



SUSTAINABLE
PLASTIC
RECYCLING
IN MONGOLIA

WASTE MANAGEMENT BASELINE STUDY REPORT KHISHIG-UNDUR SOUM



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SUMMARY REPORT

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TABLE OF CONTENTS

INTRODUCTION	5
OVERALL WASTE MANAGEMENT SITUATION IN KHISHIG-UNDUR SOUM	5
LEGAL FRAMEWORK OF WASTE MANAGEMENT IN KHISHIG-UNDUR.....	5
WASTE MANAGEMENT ACTORS IN KHISHIG-UNDUR.....	6
WASTE-RELATED DATA COLLECTION IN KHISHIG-UNDUR.....	6
GENERAL LEVEL OF AWARENESS REGARDING WASTE ISSUES IN KHISHIG-UNDUR	7
CURRENT WASTE MANAGEMENT SYSTEM IN KHISHIG-UNDUR.....	7
WASTE PRODUCTION, BURNING AND AT SOURCE SORTING.....	7
INTERMEDIARY COLLECTION POINTS AND STREET BINS	8
WASTE COLLECTION AND TRANSPORTATION TO DUMPSITE.....	8
WASTE DISPOSAL AND DUMPSITE EXTENSION	8
WASTE RECYLING AND REUSING.....	8
WASTE MANAGEMENT EQUIPMENT	9
OCCASIONAL PUBLIC CLEANING	9
MAIN WASTE PRODUCERS IN KHISHIG-UNDUR	9
HOUSEHOLDS	9
SEDENTARY HOUSEHOLDS (VILLAGERS).....	9
NOMADIC HOUSEHOLDS (HERDERS).....	11
PUBLIC INSTITUTIONS	12
SOUM ADMINISTRATION	12
HOSPITAL	13
SCHOOL.....	14
KINDERGARTEN.....	15
PRIVATE COMPANIES.....	15
SHOPS.....	15
RESTAURANTS	16
CENTRAL HEATING PLANT	16
KEY ISSUES AND RECOMMENDATIONS TO IMPROVE WASTE MANAGEMENT IN KHISHIG-UNDUR	17
LEGAL FRAMEWORK ON WASTE.....	17
SOUM FINANCIAL RESOURCES AND LOCAL WASTE-RELATED TAXATION.....	17
WASTE WORKERS	18
WASTE MANAGEMENT FACILITY	18
WASTE MANAGEMENT SCHEME.....	18

INTERMEDIARY WASTE COLLECTION POINTS AND STREET BINS	19
DUMPSITE.....	19
PUBLIC WASTE COLLECTION	19
PUBLIC SERVICE INDEPENDENT OF MARKET PRICES.....	20
AT SOURCE WASTE SORTING EQUIPMENT	21
AWARENESS-RAISING AND TRAININGS	21
INTEGRATION OF HERDER HOUSEHOLDS IN THE WASTE MANAGEMENT SYSTEM	22
FOCUS ON MAIN TYPES OF WASTE TO BE MANAGED IN KHISHIG-UNDUR	23
GLASS.....	23
PLASTICS.....	23
GREEN ORGANIC WASTE AND FOOD LEFTOVERS.....	23
BONES AND ANIMAL CARCASSES.....	23
ASH.....	23
DIAPERS.....	24
PAPER AND CARTON.....	24
MEDICAL WASTE.....	24
OTHER HAZARDOUS WASTE.....	24
SEWAGE SLUDGE.....	24

GRAPHS

<i>Graph 1: Percentage of each waste category among sample households (yearly average).....</i>	10
<i>Graph 2: Weight of each waste category among sample households in summer and winter</i>	10
<i>Graph 3: Average weekly household waste production (kg).....</i>	11
<i>Graph 4: Percentage of each waste category in administration building.....</i>	12
<i>Graph 5: Percentage of each non-hazardous waste category in hospital</i>	13

ANNEXES

ANNEX 1: MAPS OF KHISHIG-UNDUR SOUM AND SOUM-CENTER

ANNEX 2: PHOTOS RELATED TO KHISHIG-UNDUR WASTE MANAGEMENT

INTRODUCTION

As a part of the project “Sustainable Plastic Recycling in Mongolia” funded by the SWITCH-Asia-II program of the European Union¹, Ecosoum has collected data about waste in Khishig-Undur soum between October 2020 and January 2021. This specific data collection followed and completed previously gathered waste-related information and studies carried out since the creation of Ecosoum in October 2018.

The target groups of data collection were the soum’s main waste-related stakeholders (waste producers, managers and decision makers), namely sedentary (5th bag²) and nomadic (1st to 4th bag) households, local authorities and public institutions (administration, school, kindergarten, hospital) and other local waste producers (shops and restaurants, central heating plant). Location maps and photos are provided in Annex 1 and Annex 2 respectively.

The goal of this overall data collection was to establish a baseline, which would inform relevant project activities, including pertinent awareness-raising and training contents, manufacture of adequate equipment and infrastructure, and definition of proper waste management schemes. This summary baseline report aims to present the main findings of the study³, as well as summary of key issues and recommendations. More detailed information is provided in the comprehensive version of this report.⁴

OVERALL WASTE MANAGEMENT SITUATION IN KHISHIG-UNDUR SOUM

LEGAL FRAMEWORK OF WASTE MANAGEMENT IN KHISHIG-UNDUR

The legal framework, in which Khishig-Undur soum authorities operate in terms of waste management, mainly include the National Laws on Waste, Bulgan aimag decrees, and Khishig-Undur municipal council decrees – each of these complying with the higher laws. The current local decree was approved in 2014 but, to our knowledge, none of its rules are currently enforced by the local administration. The main rules to be respected are quite simple and based on common sense: soum administration is supposed to take care of waste collection service; waste workers should wear protective equipment; Environment Department team is supposed to check public spaces for illegal littering and make the polluters clean; relevant waste management rules are supposed to be explained and promoted by *bag* mayors; etc.

The municipal council’s decree and higher laws are also supposed to be transcribed by the soum administration into a local Waste Management Master Plan. It is intended to be a practical document and should precisely explain how waste is to be managed within the soum. The last Master Plan covered the 2016–2019 period but it was not useful, as it did not include reliable data and applicable instructions. The document was not renewed yet. Therefore, the soum remains without an implementable Waste Management Master Plan.

¹ www.switch-asia.eu/project/sustainable-plastic-recycling-in-mongolia/

² A “*bag*” is the smallest administrative unit in Mongolia. Khishig-Undur soum is divided into 5 *bags*.

³ Most quantitative data presented in this study include a significant margin of error and should be handled with caution as orders of magnitude rather than precise figures.

⁴ All reports produced by Ecosoum are available online: www.ecosoum.org/en-resources-and-reports

WASTE MANAGEMENT ACTORS IN KHISHIG-UNDUR

The main and virtually only actor in charge of waste management in Khishig-Undur soum remains the local administration. Besides the municipal council – which votes on the waste management budget with relatively specific purposes (for instance: “for purchasing waste bins” or “for building fence around dumpsite”) – and the elected soum Mayor – who gives strategic direction and validates practical decisions –, the main local public officer in charge of overseeing waste management is the Head of Administration. He gives instructions to the Environment Department of the soum administration, which is composed of two rangers. However, it doesn't fall under their responsibility to actually implement waste management activities, such as waste collection, cleaning or recycling. In summary, there is actually no one within the public administration who is concretely in charge of implementing waste management in the field.

The Administration currently employs two subcontracted workers, who are basically the soum's handymen. The administration delegates their public trucks to them and gives them day-to-day instructions. A few waste management activities that are implemented in the soum are usually delegated to them. For instance, when administration needs some specific waste to be collected and disposed at dumpsite, they are asked to take care of it.

When specific larger tasks are required and a dedicated budget is allocated by aimag authorities, private companies are contracted for these occasions. However, this occasional involvement of private actors should not be confused with a form of privatization of waste management in Khishig-Undur: there is absolutely no private waste management MSME based or operating in the soum on a regular basis.

Informal waste management sector is also virtually nonexistent in Khishig-Undur. In the past, a few precarious inhabitants tried to collect some recyclables to make little profit out of them. But this kind of activity is very scarce and irregular: there are no waste-scrappers and no one in the soum relies on any waste-related activities as a regular and significant form of livelihood.

Finally, although there is no other CSO involved in waste management in Khishig-Undur, Ecosoum has progressively come to play a predominant role within the soum. Soum administration collaborates very closely with Ecosoum for all waste-related matters and delegates more and more tasks to the NGO in order to set up a proper waste management system.

WASTE-RELATED DATA COLLECTION IN KHISHIG-UNDUR

Soum administration does not collect any data regarding waste in Khishig-Undur and has no idea how much waste is produced within the soum or thrown out at dumpsite. As explained below, local administration staff has almost no direct involvement in any concrete waste management activities, which means that they have no practical mean to monitor any aspects of waste flow. None of the public institution monitors their own waste either, except for the hospital that keeps track of its medical waste.

Until now, main types of waste in Khishig-Undur have thus only been estimated qualitatively, mainly by observing what is lying on the ground at the dumpsite (or based on personal assumptions of administrative staff). Although no quantitative data is available, it appears that the main types of

waste include stove ash, sawdust, glass bottles, plastics of all kinds, construction waste, livestock carcasses and dungs, various broken furniture and other items.

GENERAL LEVEL OF AWARENESS REGARDING WASTE ISSUES IN KHISHIG-UNDUR

Most people are very aware that there is a problem with waste management in Khishig-Undur. 100% of the 150 households who answered our online survey agreed there is a need to improve local waste management, and all of them also claimed they were ready to sort their waste if they are told how to do it and if a proper waste management system is set up. But, at the same time, most people still lack knowledge and proactivity to improve their waste related habits. In general, old habits are strong and 3R rules are far from most people's mind, especially among herder households (with some exceptions of people who seemed particularly concerned and affected by the situation).

Even for people who seem to have waste issues at heart and would like to sort and recycle waste, reducing waste production at source doesn't appear like something anyone ever considered. For example, within most households, plastic-wrapped candies have replaced unwrapped raw *aaruul* in the greeting bowls (*tavagiin idee*), which means that countless hardly recyclable small plastic wraps are now produced every day within the very families who claim they want to improve their waste management habits. This symbolic example is quite representative of how consumption patterns have evolved over the past decades and led to increasing amount of waste, without anyone paying much attention to it.

CURRENT WASTE MANAGEMENT SYSTEM IN KHISHIG-UNDUR

WASTE PRODUCTION, BURNING AND AT SOURCE SORTING

Waste is produced by households, public institutions and private companies. Burning waste is a practice that is disappearing in Khishig-Undur soum-center, but is still extremely common among herder households.

Besides few marginal exceptions, none of the waste producers really sort their recyclable waste (except for food waste which is sometimes given to dogs and livestock, and metal which is always valuable). Soum administration is aware of the fact that sorting is mandatory according to the National Law on Waste, but nothing is done to encourage, nudge or force waste producers to do so. Even local administration itself doesn't sort its recyclables. Whenever necessary, some people will save a few plastic bags, PET bottles or glass jars for reusing. Few may even occasionally sort aluminum cans and such relatively valuable recyclables, knowing they can probably be sold somewhere. But overall, these "sorting" practices are quite marginal and definitely not systematic: they remain more of an exception than the norm.

This quasi-absence of waste sorting is for a large part due to the fact that people are perfectly aware there is currently no point in it: as there is still no way to recycle waste in Khishig-Undur, nor even a place where recyclables could be collected for transportation to urban recyclers, everything can only end up in the dumpsite anyways. Therefore, in people's mind, it makes no sense to sort waste today.

INTERMEDIARY COLLECTION POINTS AND STREET BINS

There is no intermediary waste collection point in Khishig-Undur. Even street bins have been extremely rare and located exclusively in the very center of the village, around main public buildings. In 2019, aimag administration provided Khishig-Undur soum with twelve large bins (almost 2 m³), which have been installed in strategic locations in the soum-center (at entrances of the village, nearby public institutions, at Naadam stadium, next to gas stations, etc.). These bins are divided into two compartments, theoretically allowing segregation between recyclables and ultimate waste. However, in reality, waste is never segregated in these bins and both compartments contain exactly the same types of mixed waste.

WASTE COLLECTION AND TRANSPORTATION TO DUMPSITE

The former public collection service has long ceased to work in Khishig-Undur. As it was not efficient and rarely implemented, the inhabitants preferred to stop paying and have been bringing their waste to the dumpsite with their own cars. There doesn't seem to be any formal or informal coordination among groups of people. Some may help transporting waste for their older or disabled relatives but in general, each household disposes its own waste individually. Public waste collection also stopped for shops, due to the same reason of inefficiency. Even local public institutions don't have organized waste collection and transportation schemes in place. If they require administration to send a subcontracted handyman to collect their waste, the driver will eventually come but cleaning ladies of institutions will have to load the truck themselves (in very unpractical conditions) and institutions will have to pay for the service. This situation explains why most public institutions often prefer to find their own informal ways to transport waste to the dumpsite.

WASTE DISPOSAL AND DUMPSITE EXTENSION

All types of waste, from ordinary household waste to toxic substances and hazardous waste, are simply dumped on the ground, indiscriminately, in a vague dumpsite outside the soum-center. This dumpsite is totally open, without any boundary or protection, so the waste is spread by the wind. This lack of regulation and coordination led the surface of the dumpsite to increase dramatically and constantly. Due to negligence and fear of a flat tire when rolling over sharp garbage (mainly broken glass) people and institutions dump their waste on the edge of the dumpsite, instead of trying to dispose it on a common pile in a smaller area. This process has gradually led the dumpsite to grow out of control: lately, the surface of the main dumpsite came to cover almost 120 ha, almost as much as the total housing area. Some reduction work started at the end of 2020, but it temporarily stopped due to the Covid-19 restrictions.

WASTE RECYCLING AND REUSING

In July 2019, Ecosoum built two small recycling machines and manufactured a stool out of single-use plastic bowls. However, this experiment was not repeated yet as no plastic is sorted and collected. The recycling machines are small and unproductive; therefore, they should be considered as awareness-raising tools rather than actual recycling equipment adapted to the soum-scale. Two small industrial shredding machines (which can be used for plastic or glass) were also purchased in 2020 by Ecosoum on behalf of local administration, but they have not been used yet due to the absence of plastic

segregation and proper working space. In summary, to this day, there is no real waste recycling in Khishig-Undur.

Re-using is a more common practice in rural Mongolia, especially for plastic bottles and glass jars. This habit is not really linked to waste management considerations, but rather to personal needs for containers. For instance, it is very common to put liquids (such as fresh milk or *airag*) into soda PET bottles, or to use empty glass jars for homemade jam or other types of food – including for informal commercialization. In any case, the scale of reusing some types of waste remains extremely marginal compared to the total waste production.

WASTE MANAGEMENT EQUIPMENT

In addition to the previously mentioned recycling machines and a few street bins, waste management equipment available in Khishig-Undur is essentially limited to the soum's truck. Incidentally, it is in quite poor condition and, as there is no available garage, it usually does not start in winter (due to extreme cold). The driver has to light a fire underneath the engine for it to eventually start, which is very time consuming and limits the truck's availability. The soum also owns a second truck and a small bulldozer, which would be very useful to move and organize waste at dumpsite, but they are both broken and out of use for years apparently due to insufficient training of staff and repetitive improper usage). The soum administration not only doesn't have sufficient resources to repair them, but it seems they could not even find the necessary parts in Mongolia.

OCCASIONAL PUBLIC CLEANING

In spring (after snow melts) or on other special occasions, soum administration organizes public cleaning campaigns where at least one member of each household participates. It also happens that specific groups of population (the elderly union, a class of students, etc.) organize similar events occasionally. In addition, some underprivileged inhabitants who benefit from food coupons are asked to carry out general interest work in return: administration usually asks them to clean up waste. Overall, these public cleaning events remain relatively limited and insufficient to reduce the proliferation of waste littered in the soum-center and its surroundings.

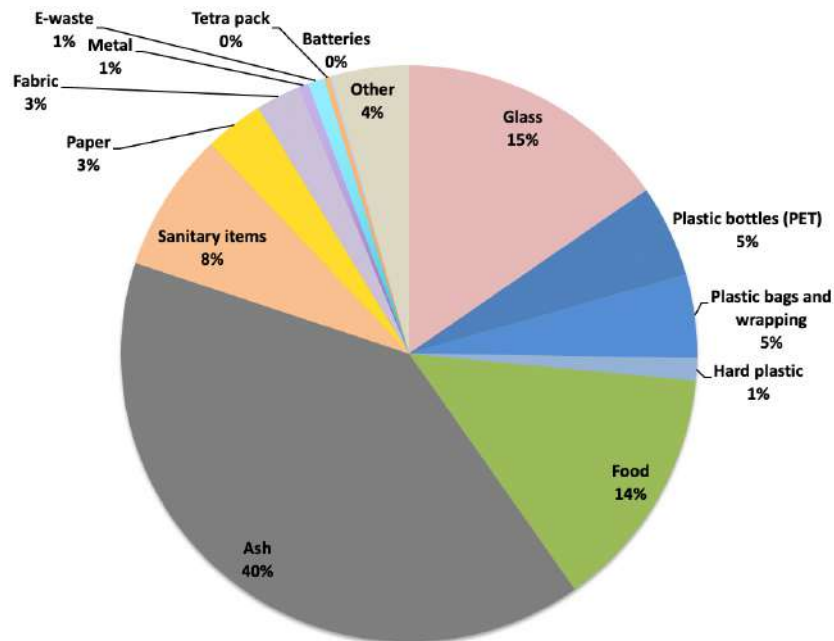
MAIN WASTE PRODUCERS IN KHISHIG-UNDUR

HOUSEHOLDS

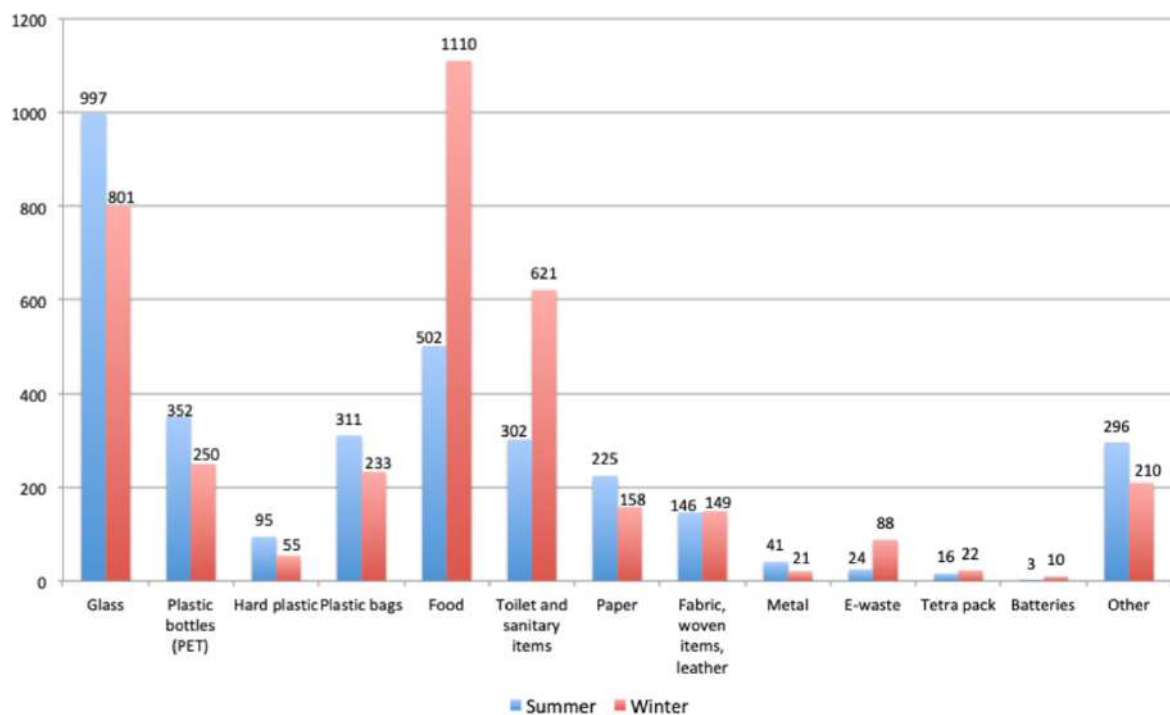
SEDENTARY HOUSEHOLDS (VILLAGERS)

Throughout the year, almost 90% of all sedentary household waste is composed of only 5 main categories: ash (40%), glass (15%), food (14%), plastics (11%) and baby diapers (8%).

While in summer ash is a relatively minor component (11%) of household waste, it is by far the largest one (54%) in winter, with an amount multiplied by factor 10 (0.4 to 4.3 kg per week). Household stove ash is mainly constituted of wood ash, but it can also include a significant (although unquantifiable) quantity of coal ash in the coldest months of winter.



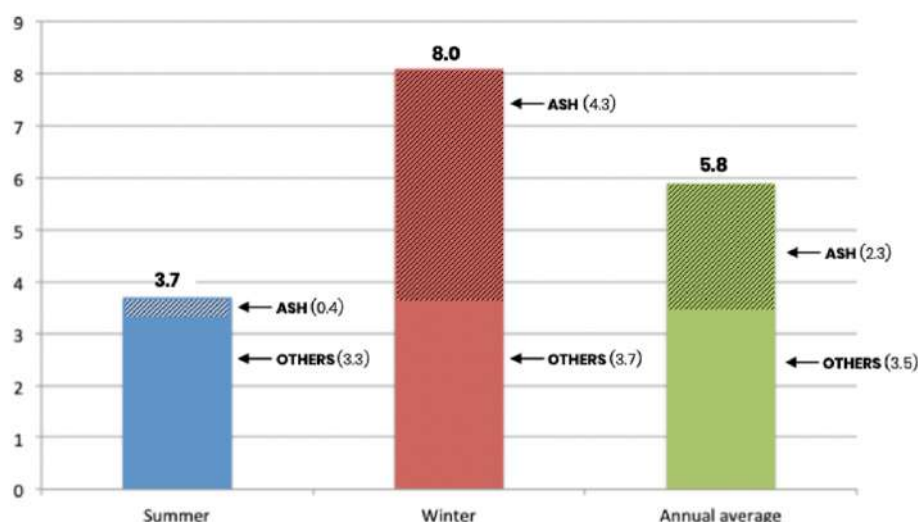
Graph 1: Percentage of each waste category among sample households (yearly average)



Graph 2: Weight (in grams) of each waste category among sample households in summer and winter

PET bottles account for almost half (46%) of all plastic waste (650g on average), both in summer and winter. Food waste production appears over two times higher in winter (1,110g / 30%) than in summer (502g / 15%). This observation reflects the fact that people apparently tend to consume more meat in winter: while summer food waste comprised more vegetable peels. Furthermore, we observed that winter food waste included a lot more bones, which are heavier than vegetable peels.⁵

⁵ The doubling of sanitary items in winter compared to summer is a study artefact: by chance, there happened to be more households with babies included in the winter study. However, for household with babies, diaper usage is relatively stable throughout the year and represents the number one category of waste that is equivalent to ash.



Graph 3: Average weekly household waste production (kg)

Excluding stove ash, average weekly household waste production is 3.5 kg (which corresponds to 0.5 kg per day or 182 kg per year). The waste production appears relatively steady throughout the year: 3.3 kg in summer and 3.7 in winter. If we include ash, average weekly household waste production is approximately 5.8 kg (3.7 kg in summer, 8.0 kg in winter). Considering there were 319 households officially registered in the village in 2019 (latest available data), the total household waste can be estimated to almost 100 tons per year (including app. 40 tons of ash).⁶

NOMADIC HOUSEHOLDS (HERDERS)

Although quite different in the past, herder household consumption habits have now become comparable to their fellow citizens living in the soum-center (only few interviewed households declared having lower and less diversified consumption). Since the number of family members also appears comparable to sedentary families, it does not seem unrealistic to consider that their waste production and composition are quite similar (although no quantitative data is available for herders). There are some specifics, such as sheep and goat skin, which have become virtually valueless and are now simply thrown away. But these specific types of herder waste are essentially livestock body parts (organic waste), not consumption-related inorganic waste such as plastics.

Most herder families estimated their monthly waste production to two or three 35L bags per month, although it is not clear how many kilograms of waste this estimation corresponds to. If we consider that each of the 460 herder families produces 3.5kg of waste each week (like sedentary households), total herder households' waste could reach up to 140 tons per year, including 50 tons of ash if waste composition is similar. In total, Khishig-Undur soum's households (both sedentary and nomadic) are thus probably producing app. 240 tons of domestic waste each year, including 90 tons of ash.

⁶ It should also be noted that sedentary families with livestock (mainly cows) in their yard (app. 10% of sedentary households according to our studies) produce a lot of dung: a single cow produces several kilograms of dung each day. For these households, dungs thus represent more than 95% of all household waste. Most of them claim they use the dungs as fuel for their stove, which means dungs would be more resources than waste to them. But field observations show there are in fact lots of cow dungs at the dumpsite, which leads us to conclude that at least part of it (although it is impossible to quantify) really is waste after all and should be considered as such when planning waste management schemes.

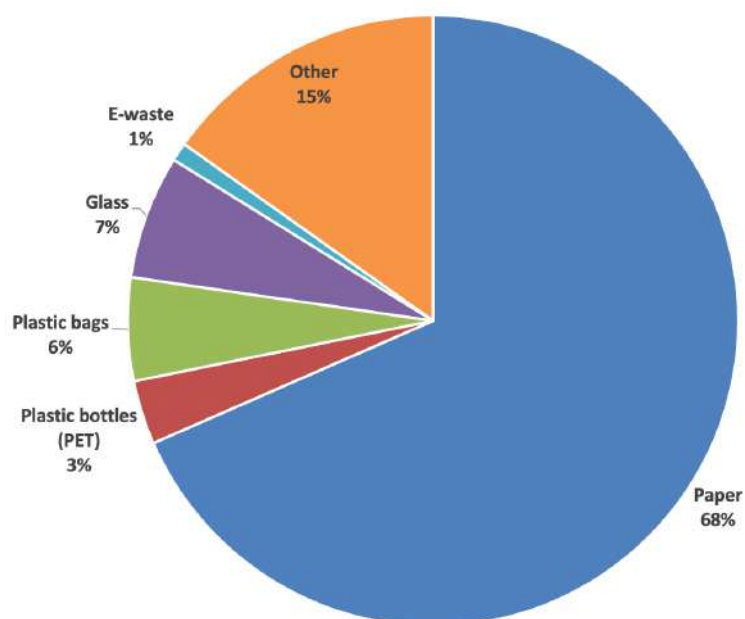
Waste is managed quite similarly by all herder families: waste produced in the yurt is put in a small bin. When this bin is full, every two or three days, it is taken outside in a bigger bag. Then the bag is usually taken to a natural depression (small ravine, dry brook bed, etc.) close to the camp. Most often, households burn whatever they can there (starting with plastics) and usually cover what remains with dirt or livestock dung. Some families use a big metal barrel to burn their waste outside and dump the ash in the creeks. Before or after burning, some households also take their waste to the soum-center's main dumpsite (more often when they live close to the village).

Livestock loss has always been part of herding activities and the way to manage carcasses is still rudimentary but effective. When a single animal dies in the wide steppe, it is usually abandoned where it fell for wild animals (vultures, crows, wolves, etc.). If it died in the camp, it is usually taken in a remote ravine, or sometimes to the main dumpsite. However, if the dead animal was suspected to carry a contagious disease, it is buried to prevent disease spread. During winter, especially the harshest ones (*dzud*), it is usual that livestock dies in relatively high numbers throughout the whole soum. Every spring, when earth defrosts, *bag* mayors organize collective dead livestock burial in a dedicated spot. The holes are dug by hand so they are usually not very deep – unless animals died of contagious disease, in which case herders dig deeper holes.

PUBLIC INSTITUTIONS

SOOM ADMINISTRATION

Soum administration employs 39 staff dispatched in a dozen rooms in a single building, which is connected to the central heating plant. Our composition study showed that, over the course of a week, total waste in the building adds up to a little over 9 kg, including more than 6kg of paper. We can thus extrapolate that soum administration produces close to 500 kg of waste per year within its office building.



Graph 4: Percentage of each waste category in administration building

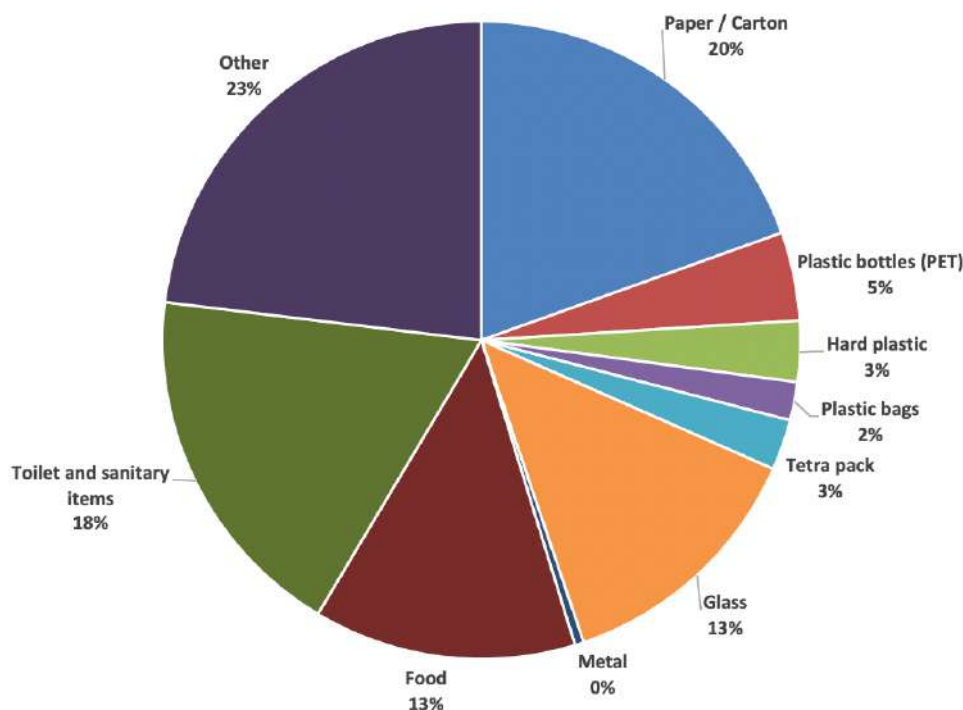
Quite logically, the number one category of waste is paper, which represents at least 68% of total. Paper probably accounts for even more since 15% of “others” actually comprised lots of papers mixed with other types of unsorted waste. When asking staff, they all answered that paper is almost the only kind of waste they produce. Others, mainly plastics and glass, essentially come from snack wrapping or drink bottles that are consumed in the office.

No one in the local administration sorts waste, thus, the waste flow is very simple: waste is produced and put in trash bins in each room by administration staff and a cleaning lady empties all the bins once a week. She puts everything together in the larger metal container outside the building. When it is full (approximately every two weeks), one of the subcontracted handymen takes all trash from the container and throws everything at dumpsite.

HOSPITAL

29 staff currently work at the soum’s hospital and the average number of hospitalized patients (staying overnight) is 7 or 8 (in addition to an average of 40 to 50 patients coming every day for medical consultation). Our study showed that hospital produces close to 20kg of non-hazardous waste per week. We can thus extrapolate that it produces nearly 1,000 kg of waste per year.

Main types of waste are paper and sanitary items. Food (from kitchen) and glass come next, while plastics only account for app. 10% of total.⁷ Overall, hospital non-hazardous waste appears quite diversified. There is also coal ash from hospital heating system and sewage sludge from inner toilets used by patients, but these could not be quantified.



Graph 5: Percentage of each non-hazardous waste category in hospital

⁷ 23% of “others” is a study artefact: this category actually comprises all the other types of wastes (plastics, papers, food and so on) which were not segregated enough to be included in their respective category.

In addition to non-hazardous waste, ash and sludge, the hospital produces on average app. 40 to 50 kg of infectious waste and 20 to 22 kg of needle-type waste, for a total of app. 65-70 kg of medical waste each month. This estimation corresponds to roughly 2.2 kg of medical waste per day, or 800 kg per year – almost as much as non-hazardous waste.

Non-hazardous waste is managed by the hospital's four cleaning ladies, who take care of it one at a time, in shifts. The waste flow starts in patient rooms, examination/treating rooms and toilets. Twice a day, cleaning ladies collect waste from bins in each of these rooms and put them in temporary indoor collection point. Then, at the end of each day, all waste is taken to a small shed outside the hospital. When this shed is full (approximately every two weeks), waste is taken to the dumpsite (informally, by a private individual with the help of hospital staff). They usually try to burn it there after disposing it on the ground. To this day, there is no waste sorting or recycling at all among non-hazardous waste and everything is mixed and dumped together.

Medical waste is produced exclusively from examination/treating rooms, by doctors and nurses who perform medical procedures on patients. Medical waste is always disposed in specific bins present in each room. In general, these doctors and nurses who produce the medical waste take it every day from their treating rooms to the temporary collection point. There, they weigh their medical waste themselves, enter data in a common logbook and directly go outside to put it in the burning container (an old rusty barrel with no filter and no protection system whatsoever). Medical waste is burnt approximately twice a day. Once every two weeks, burnt medical waste residue is taken from burning container to be disposed in dumpsite together with non-hazardous waste.

SCHOOL

There are currently 74 teachers and other staff working in the school, for 607 children from 6 to 18 years-old. There is a dormitory for boarders, as well as a large kitchen, which cooks lunch for all primary school children and teachers, as well as dinner for boarders. The school is heated by the central heating plant and has a large sewage tank for indoor toilets.

As it was impossible to carry out a proper quantitative study (due to Covid-19 restrictions), actual waste composition remains unknown. According to interviewed staff, though, main types of waste are: paper (main category), PET bottles, soft plastic bags, packages and wrapping, Tetra packs, as well as bones, yogurt bottles and vegetable peels from kitchen. Total amount of produced waste is also unknown, but it corresponds approximately to one large metal container (close to 2 m³, excluding food waste) every month.

The school staff and children appear particularly aware and concerned about waste issues. This strong awareness has led the school to start sorting its waste within its premises, even though everyone knows there is currently no way to recycle anything in the soum and everything is re-mixed in the end. All trash bins have thus been tripled: one for paper, one for plastic bottles and one for others. Sorting is still not always properly performed, but tends to improve over time.

Students are directly involved in the school's waste management system as they are the ones in charge of emptying the classrooms trash bins (in turns, under the supervision of teachers). Every day, students put the classroom's waste into larger bins in the halls. These larger hall bins are then emptied daily by cleaning ladies into the outdoor temporary collection point. Waste that is produced in the

kitchen also goes every day to the temporary collection point, except for most food waste and leftover (produced in large amount) which are systematically given away to households for dogs. Once a month, the collection point is emptied and all waste is transported to the dumpsite. Lately, transportation has been operated with a private truck (loaded by the cleaning ladies themselves).

To eliminate toilet sewage sludge, the school calls a company which comes from Bulgan city with a specific pumping truck. In normal times, the company comes on average every month and a half and pump app. 20 tons of sludge from the school (as well as some lower but unknown amount from the hospital). The sludge is taken to the soum dumpsite.

KINDERGARTEN

There are currently 20 people working in the kindergarten, which is budgeted to take care of 125 children. Children are between 2 and 6 years old, but there are also younger ones (in general, there are 5 or 6 children at the age of wearing diapers). Moreover, there is a kitchen to cook lunch for kids. The kindergarten was recently connected to the central heating plant and acquired indoor toilets with sewage tank.

As it was impossible to carry out a proper quantitative study, actual waste composition remains unknown. According to the interviewed staff, main types of waste produced in kindergarten's classrooms and toilets include: diapers (15 per day on average), toilet papers, single-use plastic shoe covers and paper. However, it is the kitchen that actually produces the most waste: tens of kilograms of food waste, bones and leftovers are produced every week. Kitchen waste also include a lot of packaging and wrapping (plastics and Tetra packs mainly). The total amount of produced waste is unclear, but it is probably relatively similar to the school, close to 2 m³ per month (excluding food leftovers).

The current waste flow is as follows: waste is produced in classrooms, toilets and kitchen, put in small trash bins and bags and taken outside in the temporary collection area every day. This area includes a large metal container (close to 2 m³) and a wooden container, as well as an elevated wooden box for bones. App. twice a month, all waste is taken to dumpsite by one of their staff's private truck. All the food waste is given to families for dogs and only bones are thrown away to dumpsite.

PRIVATE COMPANIES

SHOPS

There are currently 25 active shops in Khishig-Undur. Some are now connected to the central heating plant, but most of them still use their own individual stove to heat their shops. Most of them sell food, drinks and other general items (cleaning products and others), but there are also a few specialised shops (construction material, clothes and kitchen items). Most shops are relatively small (10 to 20 m²) but some are slightly larger (up to app. 50–60 m²). Depending on their size, most get supplies from Ulaanbaatar once or twice a month (the largest are supplied up to 3 times per month).

The main type of shop waste seems to be packaging. Carton boxes always come first: tens of boxes each month, which appears quite voluminous. But carton is not described as problematic in terms of waste management, as it is either used for fire fuel or given away to customers to take their purchases

away. Plastic wrapping is also systematically mentioned as one of the main types of waste. Depending on their size, most shops estimated monthly plastic wrapping production between 70 and 140 litres. Shops that sell vegetables also report up to 10kg of rotten vegetables per month, and the shops which are not connected to the central heating plant (the large majority) also produce a lot of wood ash (in amounts probably relatively similar to households). Finally, customers also sometimes unwrap the item they just purchased and/or consume it in the shop – which creates some additional waste for the shop to manage.

Most shops report that they produce most of their waste right after they get supplied, as they unwrap most bulked goods at once. There is no sorting and they usually take their mixed waste to the dumpsite at this moment (between 1 and 3 times a month depending on size of shop), individually, with their private vehicle (there is no real coordination between shops, especially when it comes to waste management). Some also say that they take shop waste to their homes (which is sometimes in the same yard or even the same building) and manage it with household waste.

RESTAURANTS

There are currently two small restaurants (*tsainii gazar*) active in Khishig-Undur. They are mainly open from spring to fall (especially in summer), and sometimes closed during winter to avoid having to heat the place for just a few customers (in this case, they may still take orders and cook from home). Main supplies from the city usually come twice a month, with additional punctual supplies directly from local shops whenever necessary.

Main types of waste produced in restaurants include: vegetables peels (usually given to families with livestock), egg shells, meat/bones leftovers (given to dogs), lots of plastic wraps, dirty napkins and instant noodle boxes, as well as some carton, Tetra packs, or glass jars. Plastic bottles are relatively few in winter (mainly oil and ketchup bottles), but they are produced in large amount in summer when sodas are massively sold to customers. There is also wood ash from the stoves.

Weighing of restaurant waste showed app. 9kg of vegetable peels and app. 5kg of others (not sorted, but observation confirmed what was previously described: mainly plastic wrapping, napkins, instant noodles boxes, and a few plastic bottles). Weekly waste production would thus be app. 14kg in winter time, which corresponds to 60kg per month. However, it is very clear that the summer period, which is much busier, produces much more waste. For instance, the same amount of vegetable peels would probably be produced in a single day (app. 50kg per week).

Overall, restaurant waste is managed basically as in shops and households: everything is mixed and thrown at dumpsite a couple of times per month.

CENTRAL HEATING PLANT

Central heating plant used to heat only public buildings but some small private entities (shops and individuals) recently started to be connected as well (when they can pay for connection work). The plant is active six months a year, from September 15th to May 15th. During this period, it is active 24/7 and never stops. It is not equipped with any kind of filter or protective device to reduce gas emissions. Thick black smoke is constantly emitted through the main chimney.

Central heating plan burns app. 3 tons of coal daily (in 24 hours) for the entire period it is active. There is no monitoring nor data available about how much coal ash is produced. Interviewed staff estimate it to app. 15 Porter trucks per months, which would correspond to app. to 40 or 50 m³ of ash. After being burnt, ash is temporarily stored in the plant's premises, outside the building (next to the stock of coal). When there is no more space available – app. every ten days – coal ash is taken by plant staff to the dumpsite, using the company's Porter truck (5 round trips, 3 times a month). There is no specific dumping area for them, so they just dump the ash with all other types of waste.

KEY ISSUES AND RECOMMENDATIONS TO IMPROVE WASTE MANAGEMENT IN KHISHIG-UNDUR

LEGAL FRAMEWORK ON WASTE

In our opinion, the current legal framework does not need to be modified. The latest National Law on Waste is actually rather well-written, and its transcription into local decrees is quite relevant. The local regulation is somewhat superficial and incomplete, however, most importantly, these simple rules are currently not followed, which means adding new decrees is not going to bring any solution to the waste management issue in Khishig-Undur – at least not for the time being.

For now, it seems more relevant to build on the existing regulations and design applicable rules and practical schemes and processes that can be implemented. The fact that the local Waste Management Master Plan has expired and was not renewed yet offers a good opportunity: our recommendations and suggestions of schemes could be directly transcribed into a new Master Plan, which could enter into effect immediately.

SOU – FINANCIAL RESOURCES AND LOCAL WASTE-RELATED TAXATION

However, the soum dramatically lacks financial resources. The order of magnitude of the current budget for waste management (15 million MNT in 2021) could be enough to sustainably operate a proper system, especially if it is completed with a specific local waste management tax. However, the soum's budget is far from enough to acquire all the necessary infrastructure and equipment by itself. As a pilot project supposed to set up a model waste management system in Khishig-Undur, replicable in other soums, sufficient financial resources should be provided by the project to implement its recommendations.

The issue of taxation is very complex and sensitive as it requires to be at the same time simple enough to be implementable (to make sure administration manages to collect taxes) and fair enough to be accepted by all inhabitants (to make sure everyone agrees to pay as willingly as possible). The best way to collect this tax should be discussed with soum administration and should probably be done in partnership either with national tax office and/or added to electric bill. Precise calculation should be made to cover all planned costs, and decision on final amount should be validated by the people themselves. In order to be really fair, the tax should not be flat but modulated according to several parameters such as: number of people in households, total income of households, amount of waste production, and/or level and quality of waste sorting.

WASTE WORKERS

In order to ensure the proper functioning of a soum-level waste management system, it is of paramount importance that at least two sustainable full-time waste worker positions are created by/within soum administration. As the latter is actually not free to decide to create these positions, clear advocacy should be addressed to decision makers at relevant provincial and national levels to make sure the positions are eventually created. In the meantime, subcontracted waste workers could be hired by soum administration, but such precarious positions would have no guarantee of sustainability.

WASTE MANAGEMENT FACILITY

The fact that there is currently no dedicated facility in Khishig-Undur is blocking any possibility to improve local waste management. No matter how much awareness is raised, no matter how much people start to sort their waste, if there is nowhere to collect and process the sorted waste, no real-life improvement can be expected. Building a waste management facility with proper recycling machines is therefore the absolute priority at this point.

This facility should include at least one building in which recycling and other processing operations can be carried out. There should also be some outdoor (yet covered, to protect from rain and snow) containers, sheds and/or properly organized areas where sorted waste can be temporarily stored. A garage will also be necessary to protect waste management vehicles from winter cold (to ensure that they do start in the morning).

WASTE MANAGEMENT SCHEME

The specific design and detailed organizational schemes should be perfectly adapted to local context and realities. In general, we strongly recommend that interactions between waste producers and facility's waste workers (to be hired) are encouraged, so people grasp how waste is managed and recycled fully. Design of waste management scheme should show that waste is no longer a disgusting element to eliminate out of sight, but it is a valuable and respectable resource that is part of everyone's life.

For instance, we believe that waste producers who will come to dispose their waste at the waste management facility should not just throw their sorted waste in simple containers and leave the premises without meeting anyone. This kind of system can be efficient when all users already have perfect waste management habits and can be trusted to act with responsibility. But it is not relevant when users are not used to proper waste sorting and management. The previously mentioned solution would keep waste management a very asocial activity and, without any supervision, people would not be encouraged to properly sort (so the risk of sorting containers being misused and waste categories mixed together would be high).

We instead recommend that users enter the recycling building and go to a welcoming area where they can dispose their waste in specific bags/containers, under the supervision of a waste worker. These personal interactions will enable further explanations by waste workers and make sure sorting

at source keeps improving when people are kindly explained where they made mistakes in sorting and shown how they could improve next time.

INTERMEDIARY WASTE COLLECTION POINTS AND STREET BINS

For the same reasons, non-supervised intermediary collection points should be totally avoided as they would bring no guarantee that people and shops would sort and dispose their waste correctly. On the contrary, they would just contribute to increasing the lack of social interaction that we consider necessary to introduce a proper waste management system. However, street bins with sorting compartments should be installed at key location in the village to reduce littering.

DUMPSITE

Dumpsite reduction has already started in 2020 (by regrouping and piling waste in a small part of the dumpsite) and it should be finalized as soon as possible. Even if the entire impacted area cannot be cleaned at once and will require more time, effort and resources, the main dumping area should be finalized and secured (with surrounding soil embankment and fences) so that from now on, all ultimate waste is properly disposed (in what shall now be considered as a suitable landfill). We recommend that the new scheme allows only waste workers to have access to the new landfill, and that all users have access only to the waste management facility (unless exceptional situations require people to go to landfill themselves). Such a system will ensure waste workers to control that no recyclable is dumped as ultimate waste, and that ultimate waste is properly disposed in an organized fashion (as opposed to the current chaotic system where the surface of the dumpsite is constantly growing).

The waste management facility should thus include an area with containers where users could drop their remaining ultimate waste (which shall be validated by waste workers) after disposing recyclables inside the recycling building. When these containers are full with ultimate waste, it will be waste workers' responsibility to properly dispose it in the newly secured landfill. If possible and relevant, it could be interesting from a logistical standpoint that people throw their ultimate waste directly in the truck instead of putting it in an intermediary container (in order to reduce and facilitate waste workers task).

A small bulldozer will be indispensable in the landfill, probably even at the facility for some outdoor operations. It is essential that either a new one is acquired or the old one is repaired.

PUBLIC WASTE COLLECTION

Households would for sure be happy if collection service was organized again and vast majority clearly stated they were willing to pay for this service (app. 7,500 MNT per month on average). However, for the time being, planning waste collection from all households in the village does not seem like a priority to us as people are already used to disposing of waste by themselves (a task that usually does not take more than 15 minutes per month). We recommend that until proper sorting habits are fully integrated by villagers, they keep going to the waste management facility to observe and communicate with waste workers as previously suggested.

If/when waste collection is eventually introduced for households, it should be carried out in a way that encourages people to sort their waste. For instance, initial collection could collect only properly sorted waste, and leave the task of transporting the ultimate waste to the waste facility to the waste producers. Such an approach might lead people who don't want to bother transporting their own waste to sort as much as so that the collection service collects the majority of their waste.

However, we recommend that proper waste collection is reintroduced as soon as possible for public institutions. As there are just a few institutions and since they require waste collection only once or twice a month, it seems organizing this collection should be a fairly easy task.

Waste collection from shops could also start soon, provided that they properly sort their waste and finance the service (which they seem willing to do: monthly fees such as 5,000, 10,000 or even 20,000 MNT were frequently mentioned by shops, depending on their size). As their total number is limited, logistical organization would remain relatively simple, although slightly more challenging than for public institutions. Designing and implementing collection scheme for shops could be seen as an experiment before it is extended to households.

PUBLIC SERVICE INDEPENDENT OF MARKET PRICES

The waste management system could also be partially financed by the profit made from selling sorted and/or recycled waste. As we previously established in a recyclable waste transportation analysis⁸, it could be potentially viable or even profitable to sell some recyclables to urban industries. Even though such an approach can be tempting – and relevant as a first step – it would not be very resilient and would come with high risks of unsustainability, especially in a remote soum like Khishig-Undur.

If a soum's waste management system relies entirely on trading its profitable recyclables, it is dependent on market prices, which are known for their instability. For instance, if oil international exchange rate increases, the whole profitability of transporting recyclables from Khishig-Undur to Ulaanbaatar could collapse, and the soum's waste management system with it. Similarly, if urban recycling industries are overwhelmed with recyclables, it may lead to a fall of purchasing prices, which would also impact the soum's waste management sustainability. Current Covid-19 situation and restrictions to travel to Ulaanbaatar also bring a perfect example of how relying on recyclables' trade is risky and unsustainable. In the light of these risks, favoring local recycling as much as possible may be less profitable in the short term, but it would most likely be more resilient in the long run.

Another important resilience and sustainability factor lies in the public service nature of a soum's waste management system. A private operator may find interesting to take care of the most profitable recyclables (for instance, some middlemen already roam soums to buy metal waste), but would most likely show no interest in other types of waste, which would therefore not be managed properly in the soum. More broadly, for a local waste management system to be sustainable, profit made out of the most profitable recyclables should not exit the system to end in a private operators' pockets, but it should be used as an ongoing investment to properly manage less profitable recyclables and worthless ultimate waste.

⁸ www.ecosoum.org/en-resources-and-reports

For the same reason, although we are in favor of some forms of incentives (which need to be well thought out and discussed), we strongly recommend to avoid monetarization of waste and purchasing recyclables from waste producers. If the entire waste management system was based only on personal economical interest rather than eco-friendly consciousness and civic behavior, changes in market prices could lead to the collapse of the entire system (not to mention that introducing money exchange in everyday waste management could become a logistical nightmare for waste workers and local administration).

AT SOURCE WASTE SORTING EQUIPMENT

Just like it is essential for the soum to acquire proper facilities to set up an efficient waste management system, it is essential that all waste producers are provided with sorting equipment suitable to local context and consistent with the planned waste management schemes.

As we recommend that people are required to sort their waste in several categories and have interaction with waste workers, we are not favorable to the kind of bins established in Bulgan city for households (where people are supposed to put all their recyclables in a bin which will be emptied from the road by a waste worker they will never see or talk to). We recommend bins with several bags that should be delivered to waste management facility by households themselves, like it is done in some countries.⁹ These are the kind of bins we started manufacturing for households. The same logic should be applied to shops. Individual waste sorting containers consistent with their expressed needs and main types of waste should be provided to them to facilitate waste sorting.

Although we recommend to distribute this equipment for free (at least for households), starting with the most motivated families and shops, we also recommend that this equipment formally remains the collective property of the soum (through its administration), so as to keep some leverages of control and prevent repurposing and misuse of the sorting bins by users. The bins should thus be lent rather than given away, and should come with a formal commitment of the waste to sort and manage waste according to recommendations.

In public institutions, all staff pointed out that sorting bins are lacking inside and outside the buildings. This equipment should also be provided as soon as possible. No other equipment appears necessary, except for an autoclave in the hospital. This device is supposed to be mandatory and, given how unsafe the hospital's current medical waste burning barrel is, it is of paramount importance to supply the hospital with a suitable machine as soon as possible.

AWARENESS-RAISING AND TRAININGS

Overall, it appears necessary to increase the level of awareness and implication of all stakeholders, starting with the general population. Most people are aware that waste is a serious issue, but knowledge usually remains vague and abstract. It is thus important to organize trainings focusing on the basics: what is waste, why it needs to be managed properly and so on. More importantly, people also express the need for practical explanation and guidance on what to do concretely: how and what

⁹ In France, for instance, public collection service in most villages collect only ultimate waste. Citizens are asked to bring their sorted recyclables by themselves to dedicated places.

to sort, what to do with it, etc. Some target groups should be favored in a strategic manner and public institutions should become examples to follow. Children at school should be a focal point to introduce the best practices and habits, but activities should also include other waste producers.

In any case, beyond theoretical trainings and information, awareness-raising activities should be carried out in a very interactive manner. Most importantly, rather than providing lots of information on rare punctual occasions, brief follow-up activities should be favored. For instance, it is essential to plan ongoing supervision and explanations on waste sorting by organizing group demonstrations or even door-to-door visits.

In addition, awareness-raising should probably be encouraged through waste-related community activities, such as public waste picking campaigns. The usual cleaning campaigns in Khishig-Undur have certainly not had a major positive impact on local waste management, but they do have the merit of existing and can thus constitute a good base through which to strengthen local population's involvement in the soum's waste management activities.

INTEGRATION OF HERDER HOUSEHOLDS IN THE WASTE MANAGEMENT SYSTEM

Integrating herders into a proper waste management system has always been very complicated as they are individually spread over the soum's territory and most live far from the village. Organizing waste collection, especially at relatively low cost and/or with fair acceptable taxes, is a puzzle for a soum administration. However, most herders admit that, although it would obviously be comfortable, a door-to-door waste collection is not really necessary: almost all of them own a truck and come to the soum-center several times a month anyway, so they definitely can/could bring their waste with them to the waste management facility. Therefore, this is the solution we recommend. Intermediary collection points (for example in bag-centers) should be avoided for the same reason as in the village (if no one is there to watch, there is no chance it will be managed properly).

Herders don't lack space outside, but they don't have much space inside their yurts. In most of the households, sorted waste should be kept outside until it is brought to the village, but the risk of dogs digging through and wind damaging the sorting bags fast is a real challenge that needs be considered carefully. In winter, bags could probably be stored relatively safely in the livestock shelter, but not all families have one and there is no infrastructure in the other seasons' camps.

The main issue is how to make herders start sorting and bring their waste to the waste management facility. Incentives would obviously help, but also lots of awareness-raising should be carried out. Gathering herders doesn't appear to be a real issue: each bag-center has a building and every family can send someone if a meeting is organized. Winter and summer are the best periods as herder have time; spring, on the other hand, is the busiest season and people are occupied. Families with the best waste management practice could be involved in the awareness-raising action and be presented as examples to follow.

FOCUS ON MAIN TYPES OF WASTE TO BE MANAGED IN KHISHIG-UNDUR

GLASS

To our knowledge, there is currently no glass recycling industry in Mongolia. In any case, since reusing is always better than recycling, we recommend that alcohol and pickled food industries are involved in the resolution of the problem. In other words, a system in which companies take/buy back their glass bottles and jars should be established as soon as possible, as directly as possible (sوم administration should preferably deal directly with vodka industry rather than involve intermediary stakeholders). For the remaining glass (especially when broken), local recycling solutions suitable to Khishig-Undur context should be researched and explored. If investment for glass recycling is too high and irrelevant for سوم level, we suggest that such equipment is set up in aimag centers and that all soums bring their glass waste there for recycling.

PLASTICS

While PET bottles should probably be sold to urban industries (at least in a first phase), other types of plastic should be recycled locally as much as possible. Simple machines could enable this activity, which should start as soon as possible to show local population what can be done if they sort their waste. First locally recycled items could become the best possible ambassadors towards further sorting and recycling.

GREEN ORGANIC WASTE AND FOOD LEFTOVERS

It is already very common to give vegetable peels to livestock so this practice should be encouraged and further developed until no vegetable peels are thrown in the dumpsite. Other types of food waste which livestock does not eat can usually be given to dogs. For the remaining green organics, composting could also be introduced – even though long cold winters make the process more complicated than it usually is in most countries.

BONES AND ANIMAL CARCASSES

Mongolians produce a very large amount of bone and Khishig-Undur households usually dump most of them at the dumpsite. Dead livestock is also commonly disposed there. We recommend that all safe animal waste such as bones and healthy carcasses are disposed in a specific area in the steppe (separate from landfill) and left for wild animals to eat and eliminate. This solution would not only be very cheap and effective, but also very natural and as close as possible to traditional way of disposing of such animal waste. The only exception would be carcasses of livestock carrying contagious diseases, which should be buried carefully in a specific area.

ASH

It is probably possible to find useful applications for wood and cow dung ash, especially in fields such as agriculture. Wood ash can also be used to produce lye that, together with animal fat (or any other oil), can be the base of artisanal soap production. Other options should be researched and explored

to make the most out of the resource that wood ash can be. For coal ash, applications are probably not as numerous considering the toxic substances it can contain. Nevertheless, research and experimentation should also be conducted to find a proper way to manage it. Coal ash from central heating plant actually has a texture that could be relevant to cover other types of waste in the landfill and prevent wind scattering. This option, like others, should be investigated.

DIAPERS

As there is no way to recycle single-use baby diapers, we recommend to try and reduce their production by encouraging the transition to reusable diapers. Kindergarten is favorable to this transition and could play a pioneer and model role in this transition if adequate equipment (reusable diapers in sufficient number and washing machines) is provided to the institution.

PAPER AND CARTON

Paper and cartons are commonly used to light fires and are perfectly useful as such, especially since they don't appear to be among the main types of waste produced in Khishig-Undur. If necessary, other useful application can most likely be found locally, such as in compost or dry toilets. There is also a paper recycling in Ulaanbaatar.

MEDICAL WASTE

The current way to dispose medical waste is particularly unsafe. A proper autoclave should be supplied to the hospital as soon as possible.

OTHER HAZARDOUS WASTE

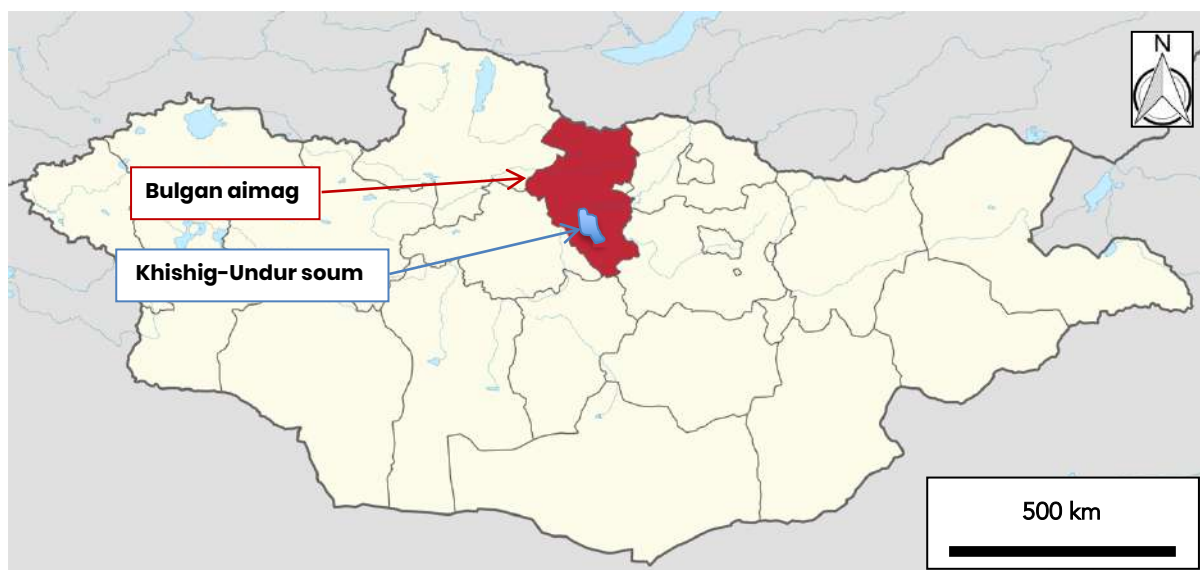
Khishig-Undur cannot continue disposing all types of toxic substances and hazardous waste in the open dumpsite, and preferably no more in the future proper landfill. If possible, we recommend to find ways to properly store hazardous waste in the waste management facility and eliminate it in proper channels in adequate urban facilities. If impossible, safe ways to bury them in Khishig-Undur's landfill should be researched and clearly defined.

SEWAGE SLUDGE

Recommendations should be made for proper disposal of sewage sludge from school, kindergarten and hospital, either in the landfill or in another dedicated area.

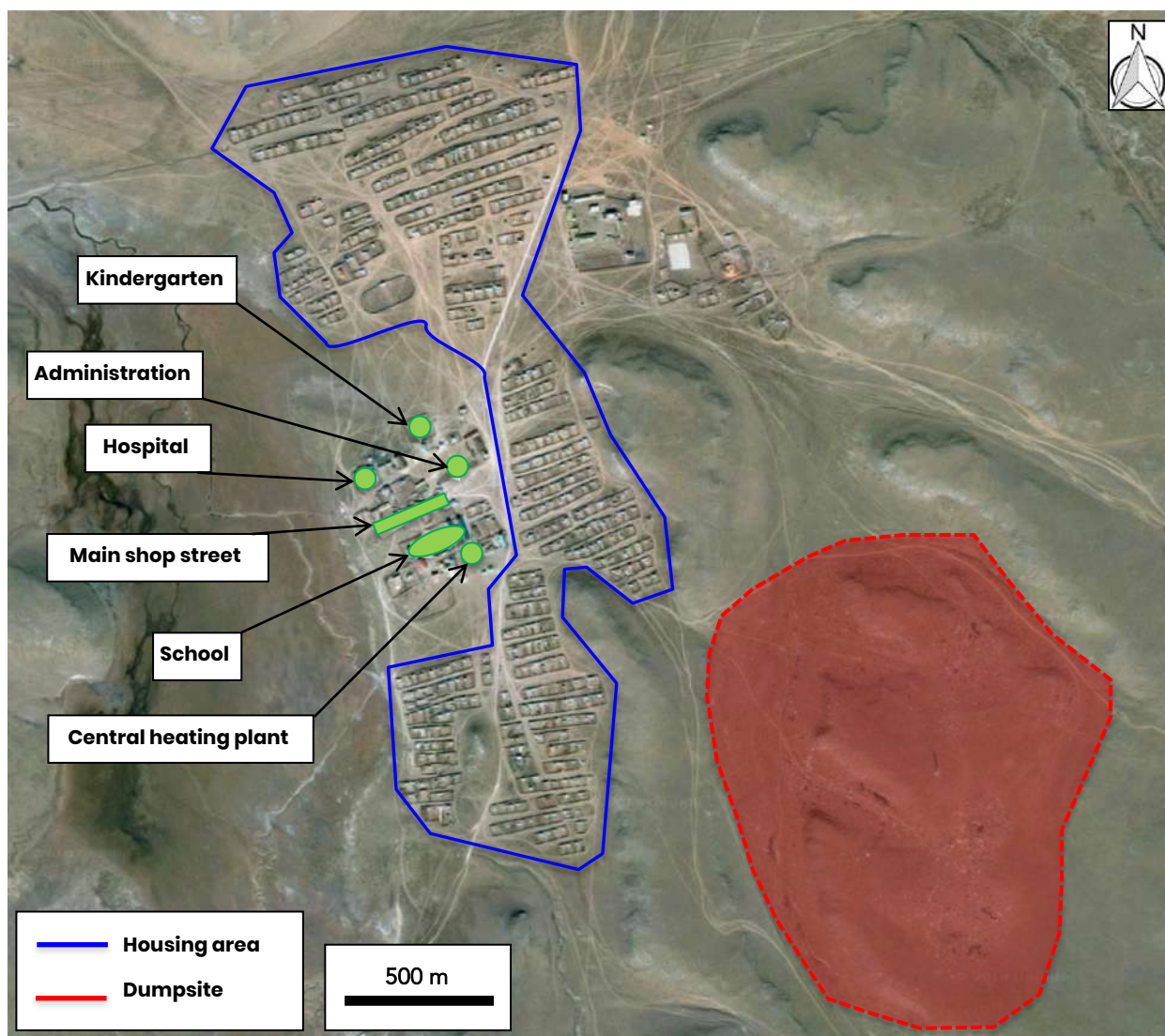
ANNEX 1

MAPS OF KHISHIG-UNDUR SOUM AND SOUM-CENTER



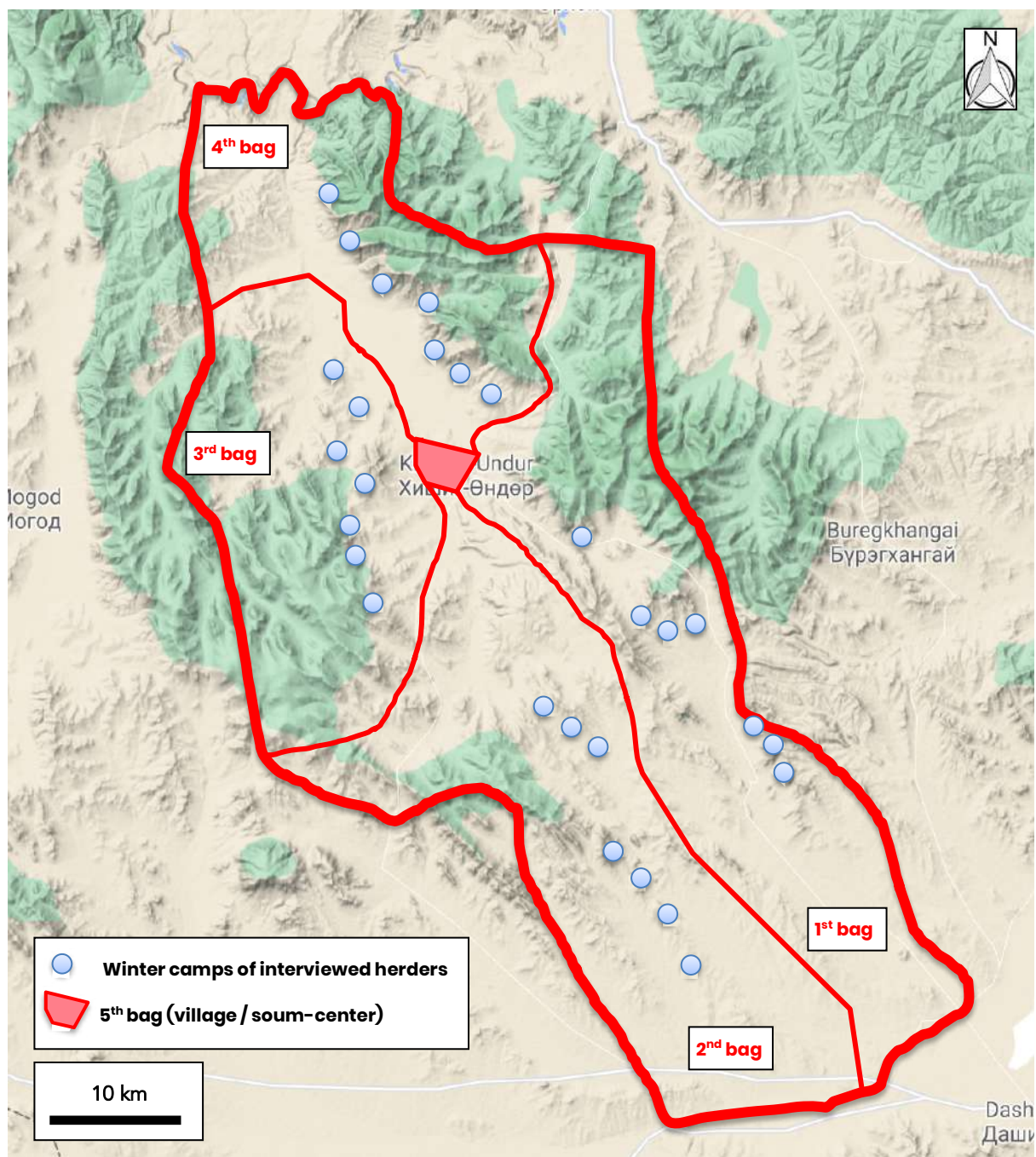
Map locating Bulgan aimag and Khishig-Undur soum within Mongolia

Source: Background map from Wikipedia, 2021



Map of Khishig-Undur soum-center (village)

Source: Background aerial picture from Google Maps, 2018



Map of Khishig-Undur soum's territory

Source: Background map from Google Maps, 2021

ANNEX 2

PHOTOS RELATED TO KHISHIG-UNDUR WASTE MANAGEMENT



Khishig-Undur soum-center



Ger in Khishig-Undur steppe



Public cleaning / waste-picking event nearby soum-center



Soum's waste collection truck at elderly's union cleaning event



Khishig-Undur's dumpsite



Khishig-Undur's dumpsite



Dumped central heating plant coal ash at dumpsite



Medical waste and paint at dumpsite



Dumpsite reduction work by contracted private company



Dumpsite reduction work by contracted private company



Administration



Administration's waste storage equipment (aimag provided bin)



Inside of recyclables' sorting container outside administration



Hospital



Hospital's waste storage area



Hospital's medical waste burning container



School



School's indoor sorting bins



School's elevated waste storage area



Kindergarten



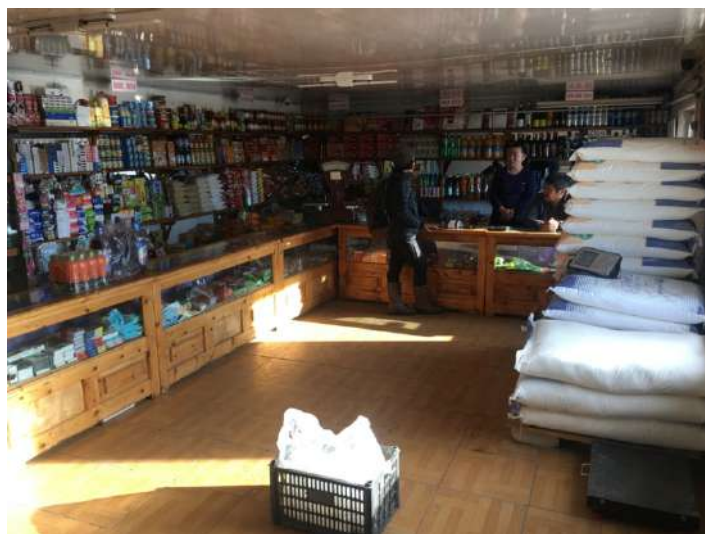
Kindergarten's waste storage area



Main shop street



Tsainii gazar



Large shop



Central heating plant



Coal ash temporary storage outside central heating plant



Typical sedentary household container for ash



Herder's individual burning area nearby camp



Ecosoum's home-made plastic recycling machines



Professional shredding machine purchased by Ecosoum