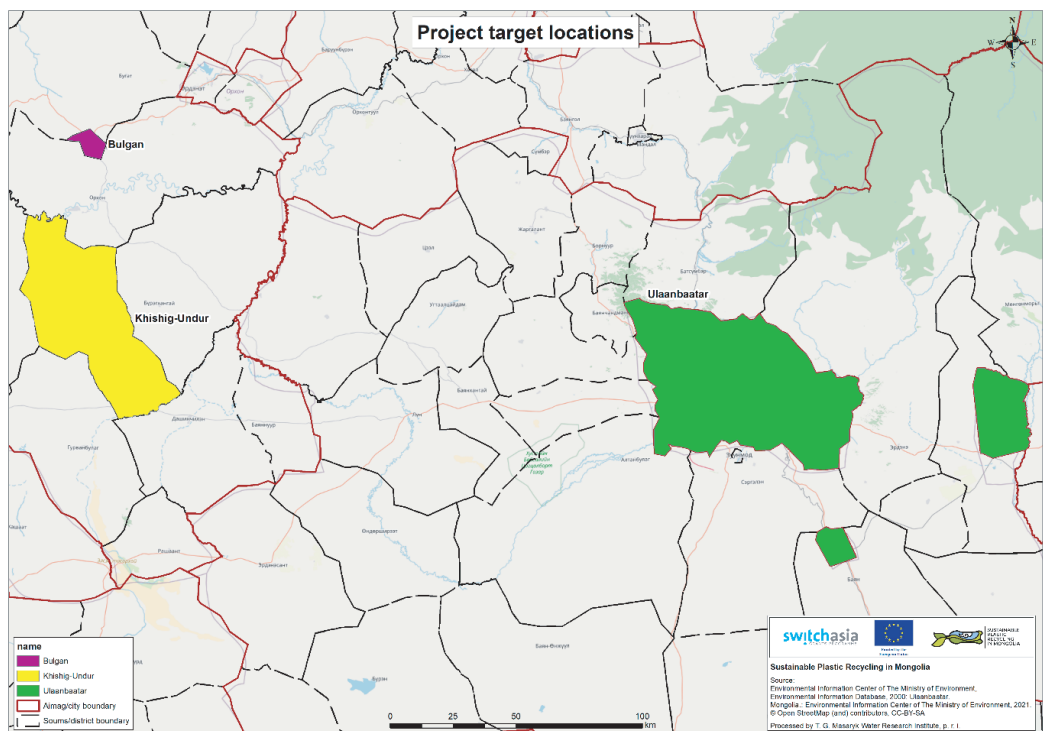


Figure 1. Project target locations

2.1 ULAANBAATAR

Ulaanbaatar is the capital of Mongolia. It lies in the north-eastern part of the country in the valley of the river Tuul and at the foot of the mountain massif Bogd Uul at an altitude of over 1,300 meters. In 2020, almost 1.5 million inhabitants lived in UB and the population density was 311.9 inhabitants/km² [4]. The city is administratively divided into nine districts. Each district is divided into sub-areas called khoroos. There is a total of 152 khoroos in Ulaanbaatar, which are further divided into micro-regions called kheseogs. Each level of government, except the kheseogs, includes a structure of self-government, an elected assembly and elected governors, and structures of state administration. An average of 3.6 inhabitants lives in one household [4].

2.2 BULGAN

The province of Bulgan is located in northern Mongolia and is about 400 km distant from the capital of Ulaanbaatar. In the province of Bulgan, 62 thousand inhabitants live in 19 thousand households. More than half of the households (52%) are located in rural areas and 20 % in the city of Bulgan . The population density in BU is 1.3 inhabitants/km². The Bulgan region has an average of 3.3 inhabitants per household [4]. The province is divided into "soums", consisting of a central village surrounded by nomadic families. Interactions between the individual municipalities are minimal. Villages are isolated [5].

2.3 KHISHIG UNDUR

Khishig Undur is a municipality in the province of Bulgan. KU has 3,200 inhabitants, 2/3 of whom are nomads. On average, 4 people live in one household (2.1 adults and 1.9 children). There are 367 settled households, and 460 households are nomadic [5].

3 LEGAL FRAMEWORK FOR WASTE MANAGEMENT IN MONGOLIA

3.1 LAW ON WASTE

The basic legal regulation defining the obligations and rights of waste generators and other participants in waste management is the Law on Waste.

The purpose of the law is to regulate activities related to the reduction, sorting, collection, transportation, storage, reuse, recycling, waste destruction, and import, prohibition of cross-border movement and export of hazardous waste to reduce the negative impact of waste on human health and the environment, to conserve natural resources and to improve public awareness of waste. The law addresses the following obligations:

- Putting waste into economic circulation through sorting, reuse, and recycling, supporting citizens and businesses involved in these activities, introducing waste-free equipment and technologies, and supporting green procurement.

Requirements for packaging, temporary storage, transportation, disposal, storage and recycling of hazardous waste, registration operators, licensing, monitoring, and

- reporting.

Requirements for the appearance and quality of waste collection containers.

- Requirement for the "polluter pays" principle when calculating waste fees. The manufacturer and importer are responsible for the collection, reuse, and recycling of waste and packaging resulting from the use of certain manufactured and imported goods.

To provide citizens and businesses with waste management education to establish a culture of environmentally friendly consumption, proper waste disposal, sorting and recycling, and knowledge of the negative impact of waste on human health and

- the environment.

3.2 REGULATIONS RELATED TO WASTE MANAGEMENT

Other regulations related to waste management are:

- I** Regulation on Municipal Solid Waste Cleaning, Segregation, Collection, Transportation, Recycling, Recovery and Disposal – Annex of Resolution 32/03 dated February 20, 2020
- II** General requirements for sorting, collection, transportation, recycling, recovering, disposal, and landfill operations of ordinary waste - Appendix to the Order A-443 of Minister of Environment and Tourism dated November 17, 2018
- III** Methodological guidelines for the establishment, operation, and closure of the centralized ordinary waste disposal site - Appendix to the Order A-445 of Minister of environment and tourism dated November 19, 2018
- IV** State central database structure, composition, and information collection procedure - Appendix to the Order A-428 of Minister of Environment and Tourism dated November 12, 2018
- V** The list of the products subject to extended producer and importer responsibility for the generated waste - Appendix to the Joint Order A-429/257 of Minister of Environment and Tourism and Minister of Finance dated November 13, 2018
- VI** Incentive reward procedure for individuals, business entities, and organizations for the implementation of environmentally friendly advanced methods and technologies - Appendix to the Government Resolution No. 290 of 2017
- VII** On prohibiting the single-use plastic bags - Government Resolution No. 189 of 2018

4 WASTE MANAGEMENT FACILITIES

4.1 ULAANBAATAR

Waste management is provided by the city management, a department under the mayor's office. The individual districts ensure the gathering and collection of waste by vehicles by dividing the districts into service zones. In UB, waste is collected by 22 companies, jointly called Tohijilt Uilchilgeenii Kompani (hereinafter referred to as TUK), owned mostly by the local government. The purpose of this service is to clean the streets, collect and transport waste produced by households for a fee to the places of disposal. These pickups are direct without the use of transfer stations. The vehicle fleet consists of 278 trucks with an average age of 8 years. There are six landfills in UB. The list of landfills with their capacities is shown in Table 1.

Name	The average monthly amount of waste received [tons]
Narangiin Enger Disposal Site (NEDS)	13 000 – 16 500
Tsagaan Davaa Disposal Site (TDDS)	30 000 – 40 000
Morin Davaa Disposal Site (MDDS)	15 000 – 17 000
Baganuur District Disposal Site (BDDS)	unavailable data
Bagakhangai District Disposal Site (BkhDDS)	unavailable data
Nalaikh District Disposal Site (NDDS)	unavailable data

Table 1. Landfills in UB

Three of the landfills are regulated. At these landfills, the received waste is compressed and covered. The waste is not sorted or otherwise treated at any of the landfills. Sorting lines are not being operated here. UB completely lacks a network of collection containers, as we know them in the EU, but there are more than 200 collection points where collected plastics and other components of municipal waste are handed over to recycling companies. Field survey¹ shows that recycling companies prefer plastics either directly from the source or the collection points. However, collection points are being squeezed out of the UB center due to increasing rents.

There are approximately 24 plastic recycling companies in UB. These companies make up the majority of UB's recycling industry and are under the umbrella of the Mongolian National Recycling Association (MNRA). The list of plastic recycling companies together with their capacities is provided in Table 2.

Name of recycling company	Date of establishment	Type of plastic secondary raw material	End products	Type of technology it uses	Installed production capacity (ton/year)	Number of employees
Od Plastic LLC	2015	ӨНП-HDPE, PE, БНП-LDPE	HDPE pellet and bin bag	Plastic waste, PP, PE, HDPE drum bottle recycling, crushing and washing machine	1000	35
Khev Khashmal Khuvantsar LLC	2011	HDPE, PP, PE	PP, PE pellets, different types of molded plastic products, including construction spacer moldings, chairs, household goods, souvenirs	South Korean modern technology, injection molding machine	1800	11
Ansekhe LLC	2013	HDPE, PP, PE	Electrical conduit, (HDPE), HDPE pellet and big bags	South Korean modern technology	3000	18
Serten Khangai LLC	2017	HDPE, PE, LDPE	HDPE pellet, big bag	Plastic waste PP, PE, HDPE drum bottle recycling, crushing and washing machine	600	40
Undur Akhyn Urguu LLC	2018	HDPE, PP, PE, PET	PET wire/string, HDPE, PP, PE, HDPE pellet /export/	Chinese extrusion line technology	1500	48

Mog Plastic LLC	2014	HDPE, LDPE	HDPE, LDPE pellet	Plastic waste (PP, PE and HDPE), drum bottle recycling, crushing and washing machine	600	6
Jin Hunrui LLC	2003	PET, LDPE	PET wire/string /export/	Chinese extrusion line technology	200	20
Dragon Construction LLC	2017	PET	PET pellet	Taiwanese modern technology	500	12
Gangan And LLC	2006	PET, LDPE	PET wire/string /export/	Chinese extrusion line technology	200	40
Dujin LLC	2006	PET, LDPE	PET wire/string /export/	Chinese extrusion line technology	200	35
Mon Account LLC	2006	PET, LDPE	PET wire/string /export/	Chinese extrusion line technology	200	38
Metro Plast LLC	2008	HDPE, PP	vacuum window frame, water pipeline	South Korean modern technology	700	
San-Orgiu LLC	2005	PE, LDPE	chair, fences, trash bins, trench cover and road speed reducer etc.	Chinese technology	200	6
Ider Iveelt LLC	2018	HDPE, LDPE	HDPE pellet and bin bag	Chinese technology	1080	5
Plastic Center LLC	2016	PE, LDPE	Latrine lining, public chair, well equipment, trench cover, plastic floor, different types of molded plastic products	Russian plastic recycling technology	350	30
Ter Ikh Nuur LLC	2004	PVC	Water pipeline	Chinese technology	200	25
TML LLC	2018	PET, LDPE, HDPE (лааз, хайлш, картон цаас)	PET container, test tube	2018 fully automated PET washing line (Austrian), and extrusion machine (Italian)	20000	50
Multipack LLC	2010	LDPE, PE	Plastic shrink wrap	Chinese extrusion line technology	1500	20
Sod Tum LLC	2015	HDPE, PE, PP	Electrical conduit, (HDPE)	South Korean modern technology	2000	
OB plastic LLC	2005	LDPE, PE	Plastic bags and packaging printed and shrink wrap	Japanese and Chinese extrusion line technology	1000	
Green Plastic UB LLC	2019	PE, LDPE	big bag, plastic packaging	Chinese extrusion line technology	500	10
JBS LLC	2016	PE, LDPE	Plastic shrink wrap	Chinese extrusion line technology	500	8
Tsetsuukh Trade Co. LTD	2020	LDPE, HDPE, PP, уур	pellet	Technology process 1. Cutting, shredding, washing under pressure and drying 2. PE coloring using an automatic machine, melting, extruding, water-cooled solidification; 3. Gas treatment technology: water scrubber, UV filter air purifier, membrane, ozonation disinfection, suction-fan	1440	25

Tumen Egshig LLC	2019	HDPE, LDPE, PP, PE	pellet	Hazardous waste detoxification and neutralization technology (membrane technology)	500	10
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Table 2. Recycling companies in UB²

The current plastic waste management situation in Ulaanbaatar is provided in Figure 2.

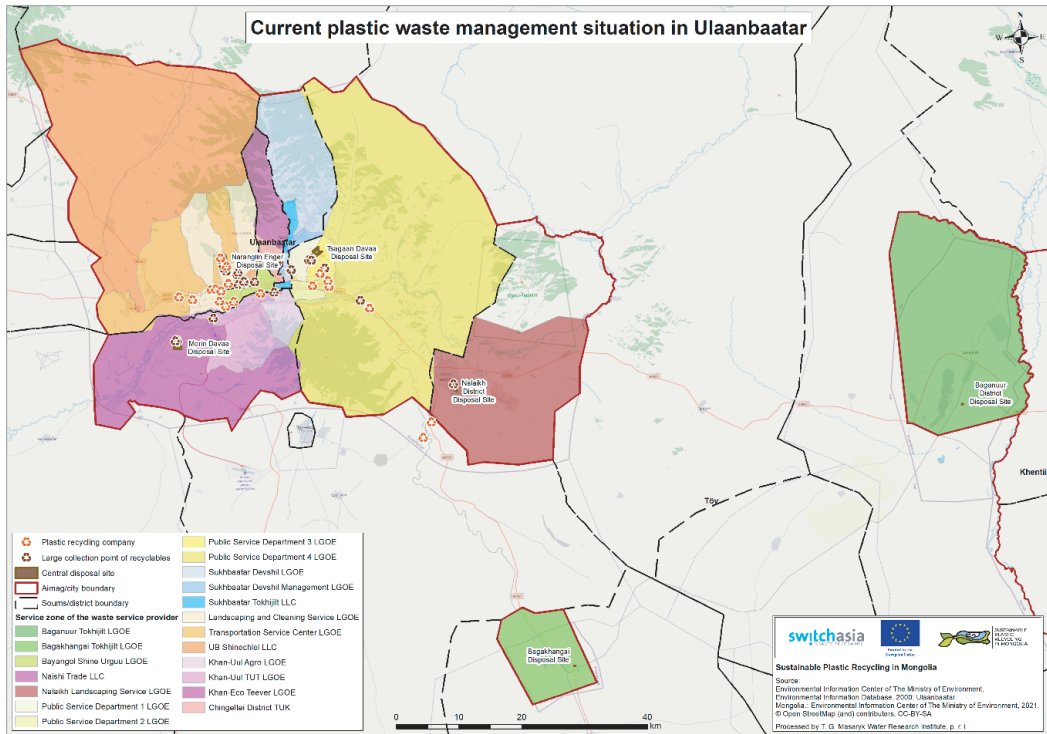


Figure 2. Current plastic waste management situation in UB

4.2 BULGAN



Photo 1. Glass bottles are segregated to be sterilized and re-used

The province of Bulgan is divided into soums, at the level of which waste collection and transport is ensured. This service is provided by one entity only, referred to as the Bulgan Landscaping Service Unit (hereinafter referred to as TUA). TUA is operated under the Bulgan Soum's Governor's Office. There is only one recycling facility in Bulgan, which is currently limited in operation in terms of plastic recycling. Currently, certain types of waste including plastic, glass, cans and organic waste are segregated at the facility to be reused as secondary raw material.

Plastics are sorted, pressed, and crushed. According to the facility operator, the waste treated in this way is temporarily stored in the facility to be sent to plastic processors in UB or to be processed in the facility when technology is improved.

No regulation has yet been enacted in Bulgan to implement the requirements of the Mongolian Law on Waste on the appearance and handling of municipal waste collection containers.



Photo 2. Waste oils and fats are segregated to be processed to produce soap

There is one disposal site in operation in the proximity of BU called Bulgan Central Disposal Site with an approximate daily capacity of 6.5 tons as referred by the Bulgan Governor's Office. The capacity of the landfill is planned only until 2024.



Photo 3. Central Disposal Site in Bulgan soum of Bulgan province

The current plastic waste management situation in Bulgan is provided in Figure 3.

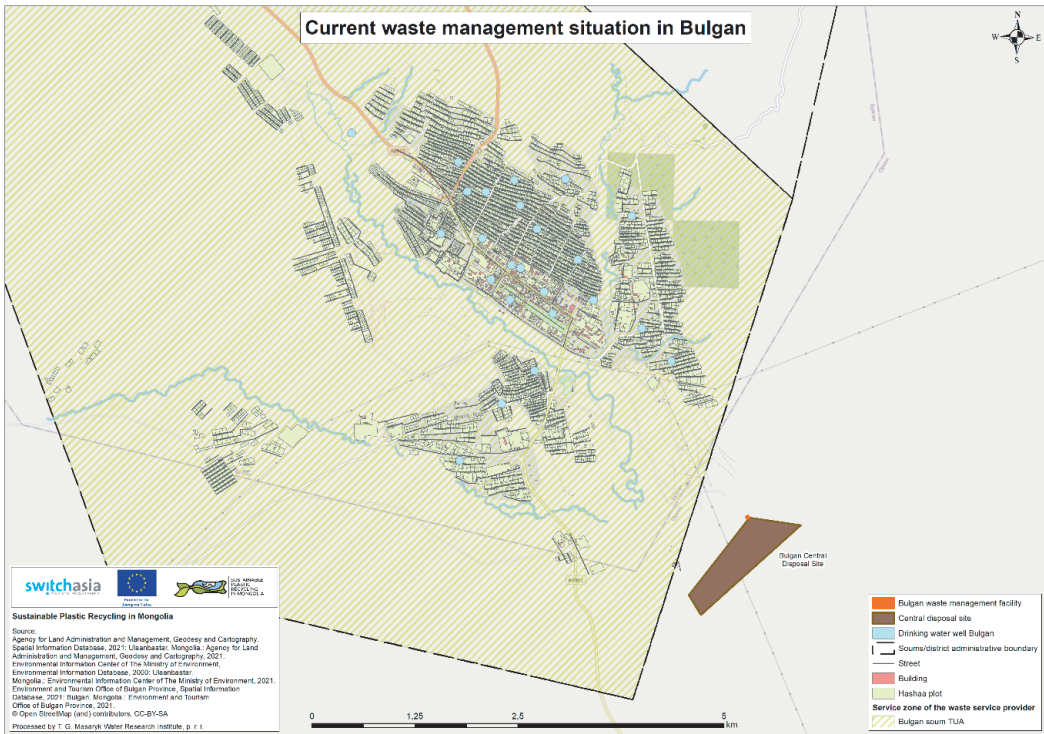


Figure 3. Current waste management situation in BU

4.3 KHISHIG UNDUR

The municipality has not established a waste collection service. The inhabitants of the village are guided to transport produced waste individually to the newly established recycling center. The center is established in the area of a reclaimed municipal landfill and aims not only to collect, sort, process, and store waste but also to provide educational activities [5].

The current plastic waste management situation in Khishig Undur is provided in Figure 4.

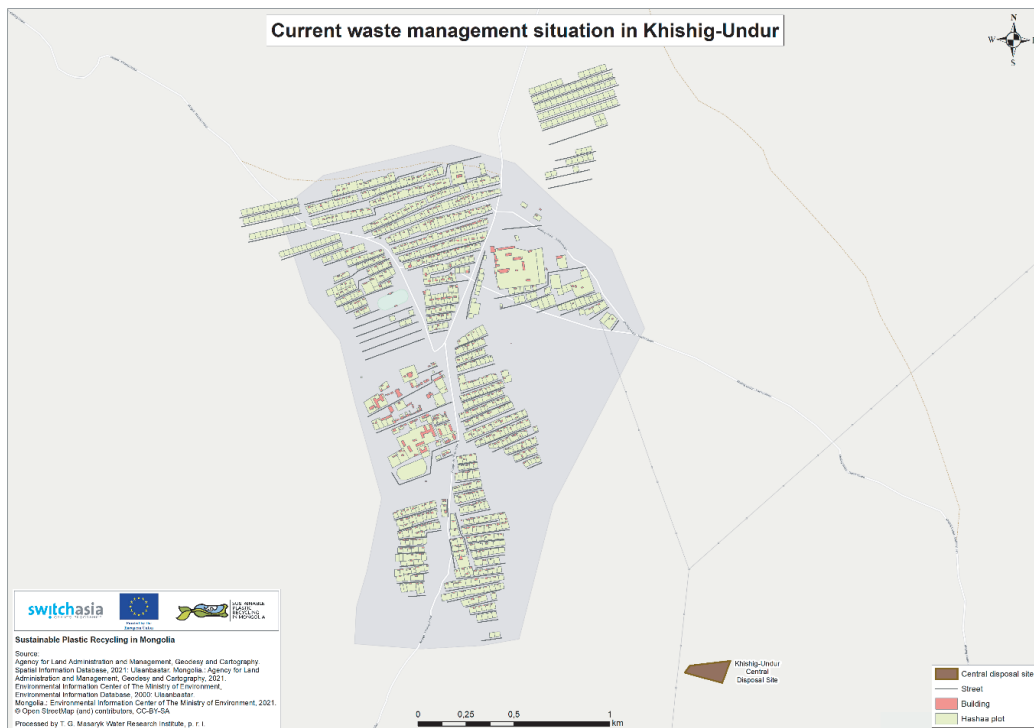


Figure 4. Current waste management situation in KU

5 SERVICE TO LARGER PLASTIC WASTE GENERATORS

All waste producers, meaning from individual households to large shops, institutions, or plastic waste producers, can use municipal collection services (if TUK or TUA service operates in the community). Some large waste producers have contracts for the collection of the plastic waste directly with a recycling company, some arrange their transport by their vehicles. In KU, all producers are motivated to take their waste to the landfill individually. There is a general lack of monitoring and record-keeping of production, collection, and waste management.

6 INFORMING AND EDUCATING THE PUBLIC/ PARTICIPANTS IN WASTE MANAGEMENT

Informing the participants involved in waste management is not systematically addressed by communities. At the same time, the participation of the informed population is one of the basic factors affecting the results and efficiency of the entire municipal waste management system. Appropriate communication and education would improve the active approach of the population to the waste management system aiming to sort and use waste.

Overall, the way of informing the population on the waste management system of cities and communities is insufficient. There is also a lack of public awareness and education on waste prevention and proper waste management.

For the successful introduction or modification of existing technology, it is necessary to create a unified system of education. The individual elements of enlightenment should be used in a focused manner, but they must have a uniform effect on the population. The best approach is to choose a waste management mascot. The work and time devoted to educating and awareness-raising of children is the most efficient one. Children interact with their surroundings at home and motivate adult relatives. Awareness-raising materials can be processed easily and at the same time in an interesting way. It is necessary to constantly educate citizens/producers. In practice, the placement of educational materials on collection points, municipal notice boards, the local press, and similar places have proved successful.

7 PRODUCTION AND WASTE MANAGEMENT

Due to the lack of central monitoring and data collection on production and waste management practices in Mongolia, data from analyzes carried out in other projects were used for this report. Due to irregular monitoring, their accuracy can be questioned, but they are sufficient for orientation in the current waste management system. An overview of waste produced in the individual regions is provided in Table 3.

	Ulaanbaatar		Bulgan		Khishig Undur	
	Summer	Winter	Summer	Winter	Summer	Winter
Food (%)	36	23	24	19	15	30
Plastic (%)	22	14	12	7	23	14
Paper (%)	22	13	11	5	7	4
Metals (%)	7	u. d.	5	5	1	1
Glass (%)	9	u. d.	20	11	30	21
Textile (%)	4	1	4	3	u. d.	u. d.
Ash (%)	u. d.	49	22	27	11	54
Total annual waste production [tonnes]	1,393,753		9,056		276*	
Annual production per person [kg/person]	929		146		86*	
Total annual plastic production tonnes **	250,875		860		51*	

*Note: including ash (own calculation according to Ecosoum data; ** own calculation; u. d. - unavailable data)*

Table 3. Overview of waste produced in UB [6, 7], BU and KU [5, 8] [tonnes and percentages]

The total production varies considerably among the individual communities. Due to the failure to record any data on the production and management of waste, it is not possible to follow the trend of plastic waste production. However, even given the identical global trend in consumer life, a gradual increase in the amount of plastic waste produced can be expected.

The calculation derived annual production of plastics in the city of Bulgan of 860 tons will be suitable to process at the place of waste origin. Appropriate recycling technology will need to be introduced for processing.

Ash, paper, glass, and food are also an important group of waste produced, for which circularity should also be addressed. It can be assumed that the lower production of plastics and paper in winter is caused by their burning in small heating appliances in households or central heating plants. This phenomenon is undesirable from an ecological point of view.

8 PRODUCTION AND MANAGEMENT OF PLASTICS

Plastic waste is entered into a circular economy as secondary raw material by passing through several sources. The first is directly from plastic product manufacturers or importers, who pass on their waste to the processors directly. The second is the employees of the TUK service, who immediately sort plastics into two groups during collection: plastic packaging for beverages and packaging for cosmetic and food products. Recyclable household waste is also collected/sorted in a third way – by private waste collectors (on average they collect and can also sort up to 42 kg of plastics per day), individuals, cleaning and handling workers, and purchased under a contractual agreement with the recycling companies directly, aiming to efficiently manage the recyclable waste. The types of recyclable waste generated in households, offices, factories, shopping malls, and public places in Mongolia are as follows:

- I 1. All types of plastics (*plastic bags - PE, PET, PP, HDPE, LDPE, vacuum window frame - PVC*)
- II 2. Waste paper, cardboard
- III 3. Glass (*bottles - beverages, beer, vodka, jams*)
- IV 4. Waste of nonferrous metals (*copper, lead, brass, can, aluminium alloys*)
- V 5. Waste of ferrous metals (*pig iron, steel, sheet metal, alloys*)
- VI 6. Hazardous waste (*scrap tires, batteries, used engine oil*)
- VII 7. Organic waste (*raw and food waste bones, wood waste, tanning waste, sewage sludge*)
- VIII 8. Industrial ash

Collection points for secondary raw materials purchase secondary materials such as plastics (plastic bags - PE, PET, PP, HDPE, PE, LDPE, vacuum window frame – PVC), glass bottle, metal, aluminium, copper, car batteries, and cans.

8.1 ULAANBAATAR

There are approximately 200 collection points in Ulaanbaatar, members of the non-governmental organization Mongolian National Recycling Association (MNRA). Their operation depends on the season, it is active mainly in the summer (depending on the volume of work). In general, 2-3 people work at collection points regularly; one of them is the owner

of that place/yard. The capacity of the individual sites is in the range of 60 - 20,000 kg. day⁻¹. The most common capacity of collection points is 60 - 300 kg of waste per day. Producers are paid for the waste brought or transported on-site (see Table 4) and after collection, the plastic waste is handed over to a pre-contracted recycling company according to the survey taken from collection points.

Plastic category	Average price (spring 2021)
PET	100-450
HDPE	400-700
PE	300-600
LDPE, PVC, polyolefin	500-800

Table 4. Purchase prices for plastic waste [MNT/kg]

The collection points are not evenly equipped with containers for collecting major commodities such as paper, plastic, glass and metal. The method and frequency of waste collection differ in both areas, i.e., ger areas and residential areas. In residential areas, the households dispose of their waste in waste collection bins outside their apartment, while in ger districts, waste is collected mainly from door to door. The most common frequency of collection by the TUK service is 2 - 4 times a month, and especially homeowners' associations consider it insufficient. A private waste collector collects an average of 41 kg (12.3 tons per year) of plastics per day. There are both open and closed types of waste collection trucks. Most vehicles require predominantly human labor. Some of the trucks have GPS installed to track their position and speed with fuel dispensing sensors installed.

8.2 BULGAN

The plastic collection pickup is provided by only one service - TUA. The collection vehicles (9 trucks) have a cargo space divided into two parts for recyclable and non-recyclable waste. The collection frequency is once every 45 days. This frequency is insufficient. Due to the lack of technological capacity to recycle plastics at the only facility, waste sorting has significantly reduced, as well as a separate collection of recyclable waste.



Photo 4. Sorting line of Bulgan recycling facility

The sorted and crushed plastic is temporarily stored at the facility to be recycled when the operator figures out technology to produce a marketable product in the future or to be further transported to recycling companies in UB. With an estimated annual generation of 680 tons of plastic waste, it would be more appropriate to build one on-site facility and preferably operate the recycling technology in cooperation with the local government. A private waste collector collects on an average 255 kg plastic waste

per day, either directly from producers (households, shops) or publicly available waste containers. The average annual amount of plastic collected per private waste collector is 61 tons. The sorting of plastics is insufficient in the area. One of the main reasons is the lack of sorting containers and the lack of motivation. A possible solution is the support and integration of private waste collectors into the collection system. Private waste collectors can collect and sort plastic waste into individual types so efficiently that it will not be necessary to operate sorting lines for processing. The motivation of the waste collectors is the purchase price paid according to the purity of the sorted plastics.

8.3 KHISHIG-UNDUR

No waste collection service is currently in place. Residents and other producers will be motivated to bring their waste individually to the local collection facility (Waste Management Facility, which is currently under construction).



Photo 5. Under construction Waste Management Facility in KU

According to the local organization Ecosoum, it is sufficient to bring waste 1 - 2 times a month from regular producers. For stores where the largest production of packaging waste is at the time of delivery of goods, the optimal frequency of collection is 1 - 3 times a month. Ecosoum cites the loss of producers' confidence in organizing the collection by the local government, as well as insufficient or unsuitable collection containers as the biggest obstacles to sorting. Awareness of children in schools is at a very good level thanks to the inclusion of the school in the international program "Eco school". There is no recycling company in the area [5].

SUMMARY

To ensure the maximum use of collection containers for sorted waste, the following rules must be followed:

- Locating collection containers in built-up areas with a high population density (e.g., urban areas with high-rise apartment buildings);
- Locating collection containers on routes with frequent movement of persons (routes to shops, offices, hospitals, schools, etc.);
- Ensuring good visibility of collection containers; the locations of the collection containers must be attractive both visually and at the same time they must be easy to operate. The marking of the containers must be unmistakable, clear, and uniform throughout the country. It must meet the requirements of the Law on Waste and its following procedures.
- Concentrating containers for several types of sorted components of municipal waste (plastic, metal, glass, paper, ash, etc.) in one place;
- Ensuring the safety and good availability of collection containers for both residents and service technicians;
- Ensuring the regularity and reliability of the collection service.

Container stations must always be accessible for the collection equipment and for container handling, which in practice can be a major limiting factor. Unsuitable locations can cause damage to the containers (breaking of the wheels when crossing larger obstacles or when pulling the containers out of unpaved surfaces, damage to the bottom when the containers are frozen to the ground, etc.).

An accessible collection network is a basic prerequisite for the active involvement of the population in waste sorting. The so-called density/availability indicator of the collection network is used for comparison. In UB where there are 200 collection points, the resulting availability is for 7,330 inhabitants. If we consider the good practice in the EU, this population density per "collection yard" is optimal, but it must be combined with a network of collection containers. However, this network is missing in UB as well as in BU. As mentioned above, there is only one collection point for 62,000 inhabitants in BU, which is completely insufficient.

9 ECONOMIC DATA FROM WASTE MANAGEMENT

The necessary data are not available to evaluate the economics of waste management. Data from the field survey were summarized for clarity in Table 5.

Type of fee/price	Current status	Note
UB		
The average monthly household cost for waste disposal service provided by TUK	2,650	

Type of fee/price	Current status	Note
The average monthly cost of landfilling per a landfill	12 сая	
The average monthly fee paid by stores for waste disposal service provided by TUK	65,000 for small grocery stores 500,000 for chain supermarkets	Cost varies depending on the size of the store. Most stores were not willing to pay for waste transportation service and considers approximately 18,000 as optimal price
The average monthly fee paid by large producers for waste disposal service provided by TUK	444,000	The average price is 75,000 per 1 load
The average monthly fee paid by the public institutions: kindergarten -school -hospital for waste disposal service provided by TUK	- 105,000 - 90,000 - 340,000	Big differences between institutions
The average cost of transporting 1 ton of plastic waste for recyclers	333,000	Big differences between individual companies
BU		
The representatives of the municipality estimate the costs of introducing the sorting system and purchasing a sorting bin	20-490 million for the sorting system; 550,000 per a sorting bin	
The total annual cost of landfilling at a central disposal site	30-35 million	
The average monthly household fee for disposal service	Fixed service rate of MNT 2000 per household per month	
The average monthly cost of public institutions: kindergarten -school -hospital for waste disposal service provided by the TUA at	25,000 -140,000 -70,000 Service rate: MNT 5000 per m ³ of waste	Big differences between institutions
The average monthly cost of shops for waste disposal service provided by TUA	80,000 Service rate: MNT 5000 per m ³ of waste	
KU		
The average annual household income[5]	8.3 сая	
The monthly payment for produced waste (monthly payment without considering weight or volume)	7,500	Ecosoum plans 12,000 for a full truck; 2000 for a 200-litre bag; 1000 for a 70-litre bag
The estimated average monthly cost for transportation of one ton of waste to BU (in MNT)	50,000	
The estimated average monthly cost for transportation of one ton of waste to UB (in MNT)	80,000	
Mongolia[4] Monthly income per household as of 2020:		
- Countryside/rural area	966,600	
- Soum center	1,130,500	
- Aimag center	1,321,000	
- UB	1,680,900	

Table 5. Data from the field survey [MNT]

In the opinion of the TUA Director, the main problem with solid waste management in Bulgan is the lack of operational funding for better waste management. The Law on Waste of 2017 stipulated that a fee for the waste service will be collected from each member of the household. Before the entry into force of this Law, the fee for households used to be fixed regardless of the number of household members. Despite the amendment to the Law on Waste, this practice is still applied by the Bulgan authorities and thus it does not comply with the new regulations. Due to this situation, the collected money for waste management from the waste service fee is still not enough to cover operating costs.¹

In KU, shops transport their waste to the landfill themselves and do not pay any fee. Sometimes, they take the waste home, mix it with household waste and then take it all to the landfill themselves. In the event of starting a collection service embracing local private entrepreneurs - truck owners, the shops would be willing to pay an amount between 5,000 – 20,000 MNT per month (depending on the amount of waste). The proposed distribution of prices in KU is good. Waste producers/households should be provided with bags for sortable waste and bags for mixed municipal waste for a fee or refundable deposit.

SUMMARY OF THE ANALYTICAL PART

The Analytical part described the waste management system in the municipalities of Ulaanbaatar, Bulgan, and Khishig Undur (as of spring 2021). Most of the data come from a field survey and document review performed by the Caritas Czech Republic, Ecosoum, and ESCM. Overall, the plastic waste management system of all municipalities can be assessed as non-functional. The shortcomings of the system are mainly the insufficient sorting and collection of produced plastics, low effectivity of spent resources, the low utilization efficiency of municipal plastic waste, high rate of landfilling, and probably also domestic incineration.

Waste management system

- The system of gathering, collection, transportation, sorting, use, and disposal of municipal waste is governed by existing legislation, but law enforcement is minimal.
- Citizens and other producers are charged fees for the operation of the system of gathering, collection, transportation, sorting, use and disposal of municipal waste, differing from community to community. The amount of collection fees also varies within one service (see payments for waste collection for institutions).
- Waste collection is provided by services designated in Ulaanbaatar - TUK and Bulgan - TUA. The TUK and TUA services are managed at the level of districts and soums. Waste producers also use the option of individual removal of their waste directly by a recycling company or to a landfill. The same system works in Khishig Undur. The recycling companies have good experience with the collection of the waste directly from the large waste producers, which ensures high cleanliness. Cleanliness is considered in the purchase price.
- There are 24 recycling companies, 6 landfills and approximately 200 collection points in the city of Ulaanbaatar. There is only one pick-up collection service and one landfill in Bulgan. The collection point with partial recycling of plastics is not fully

operated due to capacity reasons. There is only one landfill operating in Khishig Undur, a collection/recycling center is planned on the site.

Waste generation and management

The total waste production in Ulaanbaatar is approximately 1,393,753 tons, in Bulgan it is 9,056 tons and in Khishig Undur 276 tons. The percentage of plastic production averages 19 per cent in summer and 12 per cent in winter. In Bulgan, the representation is lower compared to UB and KU. The reason for the difference is unknown. The production of ash in winter is very important, representing an average of 32% in all three areas. This type of waste, together with paper, metal, glass, and biodegradable waste, should also be sorted.

The main collection methods are the TUK services in UB and TUA services in BU. In KU, producers transport waste individually to a landfill. In UB, waste is collected from ger areas using a "door-to-door" system. For households in apartment buildings, waste is collected by delivery using collection containers. The sorting of plastics in BU and KU is almost non-existent. In UB, the handover/collection of plastic waste is provided by private individuals through 200 collection points or by the producers themselves. There is no collection network of sorted plastics in any pilot community. Limited, dirt-contaminated, and fluctuating quantities of plastic waste do not allow maximum utilization of the capacities of recycling companies. The economic analysis was not performed due to a lack of data.

PROPOSAL PART

The basis for the adjustments of waste management of the cities of Ulaanbaatar, Bulgan and the village of Khishig Undur, or respectively a community of a similar size are as follows. The Proposal part of the study introduces measures that should lead to the streamlining of some areas with an emphasis on the applicable hierarchy of waste management, i.e.:

- Waste prevention (prevention)
- Reuse
- Material recovery (recycling, composting)
- Energy recovery
- Landfilling

Regarding municipal waste, it is necessary to pursue the objectives set by the Green Development Strategic Action Plan for Ulaanbaatar 2020 and Mongolia National Waste Management Improvement Strategy and Action Plan 2017-2030 for municipal waste (MW recycling, landfill restrictions and ban). The objectives are also a part of the Law on Waste.

The Proposal part summarizes the initial state of waste management in the selected cities and the community and framework conditions for their further development. It proposes technical and organizational measures that should contribute to the improvement of the state of waste management in the pilot cities and community and enable their further development.

THE INITIAL STATE OF WASTE MANAGEMENT OF PILOT COMMUNITIES

As already mentioned in the summary of the Analytical part of the study, waste management of the pilot communities is not fully functional and does not meet the requirements of good practice. The solution of deficiencies in the waste management system on which the Proposal part of the study focuses is the following:

1 WASTE MANAGEMENT SYSTEM

- Low level of sorting of usable components of MW,
- Insufficient provision of containers and baskets for sorted plastics,
- Insufficient availability of the collection network for plastics collection (need to strengthen the collection network),

- Insufficient records of production and methods of municipal waste and plastics management,
- Insufficient information and education of the population to increase active participation in sorting and use of MW,
- High mixed municipal waste production,
- The municipalities do not have rules for the collection network for mixed municipal waste and do not motivate citizens to limit it (revision of the collection network, review of the reported waste weight, setting rules for the number and volume of containers according to the number of people in households),
- High rate of landfilled waste,
- The city does not meet and in the current setting will not meet the targets for waste recycling and the landfilling reduction (reduce the production of mixed municipal waste, bulky waste, sorting and utilization of bulky waste, inter-community cooperation to ensure the use of a common recycling line),
- The municipalities do not own basic infrastructure for waste management, do not initiate infrastructure construction and are dependent on service providers,
- The BU and KU administrations do not have their collection yard or a recycling plant (consider setting up and increasing the capacity of the existing collection point in BU),
- The municipalities partly own only the collection network for usable components of MW,
- The municipalities do not carry out any waste prevention activities,
- The municipalities do not deal with the waste produced by MSMEs (possibility of involvement in the circular waste management system or their systemic control),
- The municipalities do not have an accurate overview of the costs of individual services in waste management and do not regularly evaluate them.

SWOT ANALYSIS

The proposal part is based on SWOT analysis (Tables 6 - 8) that summarizes all the facts, strengths, and weaknesses of waste management systems in the individual pilot areas. Opportunities for their further development and threats associated with maintaining the status quo without responding to the identified shortcomings are also presented.

Strengths	Weaknesses
<ul style="list-style-type: none"> Existence of legislative regulations on waste-related subjects, The interest of the city management in dealing with waste management, 	<ul style="list-style-type: none"> Low level of sorting of usable MW, High and uncontrolled production of mixed municipal waste, High rate of landfilled MW, The city does not own sufficient infrastructure for waste management (collection containers, collection yard) and lacks the knowledge of the use of collection containers, The city does not keep records of production and disposal of MW and separated plastics
Opportunities	Threats
<p>Improvements in the waste management of the City:</p> <ul style="list-style-type: none"> Strengthening of sorted waste collection, solutions to integrate entrepreneurs into the waste management system and waste prevention, Setting up a controlled system for the gathering and collection of mixed municipal and plastic waste, <p>Cooperation of municipalities:</p> <ul style="list-style-type: none"> Ensuring the use of recycling technologies by other municipalities. 	<ul style="list-style-type: none"> Non-fulfilment of legal obligations and commitments of the strategies of Mongolia and Ulaanbaatar, Significant deterioration of the environment when landfilling is continued, High costs when plastic waste is not returned to the circular economy.

Table 6. SWOT Analysis of Waste Management of the Ulaanbaatar City

Strengths	Weaknesses
<ul style="list-style-type: none"> Existence of national legislative regulations on waste-related subjects, The interest of the local administration in dealing with waste management, 	<ul style="list-style-type: none"> Inexistence of local legislations following the Waste Law of 2017 Low/no sorting of usable MW, Uncontrolled production of mixed municipal waste, High rate of landfilled MW, The minimum rate of recycling, The local administration does not own adequate infrastructure for municipal waste management (collection containers, collection yards and collection points) and lacks the knowledge of the use of collection containers, The lack of technological capacity of one waste management facility, The local administration does not keep records of production and disposal of municipal waste and separated plastic,

Opportunities	Threats
<ul style="list-style-type: none"> • Improvement of the waste management system: • Strengthening of sorted waste collection, the introduction of delivery bags for households for sorted waste with identification (for simple household identification and registration of quantity and cleanliness), • Introduction of systemic education focused on waste prevention, • Solutions for the integration of entrepreneurs in the municipal waste management system and waste prevention, • Setting up a controlled system for the collection and disposal of mixed municipal and plastic waste, • Cooperation of municipalities: • Motivating entrepreneurs at the regional level by the local government to acquire technologies for the processing of waste plastics, paper, and ash from households (together with ensuring an offtake for part of the production). Creation of LEC (local economy) focused on the treatment of local waste, by local citizens/entrepreneurs and with the application of outputs on the regional level. 	<ul style="list-style-type: none"> • Non-compliance with legal obligations and commitments of Mongolia's strategies, • Significant deterioration of the environment when landfilling is continued, • High costs when plastic waste is not returned to the circular economy.

Table 7. SWOT Analysis of Waste Management of the Bulgan City

Strengths	Weaknesses
<ul style="list-style-type: none"> • Existence of legislative regulations on waste-related subjects, • The interest of the local administration in dealing with waste management, • Ecosoum activities. 	<ul style="list-style-type: none"> • Low degree of sorting of usable MW, • Uncontrolled production of mixed municipal waste, • High rate of landfilled MW, • Minimum recycling rate, • The local administration does not own the infrastructure for waste management in the community (collection containers, collection yards), • The community does not keep records of production and disposal of MW and separated plastics.
Opportunities	Threats
<p>Improvement of the waste management system</p> <ul style="list-style-type: none"> • Strengthening of sorted waste collection, integration solution for local entrepreneurs in the local waste management system, the introduction of systemic education focused on waste prevention, • Setting up a controlled system of gathering and collection of mixed municipal waste and plastic waste, • The motivation of entrepreneurs at the regional level by local government, • Introduction of delivery bags for households for sorted waste with identification (for easy household identification and registration of quantity and purity of sorted plastics). <p>Cooperation of municipalities:</p> <ul style="list-style-type: none"> • Ensuring possible use/sharing of recycling technologies among neighbouring/other soums and provinces in the region - an opportunity for local/regional business entities. 	<ul style="list-style-type: none"> - Non-compliance with legal obligations and commitments of Mongolia's strategies, - Significant environmental degradation when landfilling is continued, - High costs when plastic waste is not returned to the circular economy.

Table 8. SWOT Analysis of Waste Management of Khishig Undur Soum

2 PROPOSED MEASURES FOR CHANGES IN WASTE MANAGEMENT

The proposal is based on the findings of the Analytical part of the study and considers the new obligations that the target areas will have, especially in the area of the use of MW. Due to the already solved setup of the waste management system in the community of KU, the Proposal part will focus only on the cities of Ulaanbaatar and Bulgan.

The proposal is divided into two parts:

- List of appropriate measures to improve the waste management system and its components,
- List of measures to improve the organization of the waste management system and its control.

The measures are designed to improve these areas so that the target areas in the field of municipal waste recycling come close to the fulfilment of legal objectives in municipal waste recycling. The actual implementation of the measures will then depend on local conditions and the technical, personnel, and financial capabilities of the target areas.

3 SYSTEM MEASURES

Increasing the plastics sorting rate in MW

Both target areas have very low or no plastics sorting rate. Concerning the fulfilment of legal and strategic goals and the provision of a continuous source of secondary raw materials for recycling companies, it will be necessary to strengthen the existing system in UB or to introduce a new (BU) system for sorting and collecting plastics.

3.1 INCREASING THE NUMBER OF COLLECTION YARD STATIONS/POINTS

3.1.1 IN UB

In UB, it is currently possible to hand over sorted plastic at approximately 200 collection points. The access availability of collection points, due to the absence of a container collection network, is very low. There are approximately 7,700 inhabitants per collection point.

Necessary measures:

- Monitoring and evaluation of the efficiency of existing collection points use. If necessary, adjust the collection frequency.
- Selection of suitable places for the location of collection containers/collection boxes (made of plastic waste that cannot be used otherwise) for plastics in all types of built-up areas. Alternatively, where appropriate, allow residents to deliver plastics individually to collection yards or central containers (central container - a place on

the main routes where there is an increased incidence of inhabitants, e.g., routes to schools, offices, shops, hospitals, etc. - 135 eco bins are planned to be installed in UB1). Equip new places with such unified boxes/containers that can be easily and operatively handled by existing means of transportation.

- Continuous revision and evaluation of the efficiency of the collection network and its gradual expansion. The actual number will depend on the possibility of where to place the container sites in the city. The collection needs to be strengthened, especially for apartment buildings, where there is the largest concentration of inhabitants. The number of sites can be partially compensated by an increased collection frequency, but it is necessary to keep in mind that the delivery distance should be tolerable in local conditions (in the Czech Republic it is 100 meters).
- In the detached house developments, it is possible to expand the bag or container collection "door to door", which is already established. However, it is still necessary to consider the economic feasibility of the service and the expected effect of the service.
- Use the products of local recycling companies (baskets, containers, bags, sacks, and big bags) for collection. Strengthen the local circular economy.
- Keep continuous records at all levels of waste management.
- Local governments should motivate business entities to produce products using plastic waste and oblige the local governments to buy parts of their products for use in the implementation of public contracts.

3.1.2 IN BU

The collection of sorted waste is provided by the TUA service, which operates trucks with divided cargo space for recycled and non-recycled waste. The collection frequency is once every 45 days. BU has only one recycling point for receiving recyclable plastics. After treatment, the collected plastic waste is temporarily stored to be accumulated and further be transported to UB recycling companies or recycled at the facility. At present, the recycling site has limited operation due to technical reasons.

Necessary measures:

- Make the current collection and recycling point/yard fully operational.
- Select suitable places for the location of other collection and recycling points/-yards. Equip new places with unified boxes/containers that are or can be easily and operatively manipulated by existing means of transportation (vehicles of local business entities).
- Continuously monitor and evaluate the effectiveness of the use of the current TUA collection service or introduce other alternative collection/transport companies (or possibly adjust the collection frequency).
- Select suitable places for the placement of collection containers for plastics (possibility to include other sorted components of municipal waste by uniform

- boxes for easier collection). Alternatively, where appropriate, allow residents/producers individual delivery of plastics to collection points or central containers (central container - a place on the main routes where the population presence is increased, e.g., when travelling to schools, offices, shops, hospitals, etc.).
- Use and integration of private waste collectors into the collection system.
- After setting up the collection network, continuously check and evaluate, and if necessary, supplement or increase the collection frequency. Delivery distance should be set according to the local needs/customs (in the Czech Republic it is 100 meters).
- Build a motivation system for all stakeholders.
- Motivate business entities by local government to produce products using waste plastics and oblige the local government to buy part of the production of these products for use in the implementation of public contracts.

3.2 PREPARATION AND IMPLEMENTATION OF A LONG-TERM INFORMATION CAMPAIGN FOR CITIZENS/PRODUCERS ON THE NECESSITY AND IMPORTANCE OF SORTING (COMMON FOR UB AND BU)

Information and education of the population is an important prerequisite for the functioning of the municipal waste sorting system. The current way of informing is insufficient. The citizens/producers should be acquainted with the entire system of waste management. Regarding the sorted waste collection system, the citizens must have:

- General information on the importance of waste sorting and its further use with specific examples from the community - support local recycling companies to use their products in the municipal waste management system,
- Specific information on the methods of gathering and collection of individual types of waste in the region;
- Results of separating sorted waste collection (compared to reference groups) and fulfilment of legal obligations for sorting and recycling of MW;
- All economic information (income from citizens, costs associated with collection, recycling, disposal, municipal subsidies, etc.);
- Introduction of an Internet application, possibly as one of the application modules, where all available information on waste management is provided in one place (see GIS maps).

3.3 CONTRACTUAL INVOLVEMENT OF PRIVATE WASTE COLLECTORS AND PLASTIC WASTE BUY-OUT ENTITIES INTO THE MUNICIPAL WASTE MANAGEMENT SYSTEM (COMMON FOR UB AND BU)

UB uses 200 collection points, where it is possible to hand over the collected plastic waste for a fee. These collection points need to be maintained, developed, and more motivated concerning the citizens. At the same time, there are private waste collectors whose number is not known. By incorporating these entities into the municipal waste management system, for example by municipal regulation, the municipality can obtain an indication of the flow of plastics, determine the locations and rules of their operation, all at minimal investment costs. In addition, this collection ensures very pure secondary materials.

3.4 CHECK THE NUMBER, VOLUME AND LOCATION OF COLLECTION CONTAINERS FOR MIXED MUNICIPAL WASTE (COMMON FOR UB AND BU)

As mentioned in Chapter 7 of the Analytical part of the report, a further increase in municipal waste production can be expected. When collecting mixed municipal waste, it is necessary to carry out continuous monitoring and, if necessary, increase the frequency of collection or change the capacity of the collection containers. Through applications, e.g., such as in mobile phones, citizens'/producers' initiatives can be used, they can themselves report the need to empty the containers.

3.5 CHECK THE MIXED MUNICIPAL WASTE PRODUCTION IN INDIVIDUAL PARTS OF THE COMMUNITY (COMMON FOR UB AND BU)

Similar to point 4, it is necessary to check the production of mixed municipal waste in the community concerning the individual collection routes. The aim is to identify localities with overproduction of mixed municipal waste as well as the sources of mixed municipal waste reported to the municipality by the collection service operators.

To implement this, it is sufficient to weigh the collection cars on the individual collection routes, where the car is filled within the municipality and weighted, for example, when entering a landfill or a recycling plant. The car is weighed before filling and after emptying.

3.6 SETTING THE RULES FOR THE COLLECTION OF MIXED MUNICIPAL WASTE IN THE MUNICIPALITY OF UB AND BU

- Recommendations on the volume and number of containers for family houses, ger areas and apartment buildings.

Based on the performed surveys, it is possible to set basic rules for the number and volume of containers concerning the size of households (e.g., 1 container, 120 l, once a week for 1 - 4 inhabitants in a household). In the target areas, the rules will be enforceable to a limited extent, because due to the predominant number of inhabitants in apartment buildings, the city cannot apply the fee related to the production of waste in a household, i.e., the size and frequency of collection of containers.

- Adjustment of the frequency of collection of mixed municipal waste containers, registration of paid fees for emptying containers (chips, we recommend stamps).

If the municipality completes and expands the collection network for usable components, biowaste and ash, the collection frequency can be reduced.

Restrictions can be made for family houses with the introduction of a compulsory collection of biowaste – for collection in the growing season once in 14 days. With the year-round collection, the frequency can be kept throughout the year.

For apartment buildings, the collection frequency can be reduced, depending on the additional components of the collection network for usable components, bio waste, and ash.

- Set up of alternative payments for municipal waste should be based on the following expectations for the possible new payment system:
 - I) Payments should be motivating and reward community citizens for an environmentally friendly way of waste management,
 - II) Payments should be:
 - a) set up to allow households to influence the level of payment for waste,
 - b) complemented by mechanisms for how households could reduce the overall level of waste payments,
 - III) Payments should contribute to the waste management costs to the municipality, to the extent chosen by the city representatives,
 - IV) Payments should also allow property owners (legal entities) who rent real estate to be charged.

3.7 EMBRACING BUSINESS ENTITIES IN THE COMMUNITY WASTE MANAGEMENT SYSTEM

- Provide a list of entrepreneurs in the city,
- Identify and check active entrepreneurs in the city, how they manage waste, introduce into a municipal decree the possibility of controlling how the business entities/producers manage their waste,
- Evaluate inspections,
- Repeatedly inform on obligations and possible solutions. Business entities must be integrated into the waste management system and it is necessary to constantly cooperate with them as well as with other stakeholders. Do not focus on just one entity, e.g., citizens. The goal is to involve everyone in LEC.

3.8 EVALUATION OF BUSINESS ENTITIES SOLUTION OPTIONS

Processing and evaluation of the options:

1. Regular inspections of business entities and generators in the city or
2. Involvement of business entities and generators with selected types of waste in the city waste management system.

It is necessary to evaluate how the city will proceed and what the possibility of involving legal entities/generators would mean for the city. Their involvement should be legally regulated, for example, by a municipal decree, according to which the city provides a service to the waste generator, the decree sets the price for this service (may be based on a multiple of the local fee or determined by prices/costs of waste management services to the city). The city would thus become the owner of the waste and the business entity/generator would not be obliged to keep records of its waste.

For both options, i.e., for regular inspections or involvement in the city system, it is necessary to consider increased staff requirements and an increase in the administrative procedures for the city. The benefit will be an accurate record of the city's system for collecting fees for waste management system services and other municipal waste management strategies.

WASTE PREVENTION

3.9 ELABORATION AND IMPLEMENTATION OF A WASTE PREVENTION PROGRAM FOR THE CITY

- Develop a unified system of communication with citizens of all ages and business entities.
 - Review the implemented or offered activities by private entities (various non-profit organizations or companies) and citizens in the city.
 - Set up cooperation and support for selected activities.
 - Take measures at the authorities and institutions established by the city.
 - Create an educational campaign for schools and kindergartens.
 - Develop prevention measures for the operation of authorities and municipal institutions.
- Implement their activities (bazaars, unwrapped goods sales, reusable dishware at events, etc.).
- Extend support for the sorting of other components of waste (ash, paper, glass, biowaste, etc.), including active communication with the public.

PRESENTATION AND COMMUNICATION OF THE CITY'S WASTE MANAGEMENT SYSTEM

One of the prerequisites for a functional waste management system is its acceptance by the inhabitants/producers of the city's waste and their participation in it. The current information provided to the population on municipal waste management (UB and BU) is not sufficient and it is necessary to significantly expand and improve it.

Appropriate means of communication should be selected in cooperation with local city officials and NGOs. Selected information channels should be used for the presentation of the entire system, its development, and changes. They will also serve as a support for the solutions being prepared to eliminate or mitigate the shortcomings of the waste

management system. It will also include an evaluation of the waste management system performance and the effectiveness of the individual measures that will be implemented by cities, which will mean changes for residents and other users of the system. It will also be needed to communicate to the city inhabitants the costs of the system and cost development in connection with the planned changes or non-standard behaviour of the population (overproduction of mixed municipal waste, bulky waste, creation of illegal landfills in the vicinity of collection points, etc.).

Measures:

3.10 SETTING THE METHOD OF REGULAR AND FOCUSED COMMUNICATION OF THE CITY REGARDING WASTE MANAGEMENT SYSTEM (UB AND BU)

- Elaboration of a communication strategy and implementation of communication campaign focused on city obligations, system elements, organization, costs, performance using appropriate communication tools for individual target groups (internet, local press, direct mail, discussions, outdoor events, etc.),
- Regular explanation of any changes to the city's waste management system.

4 MEASURES IN THE MUNICIPAL WASTE MANAGEMENT SYSTEM ORGANIZATION

4.1 ESTABLISHING A SYSTEM FOR MONITORING AND EVALUATION OF WASTE MANAGEMENT PERFORMANCE

For monitoring and evaluating the performance and costs involved in waste management, the following measures are required:

- Establish procedures and items that will allow evaluation of waste production by type, according to the methods of collection, according to the methods of waste management,
- Regularly (1x in a quarter, total 1x annually) monitor the development of waste production according to types, methods of collection and methods of management. 1x in a year carry out a comparison with comparison groups using published data on the costs to municipalities in waste management.

4.2 ESTABLISHING A SYSTEM OF MONITORING AND EVALUATION OF WASTE MANAGEMENT COSTS

In the evaluation of waste management costs to the city the financial department should be involved, as well as authorized municipality personnel who will oversee municipal waste management operation (from the point of view of local government responsibilities in waste management). To evaluate the costs, it is necessary to:

- Determine unambiguously the waste management cost items to the city so that the costs can be assessed concerning the scope and actual performance of the service provided according to the city budget.
- Check costs by item regularly (at least once a year) and make comparisons with comparison groups.
- Establish clear outputs on the waste management costs and their components for the work of city officials.
- Identify and describe the cost items of other services provided by subcontractors to the city.

4.3 PERSONNEL PROVISION FOR MUNICIPAL WASTE MANAGEMENT OPERATION

The management of the city's waste management must be strengthened so that the authorized employee or employees have sufficient time and space for monitoring, evaluation, control of the entire system, preparation and implementation of measures taken for system development. Authorized staff should not perform tasks related to the performance of state administration in the field of waste management provided by the city but should focus only on tasks related to ensuring effective waste management in the city.

- Establishment of a separate position for employees for the management and control of the waste management system in the city.

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