Section F Baseline Survey

F Baseline Survey

F.1 Public Opinion Survey on SWM in Ulaanbaatar

a. Purpose of the Survey

In the project PDM, "People's satisfaction level for urban environment and sanitation throughout the City reaches to X%" has been set up as the indicator of "Overall Goal", and "People's satisfaction level for the SWM service throughout the City reaches to X%." has been set up as the indicator of "Project Purpose".

In this project, public opinion survey (POS) was conducted for the residents who live in the 6 pilot districts of the Central District of the Ulaanbaatar City as means of verification.

This survey is planned to be conducted 3 times at the time of the beginning, intermediate, and the end of this project. 420 households of respondents of POS conducted this time will also be the target of the other two times of POS. The result of the POS will be used as the criterion whether or not the aim of the project is achieved.

In the UB City, the waste collection systems differ greatly between the Ger Area and the Apartment Area according to the differences in the system and life style of a community. This survey puts emphasis on collecting the consciousness and the opinions of residents about surrounding urban environment, public health, and waste collection service, paying attention to the difference among such resident statuses.

b. Method of the Survey

b.1 Outline of the survey

This survey was roughly divided and conducted in the Ger Area and the Apartment Area. The same number of the interviewees was chosen out of 6 pilot districts of the Central District of the UB City so that partiality might not appear in the survey. The two khoroos were selected respectively from the Ger Khoroo and the Apartment Khoroo in each district, and 35 households were further selected as interviewees of the survey. The first approach to each khoroo was taken by EPWMD staffs who take charge of each district, and actual distribution and collection of questionnaires were carried out by each khoroo officials.

* Khoroo is the administration unit which constitutes district. Each district consists of about 20 khoroos on average, and the khoroo where apartment residents are majority is called Apartment Khoroo, and the other where ger surrounded by khashaa (wooden enclosure) or detached house residents are majority is called Ger Khoroo.

The method and outline of the survey are shown below.

1. Survey Method: Distribution and collection of questionnaire
2. Object: Households who live in the 6 pilot districts of the Central District of the UB City.
3. Number of Object: (1) 420 households which reside in Ger Area
   (6 District X 2 khoroos X 35 = 420)
   (2) 420 Households which reside in Apartment Area
   (6 District X 2 khoroos X 35 = 420)

4. Target Area: Two khoroos selected respectively from the Ger Khoroo and the Apartment Khoroo in each 6 district of the Central District of the UB City. Total: 24 Khoroos.
5. Number of questions : 13
6. The theme of a question: (1) Urban environment and sanitation of the UB City
   (2) Problem of SWM in the UB City
   (3) Question on characteristics of the respondent

b.2 Selection of Target

b.2.1 Selection of Target Khoroo

The EPWMD staffs in charge of each district selected the 2 target khoroos respectively from Apartment Khoroo and Ger Khoroo.

b.2.2 Selection of Object

The object in each Khoroo was selected by each Khoroo official requested by the EPWMD staff. The EPWMD staff instructed each Khoroo official on a basis of selection so that the places of residence of the respondent would not be partial.

b.3 Execution of Survey

b.3.1 Method of Survey

Each Khoroo official distributed the questionnaire to the interviewees and collected them. The collected questionnaire was inputted into designated form by each Khoroo official, and was sent to the EPWMD staff as a digital file.

b.3.2 Period of Survey

Although the JET instructed to distribute questionnaire to each Khoroo and collect them within the limit of 1 to 2 weeks, it took one month to distribute questionnaire to each Khoroo official and collect all the digital files. Moreover, it took two weeks to analyze the received data.

The period of reply day of the questionnaire obtained from the effective ones out of all collected questionnaires was between November 10 and 20, 2009.

b.4 Questionnaire Contents

The question was roughly divided into three categories; 1) Question on urban environment and sanitation of the UB City, 2) Question on waste management in the UB City, 3) Question on characteristics of the respondent. The purpose, the contents, etc. in each item were described below, respectively.

b.4.1 Question on Urban Environment and Sanitation of the UB City

The question was considered for analyzing the consciousness and the opinion of residents about the urban environment and sanitation of the UB City. It aims at measuring "People’s satisfaction level for urban environment and sanitation throughout the City reaches to X%"

which has been set up as the indicator of "Overall Goal". The contents of question were roughly divided into two; 1) the degree of satisfaction on urban environment and sanitation, 2) the most serious problem in the UB City.

b.4.2 Question on Waste Management in the UB City

The question was considered for analyzing the consciousness and the opinion of residents about waste management in the UB city. It aims at measuring "People's satisfaction level for the SWM service throughout the City reaches to X%." which has been set up as the indicator of "Project Purpose". The contents of question were roughly divided into four; 1) the degree of satisfaction on SWM and its reason, 2) the degree of satisfaction on waste collection service and its reason, 3) evaluation on each level of local governments, 4) the degree of understanding and cooperation for separate discharge and collection.

b.4.3 Question on Characteristics of the Respondent

It aims at understanding whether there is any impartiality in distribution of a respondent, and what kind of resident answered the questions from the viewpoints of a place of residence, age, sex, education level, etc., which would make analysis of the reply to other questions even deeper.

c. Result of Survey

c.1 Information on Respondents

c.1.1 Distribution of Respondents（Place of Residence）

2 Apartment Khoroos and 2 Ger Khoroos were selected from each District respectively and questionnaire survey was conducted for 35 households from each khoroo. The number of questionnaire distributed was 840 sheets, and 826 sheets among them have been collected. The distribution of the respondent according to each place of residence is shown below. A total of 826 households consist of 411 households from Apartment Khoroo and 415 households from Ger Khoroo.

Table F-1: : Distribution of Respondents（District, Khoroo, Place of Residence）

District	Khoroo	apartment area	ger area	total
Bayangol	4	35		35
	9		35	35
	10		34	34
	13	35		35
Bayanzurkh	9		35	35
	12		35	35
	15	35		35
	18	34		34
Chingeltei	1	33		33
	6	36		36
	10		33	33
	11		33	33
Khan-Uul	1	35		35
	2	35		35
	4		35	35
	6		35	35
Sukhbaatar	1	31		31
	8	32		32
	11		32	32

	13		39	39
Songinokhairkhan	10		34	34
	12	35		35
	18	35		35
	23		35	35
total		411	415	826

c.1.2 Distribution of Respondents（Age and Sex）

The distribution of respondent according to the age and sex is shown below. There were 39.3% of males, and 58.6% of females. Furthermore, according to age, 48 years old and over accounts for 44.1% and the age groups not more than 48 years old are scattered on the average. In addition, the method of the classification of more than 48 year old is based on the statistics on population and age of the UB City, and was determined based on the request of EPWMD that the method of such a classification is suitable because a life expectancy is shorter than Japan in Mongolian and the 50 or older-year people account for only 14.3%[1] of all population based on age distribution of the UB City in 2008. In this sense, it can be said that the ratio which senior occupies in this survey is higher to the ratio of the senior to the population of the UB city.

Table F-2: Distribution of Respondents (Age and Sex)

Age	male	female	(Blank)	Total	Total (number)
18-23	1.5%	2.5%	0.0%	4.0%	33
24-29	4.5%	6.5%	0.0%	11.0%	91
30-35	4.6%	8.0%	0.0%	12.6%	104
36-41	5.3%	8.0%	0.1%	13.4%	111
42-47	5.0%	8.2%	0.0%	13.2%	109
48 above	18.5%	25.2%	0.4%	44.1%	364
(Blank)	0.0%	0.1%	1.6%	1.7%	14
Total	39.3%	58.6%	2.1%	100.0%	826

c.1.3 Distribution of Respondents（Education Level and Residence Area）

The following table shows the distribution of final academic background of respondents. 40% or more of all respondents has the academic background of the university graduation, and 70% or more among them is those who live in the Apartment Area.

Table F-3: Distribution of Respondents（Education Level and Residence Area）

Educational background	apartment area	ger area	Total	Total (number)
1.University	31.0%	12.6%	43.6%	360
2.Special Secondary (Diploma)	8.5%	13.3%	21.8%	180
3.Secondary School	7.7%	16.7%	24.5%	202
4.Half Secondary School	1.9%	5.1%	7.0%	58
5.Primary School or no education	0.2%	1.0%	1.2%	10
(Blank)	0.4%	1.6%	1.9%	16
Total	49.8%	50.2%	100.0%	826

c.2 Question on Urban Environment and Sanitation of the UB City

[1] “Capital City” statistical bulletin 2008

c.2.1 Degree of Satisfaction on Urban Environment and Sanitation of the UB City

Q1-1: Are you satisfied with urban environment and sanitary conditions in Ulaanbaatar City?

The answer to the question was analyzed from three kinds of viewpoints and summarized into the table. One was totaled and analyzed by residence area, and other two were analyzed by District; Apartment Area and Ger Area.

Answer to the Q1-1 (by Residence Area)

The answer to Q1-1 was totaled and analyzed by the residence area. 43.6% or more in the Apartment Area and 40.8% or more in the Ger Area and 42.1% on average show the satisfaction rating more than average for the urban environment and sanitation of the UB city. A big difference is not seen though the resident in Apartment Area shows some high degree of satisfactions overall. It can be said to this question that the public opinion in the UB city is common regardless of the residence area.

Table F-4: Are you satisfied with urban environment and sanitary conditions in Ulaanbaatar City?

Q.1-1	apartment area		ger area		total	
	number	rate	number	rate	number	rate
1. Yes, it is very good conditions	9	2.2%	5	1.2%	14	1.7%
2. Yes, it is good conditions	23	5.6%	21	5.1%	44	5.3%
3. Yes, but it is average conditions	147	35.8%	143	34.5%	290	35.1%
4. No, it is poor conditions	135	32.8%	161	38.8%	296	35.8%
5. No, it is very poor conditions	93	22.6%	77	18.6%	170	20.6%
invalid	4	1.0%	8	1.9%	12	1.5%
total	411	100.0%	415	100.0%	826	100.0%

: Satisfaction rating more than the average

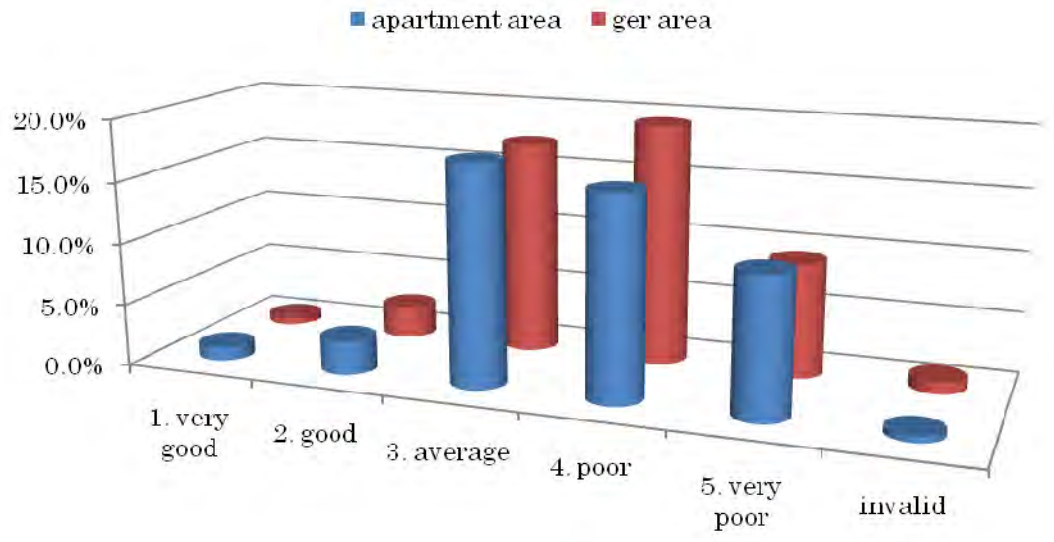


Figure F-1: Answer to the Q1-1（by Residence Area）

Answer to the Q1-1 (by District, the Case of Apartment Area)

The answer to Q1-1 in the Apartment Area was totaled by District. When we see the data of each district that shows the satisfaction rating more than average, it is BGD31.5%,

BZD57.9%, ChD39.1, KhUD 41.4%, SBD60.2%, and SKhD32.9%. BZD is 57.9% after 60.2% of highest SBD, and the lowest one is 31.5% of BGD, and 32.9% of SKhD comes next.

Table F-5: Are you satisfied with urban environment and sanitary conditions in Ulaanbaatar City (In case of Apartment area)?

Q.1-1	BGD		BZD		ChD		KhUD		SBD		SKhD		total	
	Num	rate	Num	rate	Num	rate	Num	rate	Num	rate	Num	rate	Num	rate
1. Yes, it is very good conditions	2	2.9%	0	0.0%	0	0.0%	2	2.9%	4	6.3%	1	1.4%	9	2.2%
2. Yes, it is good conditions	2	2.9%	5	7.2%	4	5.8%	1	1.4%	5	7.9%	6	8.6%	23	5.6%
3. Yes, but it is average conditions	18	25.7%	35	50.7%	23	33.3%	26	37.1%	29	46.0%	16	22.9%	147	35.8%
4. No, it is poor conditions	25	35.7%	13	18.8%	35	50.7%	21	30.0%	16	25.4%	25	35.7%	135	32.8%
5. No, it is very poor conditions	23	32.9%	16	23.2%	6	8.7%	19	27.1%	8	12.7%	21	30.0%	93	22.6%
invalid	0	0.0%	0	0.0%	1	1.4%	1	1.4%	1	1.6%	1	1.4%	4	1.0%
total	70	100%	69	100%	69	100%	70	100%	63	100%	70	100%	411	100%

: Satisfaction rating more than the average

Answer to the Q1-1 (by District, the Case of Ger Area)

The answer to Q1-1 in the Ger Area was totaled by district. When we see the data of each district that shows the satisfaction rating more than average, it is BGD31.8%, BZD41.4%, ChD44.0%, KhUD50.1%, SBD40.8%, and SKhD36.2%. ChD is 44.0% after 50.1% of highest KhUD, and the lowest one is 31.8% of BGD, and 36.2% of SKhD comes next.
It can be understood that BGD and SKhD are the lowest in the satisfaction level in case of Apartment Area as well, these two districts shows low satisfaction rating for urban environment and sanitation of the UB city.

Table F-6: Are you satisfied with urban environment and sanitary conditions in Ulaanbaatar City? (In case of Ger Area)

Q.1-1	BGD		BZD		ChD		KhUD		SBD		SKhD		total	
	Num	rate	Num	rate	Num	rate	Num	rate	Num	rate	Num	rate	Num	rate
1. Yes, it is very good conditions	1	1.4%	0	0.0%	0	0.0%	3	4.3%	0	0.0%	1	1.4%	5	1.2%
2. Yes, it is good conditions	4	5.8%	4	5.7%	5	7.6%	2	2.9%	2	2.8%	4	5.8%	21	5.1%
3. Yes, but it is average conditions	17	24.6%	25	35.7%	24	36.4%	30	42.9%	27	38.0%	20	29.0%	143	34.5%
4. No, it is poor conditions	29	42.0%	27	38.6%	28	42.4%	22	31.4%	25	35.2%	30	43.5%	161	38.8%
5. No, it is very poor conditions	18	26.1%	13	18.6%	7	10.6%	13	18.6%	13	18.3%	13	18.8%	77	18.6%
invalid	0	0.0%	1	1.4%	2	3.0%	0	0.0%	4	5.6%	1	1.4%	8	1.9%
total	69	100%	70	100%	66	100%	70	100%	71	100%	69	100%	415	100%

: Satisfaction rating more than the average

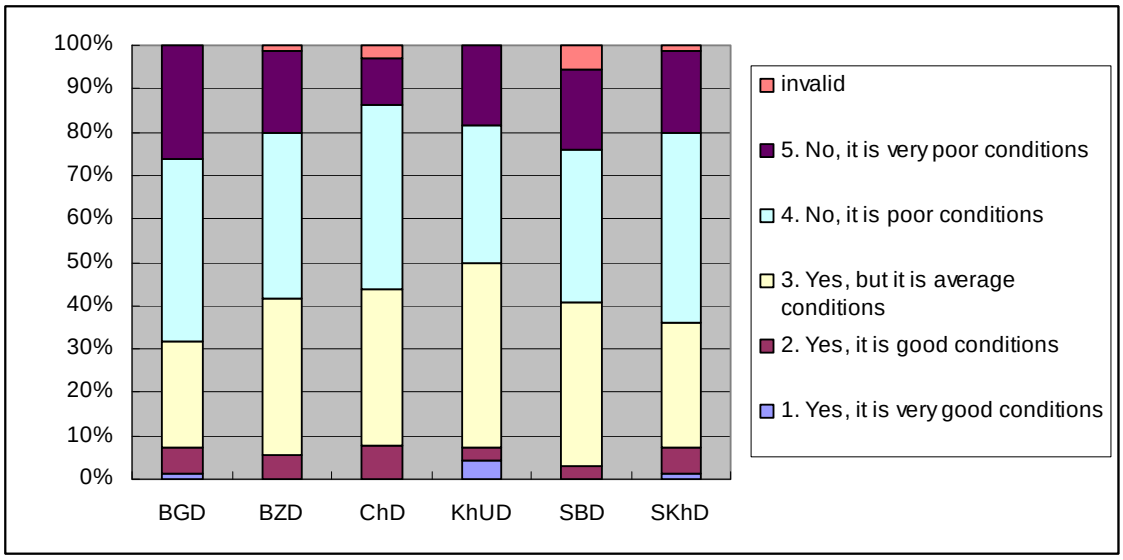


Figure F-2: Answer to the Q1-1 (by District, the Case of Ger Area)

c.2.2 Problem on Urban Environment and Sanitation of the Ulaanbaatar City

Most Serious Problem

Q1-2: Which do you think the most serious problem is in whole Ulaanbaatar City at present?

The answer to the question was totaled as follows. In both Apartment Area and Ger Area, about 80% of the respondents has answered that the most serious problem in the urban environment and sanitation of the UB city is "air pollution", and it is overwhelming other items. Although there is a big difference considering air pollution, 3.4% of respondent has chosen the "waste problem" as the 2nd as a serious problem.

Table F-7: Which do you think the most serious problem is in whole Ulaanbaatar City at present

Q.1-2	Apartment area		Ger area		Total	
	num	rate	num	rate	num	rate
01. Inadequate supply of safe water	3	0.7%	0	0.0%	3	0.4%
02. Air pollution	328	79.8%	345	83.1%	673	81.5%
03. Water pollution	9	2.2%	11	2.7%	20	2.4%
04. Soil contamination	8	1.9%	5	1.2%	13	1.6%
05. Noise problems	4	1.0%	0	0.0%	4	0.5%
06. Solid waste (garbage) problems	17	4.1%	11	2.7%	28	3.4%
07. Inadequate capacity of sewerage treatment	0	0.0%	3	0.7%	3	0.4%
08. Public toilet is not sanitary conditions	1	0.2%	3	0.7%	4	0.5%
09. sanitary conditions of pit latrine	1	0.2%	1	0.2%	2	0.2%
10. Traffic congestions	9	2.2%	4	1.0%	13	1.6%
11. Inadequate supply of electricity	1	0.2%	1	0.2%	2	0.2%
12. Inadequate supply of public transport	1	0.2%	4	1.0%	5	0.6%
13. I do not know	0	0.0%	0	0.0%	0	0.0%
14. Others	1	0.2%	0	0.0%	1	0.1%
invalid	28	6.8%	27	6.5%	55	6.7%
total	411	100%	415	100%	826	100%

: Item with most answers

Other Serious Problems

Q1-3: Other than the most serious problems, what problems are there in Ulaanbaatar City?

(Multiple Answers)

The answer to the question was totaled as follows. Although 80% or more people answered that "air pollution" is the most serious problem in question Q1-2, 18.8% of people still considers "air pollution" as the most serious problem, which means how seriously "air pollution" is regarded as problem by citizens. After that, 14.3% of "Traffic jam", 12.9% of "Soil contamination", and 12.8% of "Waste issue" follows. "Soil contamination" mentioned here seems to refer to what happens from some causes which pose a problem in the UB city at present. There are contaminations by dumping waste directly on the ground, by the lavatory in a Ger Area (the type of lavatory which digs a hole in the ground and excretes directly human waste), by illegal dumping of oil and chemical etc., from car repair plant, and by lead contained in the smoke by coal combustion that becomes a problem due to air pollution that began to come up in conversation permeating the ground out of the atmosphere.

Incidentally, there is also no big difference in the public opinion regardless of the difference in residence area. The problem mentioned here can be said to be the problem which UB citizen is conscious of in common irrespective of the form and area of residence.

Table F-8: Other than the most serious problems, what problems are there in Ulaanbaatar City?

Q.1-3	Apartment area		Ger area		Total	
	num	rate	num	rate	num	rate
01. Inadequate supply of safe water	50	3.9%	52	3.9%	102	3.9%
02. Air pollution	226	17.5%	266	20.0%	492	18.8%
03. Water pollution	120	9.3%	124	9.3%	244	9.3%
04. Soil contamination	154	11.9%	184	13.8%	338	12.9%
05. Noise problems	93	7.2%	56	4.2%	149	5.7%
06. Solid waste (garbage) problems	171	13.2%	165	12.4%	336	12.8%
07. Inadequate capacity of sewerage treatment	52	4.0%	26	2.0%	78	3.0%
08. Public toilet is not sanitary conditions	79	6.1%	103	7.7%	182	6.9%
09. sanitary conditions of pit latrine	46	3.6%	75	5.6%	121	4.6%
10. Traffic congestions	201	15.6%	173	13.0%	374	14.3%
11. Inadequate supply of electricity	27	2.1%	46	3.5%	73	2.8%
12. Inadequate supply of public transport	65	5.0%	53	4.0%	118	4.5%
13. I do not know	2	0.2%	1	0.1%	3	0.1%
14. Others	5	0.4%	6	0.5%	11	0.4%
invalid	1	0.1%	0	0.0%	1	0.0%
total	1292	100%	1330	100%	2622	100%

: Item with most answers

c.3 Question on SWM in the Ulaanbaatar City

c.3.1 Degree of Satisfaction on SWM in the Ulaanbaatar City

Q2-1: Are you satisfied with Solid Waste Management services (discharge, collection, transportation and disposal) in Ulaanbaatar City?

The answer to the question was totaled and analyzed from three kinds of viewpoints. One was totaled and analyzed by residence area, and other two were analyzed by each district; Apartment Area and Ger Area.

Answer to the Q2-1 (by Residence Area)

When the answer to Q2-1 was totaled by residence area, the respondent of 53.8% in Apartment Area and 58.1% in Ger Area, and 55.9% on average showed the satisfaction rating more than average. The high degree of satisfaction was shown here overall compared with the answer of the satisfaction level to the urban environment and sanitation of the UB city in Q1-1.

Table F-9: Are you satisfied with Solid Waste Management services? (According to Residence Area)

Q. 2-1	apartment area		ger area		total	
	number	rate	number	rate	number	rate
1. Yes, it is very good services	6	1.5%	9	2.2%	15	1.8%
2. Yes, it is good services	42	10.2%	57	13.7%	99	12.0%
3. Yes, it is average services	173	42.1%	175	42.2%	348	42.1%
4. No, it is poor services	136	33.1%	118	28.4%	254	30.8%
5. No it is very poor services	43	10.5%	38	9.2%	81	9.8%
6. I do not know	5	1.2%	6	1.4%	11	1.3%
invalid	6	1.5%	12	2.9%	18	2.2%
total	411	100%	415	100%	826	100%

: Satisfaction rating more than the average

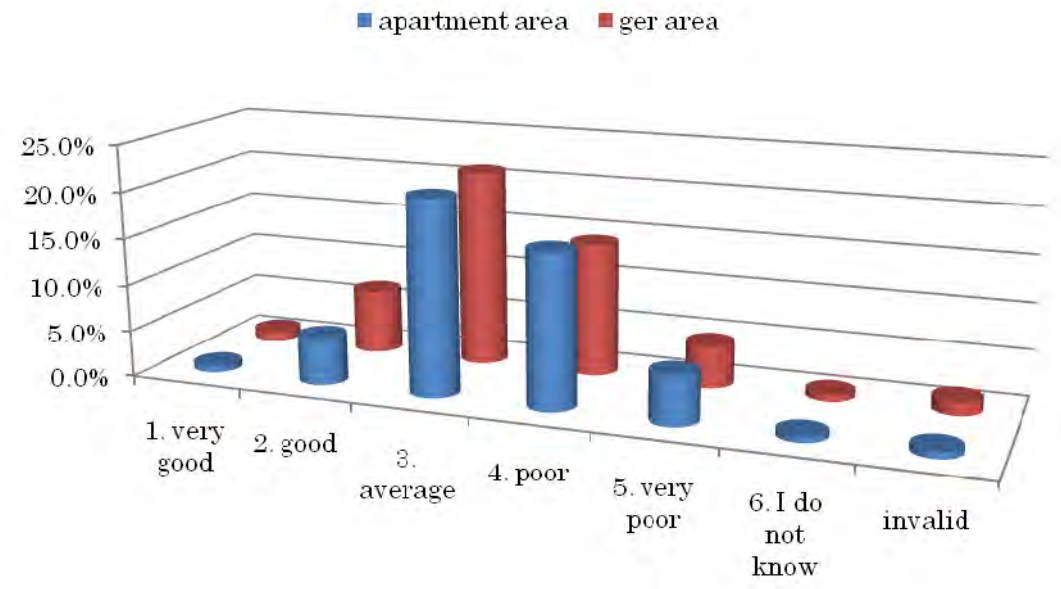


Figure F-3: Answer to the Q2-1 (by Residence Area)

Answer to the Q2-1 (by District, the Case of Apartment Area)

The answer to Q2-1 in the Apartment Area was totaled by district. When we see the data of

each district that shows the satisfaction rating more than average, it is BGD 35.8%, BZD 62.3%, ChD59.4%, KhUD48.6%, SBD68.3%, SKhD50.0%. BZD was 62.3% after 68.3% of highest SBD, and the lowest one is 35.8% of BGD, 48.6% of KhUD comes next.

Table F-10: Are you satisfied with Solid Waste Management services?（by District, the Case of Apartment Area）

Q.2-1	BGD		BZD		ChD		KhUD		SBD		SKhD		total	
	num	rate	num	rate	num	rate	num	rate	num	rate	num	rate	num	rate
1. Yes, it is very good services	0	0.0%	2	2.9%	0	0.0%	1	1.4%	3	4.8%	0	0.0%	6	1.5%
2. Yes, it is good services	2	2.9%	8	11.6%	14	20.3%	3	4.3%	11	17.5%	4	5.7%	42	10.2%
3. Yes, it is average services	23	32.9%	33	47.8%	27	39.1%	30	42.9%	29	46.0%	31	44.3%	173	42.1%
4. No, it is poor services	35	50.0%	17	24.6%	20	29.0%	24	34.3%	12	19.0%	28	40.0%	136	33.1%
5. No it is very poor services	10	14.3%	8	11.6%	7	10.1%	9	12.9%	4	6.3%	5	7.1%	43	10.5%
6. I do not know	0	0.0%	1	1.4%	1	1.4%	1	1.4%	1	1.6%	1	1.4%	5	1.2%
invalid	0	0.0%	0	0.0%	0	0.0%	2	2.9%	3	4.8%	1	1.4%	6	1.5%
total	70	100%	69	100%	69	100%	70	100%	63	100%	70	100%	411	100%

: Satisfaction rating more than the average

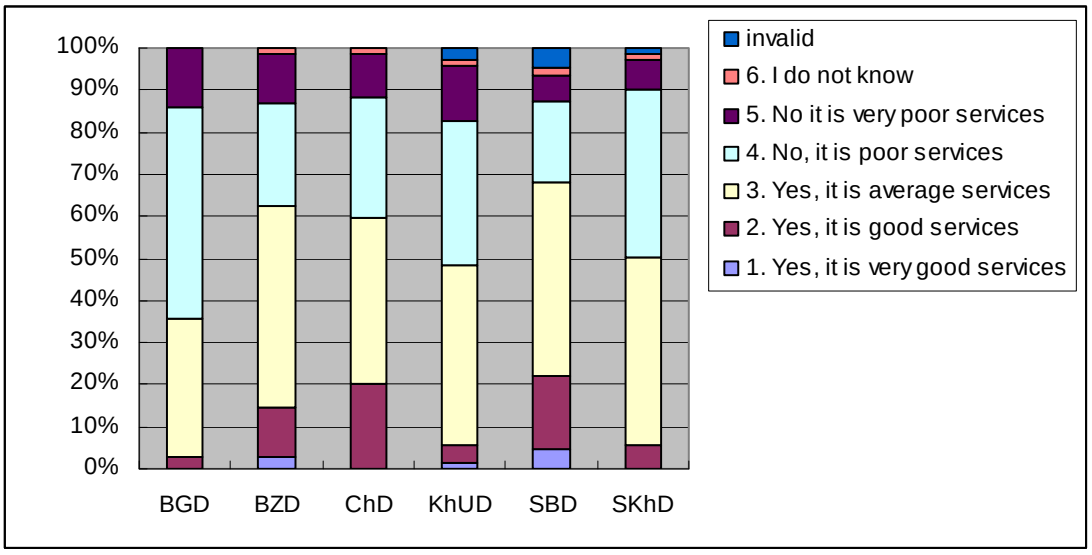


Figure F-4: Answer to the Q2-1（by District, the Case of Apartment Area）

Answer to the Q2-1 (by District, the Case of Ger Area)

The answer to Q2-1 in the Ger Area was totaled by district. When we see the data of each district that shows the satisfaction rating more than average, it is BGD49.2%, BZD65.7%, ChD63.6%, KhUD67.2%, SBD45%, SKhD58%. BZD was 65.7% after 67.2% of highest KhUD, and the lowest one is 45% of SBD, 49.2% of BGD comes next.

In SBD, although the residents in Apartment Area showed the highest degree of satisfaction among the 6 districts, the residents in Ger Area showed the lowest. In BZD, both in the Apartment Area and the Ger Area showed the high degree of satisfaction, and the low degree was shown in both Areas in BGD.

Table F-11: Are you satisfied with Solid Waste Management services? (by District, the case of Ger Area)

Q.2-1	BGD	BZD	ChD	KhUD	SBD	SKhD	total

	num	rate	num	rate	num	rate	num	rate	num	rate	num	rate	num	rate
1. Yes, it is very good services	1	1.4%	1	1.4%	0	0.0%	3	4.3%	0	0.0%	4	5.8%	9	2.2%
2. Yes, it is good services	3	4.3%	15	21.4%	15	22.7%	7	10.0%	5	7.0%	12	17.4%	57	13.7%
3. Yes, it is average services	30	43.5%	30	42.9%	27	40.9%	37	52.9%	27	38.0%	24	34.8%	175	42.2%
4. No, it is poor services	24	34.8%	9	12.9%	18	27.3%	15	21.4%	30	42.3%	22	31.9%	118	28.4%
5. No it is very poor services	7	10.1%	8	11.4%	3	4.5%	8	11.4%	5	7.0%	7	10.1%	38	9.2%
6. I do not know	3	4.3%	2	2.9%	1	1.5%	0	0.0%	0	0.0%	0	0.0%	6	1.4%
invalid	1	1.4%	5	7.1%	2	3.0%	0	0.0%	4	5.6%	0	0.0%	12	2.9%
total	69	100%	70	100%	66	100%	70	100%	71	100%	69	100%	415	100%

: Satisfaction rating more than the average

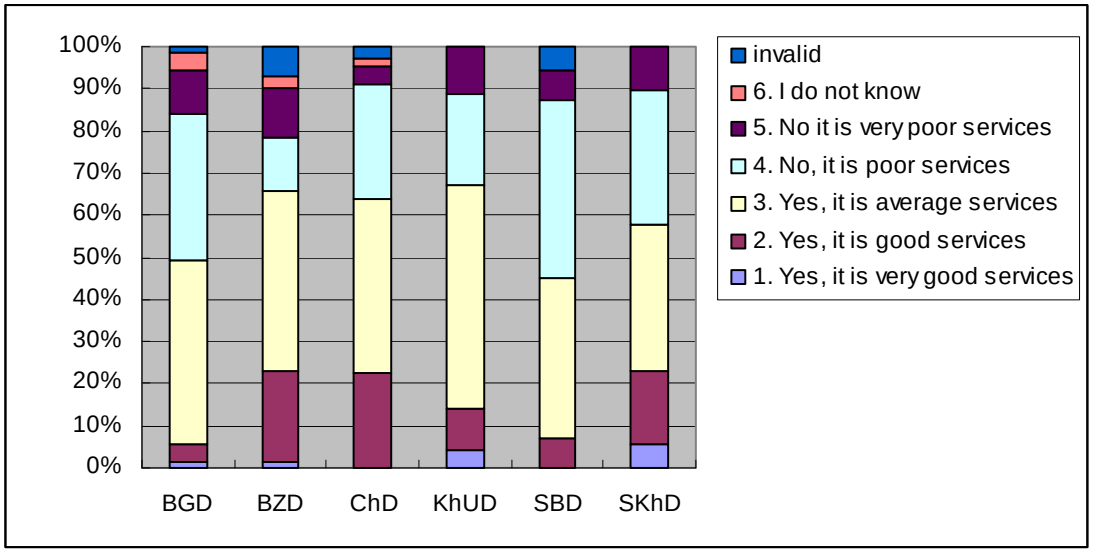


Figure F-5: Answer to the Q2-1 (by District, the case of Ger Area)

c.3.2 Most Serious Problem for SWM in the Ulaanbaatar City

Q2-2: What do you think the most serious problem is for SWM in Ulaanbaatar City at present?

(Maximum two answers)

The answer to the question was totaled as follows. It was "People's waste discharge manners and education is poor" that the resident had answered as the most serious problem of waste in the UB city. The Apartment Area and Ger Area accounted for 36.3% and 35.9% respectively and 36.1% on average. Next to this, it was 19.5% of residents in the Apartment Area, 14.1% in the Ger Area, and 16.8% on average who had answered "There are not enough SMEs to conduct waste separation and recycling activities ". It shows the current state that there are no recycling facilities though residents are enthusiastic about recycling. In the point of difference between the Apartment Area and the Ger Area, the resident in Ger Area answered the item "The collection service was not enough" more than the resident in Apartment Area.

Table F-12: What do you think the most serious problem is for SWM in Ulaanbaatar City at present?

Q.2.2 (max two)	Apartment area		Ger area		Total	
	num	rate	num	rate	num	rate
1. People's waste discharge manners is poor	267	36.3%	264	35.9%	531	36.1%
2. Waste collection services are not	48	6.5%	91	12.4%	139	9.4%

enough						
3. Waste disposal operations is not appropriate	72	9.8%	42	5.7%	114	7.7%
4. There are no waste treatment facilities like an incineration plant	84	11.4%	80	10.9%	164	11.1%
5. There are not enough SMEs to conduct waste separation and recycling activities	143	19.5%	104	14.1%	247	16.8%
6. Waste separation at household level is not conducted	74	10.1%	86	11.7%	160	10.9%
7. Public Education activities are not enough	40	5.4%	61	8.3%	101	6.9%
8. Others	7	1.0%	8	1.1%	15	1.0%
total	735	100%	736	100%	1471	100%

: Item with most answers

c.3.3 Degree of Satisfaction on Waste Collection Service in the Ulaanbaatar City

Here, the result of survey about the degree of satisfaction on waste collection in the UB City was analyzed. In UB city, the group that collects waste is different in each district and khoroo. Therefore, the object is various even if it calls it at a word "the degree of satisfaction on collection service." Furthermore, it is doubt whether all residents know the exact waste collection provider in their own districts. Therefore, first of all, how much respondent correctly understood the exact collection provider in their own districts was analyzed (c.3.1).

With that in mind, then, the degree of satisfaction of residents for waste collection itself (c.3.2), and the public opinion for the group actually collecting waste (c. 3.3) were analyzed.

Answer to the Q2-3 (Comparison with the Actual Waste Collection Provider in Each Khoroo)

Q2-3: Who is providing waste collection service in your area?

The answer to the question was totaled as follows. The item indicated in the column shows an actual collection service implementing body at the POS target area, and the item indicated in the row shows the collection service implementing body that the respondent recognizes. The square in which it adds shading in each column shows the right answer. The percentage of correct answers in each column is shown in the lowest row.

It is 48.2% of TUK that the percentage of correct answers was the highest, and 39.5% of Organization under District Government follows it. On the other hand, the lowest was 7.2% of CMPUA, and it seems that many of residents of the area where collection is carried out by CMPUA recognize it as District Government and TUK. On the whole, there are few respondents who answered it as Private Company, and it seems that it is seldom recognized that the private company is providing the collection service. Furthermore, it turned out that residents' recognition to waste collector is not so high because the whole average percentage of correct answers was only 29.3%.

Table F-13: Who is providing waste collection service in your area?

Q2-3	Actual Collection implementing body on each khoroo					
Options of answer	Organization under District	Khoroo	CMPUA	TUK	Private company	Total

1.WSF under District Government	68	25	58	61	7	219
2. Khoroo Government	12	16	11	48	1	88
3. CMPUA	10	9	10	26	0	55
4. TUK	45	9	43	198	13	308
5. Private Company other than TUK	24	2	4	7	10	47
6. I do not know	10	6	9	57	3	85
7.Others	0	0	0	6	0	6
invalid	3	2	4	8	1	18
Total	172	69	139	411	35	826
Rate of correct answer	39.5%	23.2%	7.2%	48.2%	28.6%	29.3%

: Correct answer in each item

Answer to the Q2-4 (Degree of Satisfaction for the Collection Service)

Q2-4: Are you satisfied with the collection services in your area?

The answer to the question was totaled as follows. The respondents who showed the degree of satisfaction more than average were 67.9% of Apartment Area, 67.1% of Ger Area, and an average of 67.4% of the whole. In this question, the big difference between the opinions of the residents in Apartment Area and Ger Area was not seen, but brought a result satisfied in general on the whole.

Table F-14: Are you satisfied with the collection services in your area?

Q. 2-4	apartment area		ger area		total	
	number	rate	number	rate	number	rate
1. Yes, it is very good services	13	3.2%	11	2.7%	24	2.9%
2. Yes, it is good services	53	12.9%	75	18.1%	128	15.5%
3. Yes, it is average services	213	51.8%	192	46.3%	405	49.0%
4. No, it is poor services	100	24.3%	98	23.6%	198	24.0%
5. No, it is very poor services	27	6.6%	23	5.5%	50	6.1%
invalid	5	1.2%	16	3.9%	21	2.5%
total	411	100%	415	100%	826	100%

: Satisfaction rating more than the average

Answer to the Q2-4 (Degree of Satisfaction on Activities of Collection Service Provider)

Q2-4: Are you satisfied with the collection services in your area?

The answer to the question was totaled as follows. When the answer of Q2-4 and the list of groups who are actually providing collection service in each area of respondent are combined, the degree of satisfaction shown in Q2-4 would correspond to the one made for actual collection service providers.

The item indicated in the column in most left-hand side shows the group which is actually collecting waste in the POS target area, and the items on degree of satisfaction to the waste collection service which is the answer of Q2-4 is shown in the 2nd column from the left.

In this POS target area, the group which is providing collection service to most residents in both Apartment and Ger Areas is TUK, and the number of the residents who receive their service is 240 persons and 171 persons respectively. The organization belonging to District Government follows the next, and they are 67 persons and 105 persons respectively. And it turned out that Khoroo Government does not collect in the Apartment Area, and Private Company is not collecting on the contrary in the Ger Area.

Table F-15: Are you satisfied with the collection services in your area?

Actual collection implementing body on each khoroo	Q.2.4	Apartment area		Ger area		Total	
		num	rate	num	rate	num	rate
1. Organization under District Government	1. Yes, it is very good services	1	1.5%	2	1.9%	3	1.7%
	2. Yes, it is good services	13	19.4%	14	13.3%	27	15.7%
	3. Yes, it is average services	41	61.2%	53	50.5%	94	54.7%
	4. No, it is poor services	10	14.9%	28	26.7%	38	22.1%
	5. No, it is very poor services	2	3.0%	4	3.8%	6	3.5%
	(Blank)	0	0.0%	4	3.8%	4	2.3%
1. WSF under District Government total		67	100%	105	100%	172	100%
2. Khoroo Government	1. Yes, it is very good services	0	0.0%	1	1.4%	1	1.4%
	2. Yes, it is good services	0	0.0%	7	10.1%	7	10.1%
	3. Yes, it is average services	0	0.0%	29	42.0%	29	42.0%
	4. No, it is poor services	0	0.0%	25	36.2%	25	36.2%
	5. No, it is very poor services	0	0.0%	6	8.7%	6	8.7%
	(Blank)	0	0.0%	1	1.4%	1	1.4%
2. Khoroo Government total		0	0%	69	100%	69	100%
3. CMPUA	1. Yes, it is very good services	3	4.3%	3	4.3%	6	4.3%
	2. Yes, it is good services	9	13.0%	16	22.9%	25	18.0%
	3. Yes, it is average services	47	68.1%	29	41.4%	76	54.7%
	4. No, it is poor services	8	11.6%	11	15.7%	19	13.7%
	5. No, it is very poor services	1	1.4%	5	7.1%	6	4.3%
	(Blank)	1	1.4%	6	8.6%	7	5.0%
3. CMPUA total		69	100%	70	100%	139	100%
4. TUK	1. Yes, it is very good services	8	3.3%	5	2.9%	13	3.2%
	2. Yes, it is good services	29	12.1%	38	22.2%	67	16.3%
	3. Yes, it is average services	113	47.1%	81	47.4%	194	47.2%
	4. No, it is poor services	66	27.5%	34	19.9%	100	24.3%
	5. No, it is very poor services	20	8.3%	8	4.7%	28	6.8%
	(Blank)	4	1.7%	5	2.9%	9	2.2%
4. TUK total		240	100%	171	100%	411	100%
5. Private Company other than TUK	1. Yes, it is very good services	1	2.9%	0	0.0%	1	2.9%
	2. Yes, it is good services	2	5.7%	0	0.0%	2	5.7%
	3. Yes, it is average services	12	34.3%	0	0.0%	12	34.3%
	4. No, it is poor services	16	45.7%	0	0.0%	16	45.7%
	5. No, it is very poor services	4	11.4%	0	0.0%	4	11.4%
	(Blank)	0	0.0%	0	0.0%	0	0.0%
5. Private Company other than TUK total		35	100%	0	0%	35	100%
total		411		415		826	

: Satisfaction rating more than the average

Only the rate of the respondent who showed the degree of satisfaction more than average is extracted from the above table, and it is shown as a table below.

In Apartment Area, 85.4% of residents of an area that CMPUA provides with collection service showed the highest degree of satisfaction more than average, and 42.9% of residents of an area that, as for the lowest one, Private Company (except TUK) provides with collection service. In Ger Area, 72.5% of residents of an area that TUK provides with collection service showed the highest degree of satisfaction more than average, and 53.5% of residents of an area that, as for the lowest one, Khoroo Government provides with collection service.

As a whole, 77.0% of the residents of an area that CMPUA provides collection service showed the highest degree of satisfaction more than average, and the lowest one, when

removing the provider that is collecting only in one of the two areas in which the respondent of the POS lives, was 66.7% of the residents of an area that TUK provides collection service.

Table F-16: Answer to Q2-4 - The rate of the respondent who showed the degree of satisfaction more than average was added and extracted out of Table 0-15

	apartment area	ger area	total
1. Organization under District Government	82.1%	65.7%	72.1%
2. Khoroo Government	-	53.6%	53.6%
3. CMPUA	85.5%	68.6%	77.0%
4. TUK	62.5%	72.5%	66.7%
5. Private Company other than TUK	42.9%	-	42.9%

- The collection service is not given in the POS target area.

c.3.4 Problem on Waste Collection Service in the Ulaanbaatar City

Q2-5: Why aren't you satisfied with waste collection services?

(Multiple Answers)

The answer to the question was totaled as follows. It was "1. Waste collection manner is poor" that most respondents answered as a problem in collection service, and it was 25.6% in the Apartment Area, 19.8% in the Ger Area, and 22.6% on average. If it sees from this result, the residents of an area to whom collection is provided by CMPUA showed the highest degree of satisfaction in Q2-4 of (c.3.3), it can be put in another way as such a high degree of satisfaction having been shown just because they were satisfied with the collection manners of the workers of CMPUA to some extent. "6. Some people do not pay waste collection fee" follows to the next as a problem, and it was 15.9% in the Apartment Area, 26.9% in the Ger Area, 21.5% on average, and especially high ratio was shown in the Ger Area. "3. Waste collection schedule is not fixed" was answered mostly to the third as a problem, and it was 19.7% in the Apartment Area, 22.9% in the Ger Area, and 21.3% on average.

In addition, for example in the Ger Area of the UB City, waste collection is conducted only once per month, and there is no telling when it comes. The selection item of "3.Waste collection schedule is not fixed" was prepared based on such a background.

Regarding "4.Waste collection time is not fixed", for example in the Apartment Area, there are areas where waste collection service is provided everyday, but also in such a case, at what time of the day it comes is not fixed so that it is hard for residents when to take out waste. Taking into account such an actual condition of the UB City, the selection item was prepared.

In any case, both items essentially correspond as "a problem resulting from there being no schedule of the time of collection." When the number of residents answered to both items in such meaning is added together, it is 32.9% in Apartment Area, 35.1% in Ger Area and 34% on average. Most of the residents seem to recognize this as a problem in waste collection service.

Table F-17: Why aren't you satisfied with waste collection services?

Q.2.5(Multiple answer)	Apartment area		Ger area		Total	
	num	rate	num	rate	num	rate
1. Waste collection manner is poor	190	25.6%	152	19.8%	342	22.6%
2. Frequency of waste collection is not enough	116	15.6%	85	11.1%	201	13.3%

3. Waste collection schedule is not fixed	146	19.7%	176	22.9%	322	21.3%
4. Waste collection time is not fixed	98	13.2%	94	12.2%	192	12.7%
5. Waste is not collected	18	2.4%	28	3.6%	46	3.0%
6. Some people do not pay waste collection fee	118	15.9%	207	26.9%	325	21.5%
7. Others	56	7.5%	27	3.5%	83	5.5%
total	742	100%	769	100%	1511	100%

: Item with most answers

c.3.5 Evaluation on Each Level of Local Governments in the Ulaanbaatar City

Q2-6: How do you evaluate waste management services of your Khoroo, District and City Government?

The answer to the question was totaled as follows. The respondent who gave the evaluation more than average to the Khoroo was 82.7% in the Apartment Area, 84.8% in the Ger Area and 83.8 % on average. As for the District, it was 69.6% in the Apartment Area, 67.5% in the Ger Area and 68.5% on average. As for the City, it was 51.0% in the Apartment Area, 56.0% in the Ger Area and 53.5% on average. Although the administration unit of Khoroo, District, and City is set as order with a near distance from residents, the degree of satisfaction to them also decrease in proportion to distance. As a result, the highest degree of satisfaction has been shown to Khoroo that is working most closely in visible way with residents. The blank to each administrative unit has increased gradually with Khoroo7.1%, District14.3%, and City19.9% in conjunction with it.

Table F-18: How do you evaluate waste management services of your Khoroo, District and City Government?

Q2-6		apartment area		ger area		total	
		number	rate	number	rate	number	rate
Khoroo	1. very poor	7	1.7%	6	1.4%	13	1.6%
	2. poor	33	8.0%	29	7.0%	62	7.5%
	3. average	156	38.0%	139	33.5%	295	35.7%
	4. good	174	42.3%	186	44.8%	360	43.6%
	5. very good	10	2.4%	27	6.5%	37	4.5%
	blank	31	7.5%	28	6.7%	59	7.1%
Khoroo total		411	100%	415	100%	826	100%
District	1. very poor	19	4.6%	9	2.2%	28	3.4%
	2. poor	56	13.6%	58	14.0%	114	13.8%
	3. average	209	50.9%	189	45.5%	398	48.2%
	4. good	76	18.5%	87	21.0%	163	19.7%
	5. very good	1	0.2%	4	1.0%	5	0.6%
	blank	50	12.2%	68	16.4%	118	14.3%
District total		411	100%	415	100%	826	100%
City	1. very poor	46	11.2%	36	8.7%	82	9.9%
	2. poor	83	20.2%	55	13.3%	138	16.7%
	3. average	169	41.1%	165	39.8%	334	40.4%
	4. good	40	9.7%	65	15.7%	105	12.7%
	5. very good	1	0.2%	2	0.5%	3	0.4%
	blank	72	17.5%	92	22.2%	164	19.9%
City total		411	100%	415	100%	826	100%

: Satisfaction rating more than the average

c.3.6 Degree of Understanding and Cooperation for Separate Discharge and Collection.

Q2-7: Government is going to introduce separate discharge and collection system in your living area. Do you want to cooperate for separating your waste into "Recyclables and Non-Recyclables" in your house?

The answer to the question was totaled as follows. The respondent who showed willingness to cooperate was 88.8% in the Apartment Area, 82.7% in the Ger Area, and 85.7% on average, which turned out to be a very high rate. Of course, since this is a result on a questionnaire, this number cannot be swallowed without question, but when it is going to introduce separate collection, and it can be said that the ground for obtaining cooperation of residents is made in both Apartment Area and Ger Area are.

Table F-19: Do you want to cooperate for separating your waste into "Recyclables and Non-Recyclables" in your house?

Q. 2-7	apartment area		ger area		total	
	number	rate	number	rate	number	rate
1. Yes, very much	282	68.6%	256	61.7%	538	65.1%
2. Yes, some extent	83	20.2%	87	21.0%	170	20.6%
3. Not much	17	4.1%	15	3.6%	32	3.9%
4. Not at all	5	1.2%	4	1.0%	9	1.1%
5. I do not know.	15	3.6%	35	8.4%	50	6.1%
invalid	9	2.2%	18	4.3%	27	3.3%
total	411	100%	415	100%	826	100%

: Answer showing willingness to cooperate

d. Findings of Survey

(1) **Regarding Urban Environment and Sanitation of the Ulaanbaatar City**

The degree of satisfaction for the urban environment and sanitation of the UB City was lower than that of the SWM both in the Apartment and Ger Areas. The reason is that the air pollution is recognized by residents as the most serious problem of the UB City.

Yet, in November when the survey was conducted, the temperature was starting to get lower and it was about the beginning of winter, there was increasing number of the Ger residents who warms themselves by burning coal. Since the survey was conducted at the time that the central part of the UB City was covered with thick smoke resulting from the air pollution which is considered as a big social problem in recent years, the results of the survey may have been affected somewhat.

The resident of BGD and SKhD showed low degree of satisfaction both in the Apartment and Ger Areas compared with other districts. Since these two districts are adjacent and located from the center part of the UB City to the northwest, it can be said that the air pollution of the UB city has serious damage from the center to the northwest.

(2) **Regarding SWM in the Ulaanbaatar City**

It seems that the degree of satisfaction of the residents on the SWM of the UB City is about 10% higher than that of the urban environment and sanitation and residents have not taken it

as seriously as the environmental problem. When we look at it by district, the residents of BZD showed the high degree of satisfaction, and on the other hand the BGD showed the low degree. In SBD, although the highest degree of satisfaction was shown among those six districts in the Apartment Area, the lowest degree of satisfaction was shown in the Ger Area. Moreover, BGD showed the lowest degree of satisfaction in total as well as that of the urban environment and sanitation.

Regarding the problem on the SWM of the UB City, most residents both in the Apartment and Ger Area answered "People's waste discharge manners is poor" as a problem. Although the degree of satisfaction for waste collection service was comparatively high, in response to the question on the first problem on waste collection, most residents answered "Collection manner is poor" as a problem. It talks about manners again here.

Because of the fact mentioned above and that more than 85% of respondents show willingness to cooperate when the UB City implements waste separation and recycling, it seems that the consciousness of the UB citizen for environment and SWM are comparatively high.

F.2 Illegal Dump Site

The JET, in cooperation with the C/P staffs, visited places were waste is dumped illegally in the 6 central districts of the UB city from 4 Nov and 6 Nov 2009. The detailed report on the field survey and its results are the following.

a. Purpose of the Survey

The purpose of this field survey is for the C/P to identify possible illegal dump sites with willingness to improve as criteria by which the degree of achievement of the overall goal in PDM is evaluated.

b. Members

The JET: Mr. Fujita, Mr. Gantumur
The C/P: Mr. Arigun, Mr. Ganbaatar
Others: District officials and staffs of WSFs

c. Contents of the Survey

c.1 Visited Sites:

Although the total number of illegal dump sites suggested by the EPWMD to visit was 38, the JET visited 21 sites; 17 of which were those suggested by the EPWMD while the rest were additional sites. At the time of the survey, many among the suggested sites were extremely small in waste amount or waste has been already removed and some of them were those permitted by khoroo governors as a legal disposal site (sites in khoroos #11 and #20 of Bayanzurkh). The JET excluded those sites in consultation with Mr. Ariguun, the EPWMD staff.
The number of visited sites in each district is as follows:

- Khan-Uul District -4
- Chingeltei District -2
- Bayangol District -6
- Songinokhairkhan District -4
- Bayanzurkh District -4
- Sukhbaatar District -1 Total-21 places

At each site, the JET members observed present condition, shoot photos of the site and obtained general information about illegal dumping through interviewing the attended staffs of Mongolian side (For detailed information about the sites, please refer to the file named “Visited Illegal Dump Sites” attached to this report).
Based on these, the main descriptions of each site is explained below. There are codes written before the names of the sites such as “(KhU5)”. The letters of the code shows the abbreviations of district name and the number indicates khoroo number where the site exists.

c.2 Khan-Uul district:

1. (KhU5) Khoroo #5 (West of School #41): The dumping place is in the middle of the ditch located in the west of the Secondary School #41. On both sides, there are ger areas. The content is solely household waste (ash included). Waste is dumped by residents during the nights. Although waste is removed 3 to 4 times a year (amount of removal is

about 50 to 60 trucks), the amount of waste remains big in quantity as it was at the time of the survey. Last cleaning was done on 17 and 18 Oct 2009.

2. (KhU9) Khoroo #9 (Tain Street): Waste is dumped illegally along the fence made of blocks at the outer edge of ger areas that is located in the north of White Gate in Yarmag. The content is solely household waste. Waste is dumped by residents during the nights in two ways: direct disposal by a household and joint disposal by 4 to 5 households. Although the place was cleaned 3 times from July 2009 (the last cleaning was conducted in early Oct), the amount of waste is still considerable.
3. (KhU12) Khoroo #12 (Habitat): Exact location is at the west edge of habitat house area. The distance from the site to the nearest houses is just around 40 m. According to kheseg staff, local residents dispose their waste regularly at the place. The latest cleaning was conducted on 17 and 18 Oct 2009. As Morin Davaa FDS is located not too far from the place, separated by a mountain, trucks often dispose their waste along the road on their way to MDDS. Although the amount of waste was not large in the dumping site, it is supposed that there is considerable amount of waste along the road to Morin Davaa.
4. (KhU13) Khoroo #13 (Shuvuu Village): The exact location is in the southern part of Shuvuu Fabric village. The distance to the residential area is several hundred meters. Illegal dumping at the place has been existed for years. Most of the waste is construction waste. However, local residents are still dumping household waste. It seems that waste is brought by small-scale trucks. The biggest problem is construction waste dumped by outsiders. As a gravel mining site exists in the south of the place, outsiders who come to take gravel bring construction waste to the dump site with their trucks. Although the waste spread around the site used to be clearned before, the place has not been cleaned recent years. The waste spread area is 14,000 m2, according to GPS estimation.

c.3 Chingeltei district:

5. (Ch12) Khoroo #12 (Ditches; North of pig house & top of the mountain): The covered area is very big: from 3 ditches laid at the back edge of ger areas (in the north from the central workshop of the CMPUA) to the backside of the mountain in the khoroo #12. By the ditches, there are newly settled ger households. The content of waste is household waste dumped by residing households who do not pay for waste collection service. Considerable area over the mountain is covered with waste brought by trucks, since the main ger areas are located at distances of 1 to 2 km at the opposite side of the mountain. Therefore, there is a possibility that dumpers are outsiders as well as the local residents. The amount of waste was impossible to estimate.
6. (Ch9) Khoroo #9 (Dalan Davkhar grave) : The place of illegal dumping is the strip land or ditch along the road of Dalan Davkhar grave. The waste has been accumulated for years. Ger area is separated with the ditch from the grave. The content of the waste is household and construction waste. As for the construction waste, it seems that the local residents brought them on purpose to elevate the land so that they can extend their fences to the ditch-side. As for household waste, it is dumped not only by the local residents living along the ditch, but also trucks that carry wastes along the road (The road becomes a shortcut to the FDS for ger areas of the northern UB). As the informant says, the amount of waste dumped in this way is considerable. Complete removal of waste has not been conducted. Cleaning is not conducted regularly. The latest was done in July 2009.

c.4 Bayangol district

7. (BG11) Khoroo #11 (Zuun Ard Ayush & Khuvisgalchid D): Waste is dumped illegally at the 3 places along the road between the ger areas Zuun Ard Ayush and Khuvisgalchdiin D. The amount of waste is not large as waste collection staffs remove regularly. The content is solely household waste. Complete removal is done once a month. However, the residents dump their waste habitually from the following day. Last complete removal was conducted on 25 and 26 Oct 2009.
8. (BG10-1) Khoroo #10 (Str-15): The dumping site is located under the high voltage pole on the street #15. As it is surrounded by gers, the residents dump waste habitually.

The content is household waste. Although complete removals are done twice or three times a month, illegal dumping does not allow eliminating the site. The latest complete removal was done on 25 and 26 Oct 2009.

9. (BG10-2) Khoroo #10 (Str-12): The location of illegal dumping is under the high voltage pole in the middle of ger area in the street #12. Content is household waste dumped by residents. There were occasions that waste was brought by small-scale trucks. Complete removal of waste is done once in 2 months. The latest was on 20 and 21 Oct 2009.
10. (BG9-1) Khoroo #9 (Str-18): The dumping site is located at the water station in street-18 in the middle of ger area. The content is solely household waste dumped by residents. Collection staffs take waste regularly and a complete removal is done once a month. The latest complete removal was done on 20 Oct 2009.
11. (BG20) Khoroo #20: Illegal dumping occupies huge area in the east and south-east of the Power Plant #4; along the road and the thermal line. The waste is solely consisted of construction waste such as blocks, bricks and cements. It is impossible to measure the waste scale. The dumpers are usually construction companies.
12. (BG9-2) Khoroo #9 (SOT service center; additional site): The location is at the electric pole located in the right-side street of SOT Service center, in the middle of ger area. It came into existence recently. According to the staff of the WSF, there was no waste before a month. The amount of the waste is about 2.4 m3, according to a rough estimation. Waste collection staffs were removing the waste at the time of the survey.

c.5 Songinokhairkhan district:

13. (SH6&23) Khoroos #6 & #23 (border): Large-scale waste is accumulated in the whole ditch located between khoroo #6 and #23. Waste has been accumulated for years; it is still used as dump site by the residents. The content is household waste. The content of the waste is household waste. There is a possibility that residents bring their waste by small scale trucks. Complete removal is somehow difficult due to its large amount (must be considered when selecting the site).
14. (SH4&7) Border of khoroos #4 and #7: The exact place of illegal dumping is difficult to identify due to its wide-spread waste. Generally, it is located in the east of former UCDS, separated by a mountain and accumulated for years. The illegal dumping at the place came into existence when UCDS was in operation since waste collection trucks and private transporters used to dump their waste at the place without entering UCDS. Although the city financed 13 mln Tg for the removal of the waste in Jun 2009, half of the waste remained since the budget was not sufficient for a complete removal. Regular cleaning is not conducted. However, the amount of waste dumped illegally has not increased after the closure of UCDS. As new settlements of gers have been extending to the area, it is supposed that the local residents who settled near the area have been dumping their waste. The content of waste is household waste.
15. (SH24-1) Khoroo #24 (South East from NEDS): The location of the waste is in the south east ditch of NEDS; separated by mountain from the NEDS. It is supposed to have existed for years. Newly settled ger households are at the distance of 300 m from the place. According to the district officials, the origin of the waste is waste collection trucks, private operators and individuals who used to transport waste from Bayankhoshuu and the northern part of Chingeltei and Sukhbaatar districts to UCDS. Cleaning or removal of waste has not been conducted. However, the amount of waste is not so large in comparison with typical accumulated large-scale waste. Presently, illegal dumping has not been conducted regularly.
16. (SH24-2) Khoroo #24 (North east from NEDS): The location of the waste is the ditch in the north east from NEDS. Ger areas are at the distance of 500 m approximately. The content of the waste is household waste. Cleaning has not been conducted. No one knows when it came into existence. The district officials consider that most of the waste was dumped by trucks. They assume that waste carriers who do not want to pay for disposal fee at NEDS dump their waste at the place.

c.6 Bayanzurkh district:

17. (BZ22) Khoroo #22 (Near the Grave): The dumping site is located along the road in front of the grave in the northern territory of khoroo #22. Ger areas have been extended along the road on its west side. Content is household waste dumped by residents and construction waste in smaller extent. Waste on the west side of the road was removed in May 2009. However, amount of waste has been increased after the latest removal.
18. (BZ2&21) Khoroo #2 and #21 (Selber river): The exact location is along the river Selbe in the territory of khoroo #2 and #21. The content of the waste is mainly construction waste. Residing people bring construction waste in order to elevated land for the purpose to extend their fences to the river side. At the time of the survey, amount of household waste is very small. However, it had long been illegal dump site and residents throw their waste customarily to places where construction waste is dumped, according to the chief of the WSF. Household waste was removed completely this summer.
19. (BZ21) Khoroo #21: The dumping place is located in the north-west valley of Tsagaan Davaa mt. in the northern territory of the khoroo #21. The exact location is along the road that stretches out of ger area to the north. The distance between ger areas and the waste is getting shorter from time to time as ger areas extend gradually. Illegal dumping has been existed for years. The amount is too large. It is not known whether residents dump their household waste habitually. Anyhow, most of the waste is construction waste and transported by trucks from elsewhere of UB to the place. Cleaning or waste removal is not conducted.
20. (BZ9) Khoroo #9: The location of the site is along the road of Khadan Khoshuu in Uliastai, the north east of Khoroo #9. It is said that waste has been dumped here illegally for years. However, the amount of waste is not so considerable. As most of the waste is old, it can be considered that illegal dumping is relatively few. Cleaning or removal is not conducted.

c.7 Sukhbaatar district:

21. (SK15) Khoroo #15: The location of the illegal dump point is in east side of main road to Sharga Morit near the final stop of bus route of Sharga Morit. Illegal dumping at the point came into existence in July this year. Although the allowed disposal point is located at the distance of 200 to 300 m, people living in houses located in the east side of the road dumped their waste. Since cleaning was not conducted after its appearance, the amount of waste has become considerable. The waste spread area is around 60 m2, according to a rough estimation. The content of the waste is solely household waste and ash. As the area is summer camp area, relatively few households were residing at the time of the survey. However, the households still keep dumping their waste and coal ash at the point.

The location of each site is shown in the map inserted below:

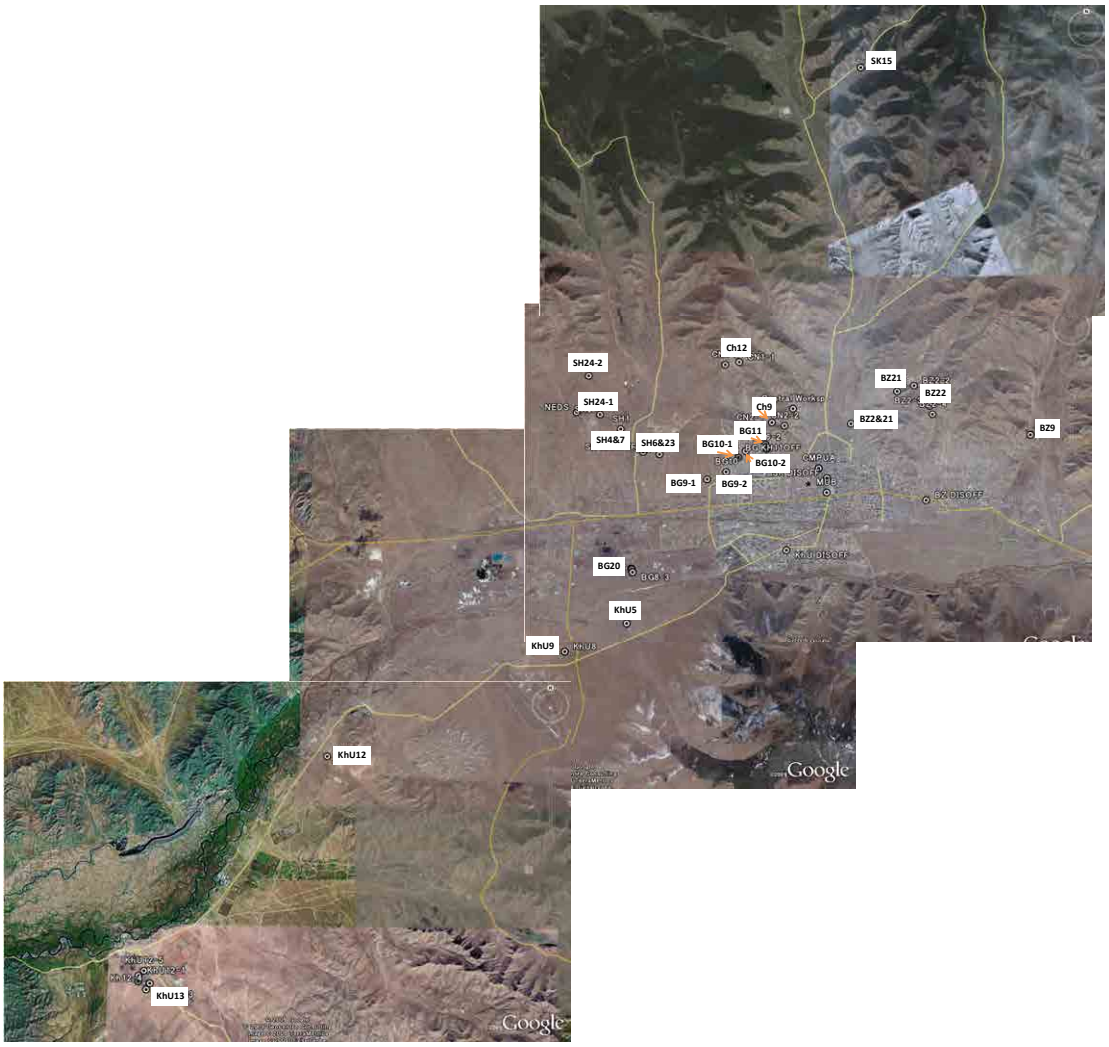


Figure F-6: The Location of the Visited Sites

d. Findings:

The main findings of the survey are the following:

1. Illegal dump sites are usually located in the middle or near ger areas in the suburbs of UBC;
2. Active dumpers are usually households residing near the places. Those households are usually those who do not pay waste fees;
3. Illegal dumping is conducted at nights in two ways: directly by a household or joint disposal by several households with trucks; and
4. Subjects who dump construction waste are difficult to identify.

e. Criteria for Selection of Illegal Dump Sites

When selecting sites for evaluation of improvements on illegal dumping, the following items have been investigated and set as criteria through consultation with the C/P.

1. Contents of the waste dumped illegally at the site;
2. Location of the site in terms of distances to residential areas;
3. Amount of waste dumped;
4. People or organizations who dump illegally at sites; and

5. Current condition of illegal dumping (ongoing or stopped)

As a result of investigating the above items, comparison table is shown below.

Table F-20: Comparison table of the illegal dump sites based on selection criteria

Content of waste	#	Site name/location	Location			Dumpers		Amount of Waste		Present Condition	
			In ger area	Near ger area	Far from ger area	Local residents	Outsiders	Large	Small	Ongoing	Stopped
Household waste	**Khan-Uul**										
	1(1)	(KhU5) Khoroo #5 (West of School-41)	1			1		1		1	
	2(2)	(KhU9) Khoroo #9 (North of White Gate)		1		1		1		1	
	3(3)	(KhU12) Khoroo #12 (Khabitat)		1		1			1	1	
	Chingeltei district										
	4(5)	(Ch12) Khoroo #12 (Ditches in the North of Central workshop and top of the mountain)		1		1		1		1	
	Bayangol										
	5(7)	(BG11) Khoroo #11 (Zuun Ard Ayush & Khuvisgalchid D)	1			1			1	1	
	6(8)	(BG10-1) Khoroo #10 (Str-15)	1			1			1	1	
	7(9)	(BG10-2) Khoroo #10 (Str-12)	1			1			1	1	
	8(12)	(BG9-2) Khoroo #9 (near SOT Service Center)	1			1			1	1	
	9(10)	(BG9-1) Khoroo #9 (Str-18)	1			1			1	1	
	Songinokhairkhan										
	10(14)	(SH4&7) Khoroos #4 & #7 (border)		1		1		1			1
	11(15)	(SH24-1) Khoroo #24 (South East of NEDS)			1		1		1		1
	12(16)	(SH24-2) Khoroo #24 (North East of NEDS)			1		1		1	1	
	13(13)	(SH6&23) Khoroos #6 & #23 (border)	1			1		1		1	
	Bayanzurkh										
	14(17)	(BZ22) Khoroo #22 (Near the block factory and the Grave)		1		1		1		1	
	15(20)	(BZ9) Khoroo #9 (Uliastai khadan khoshuu)		1		1			1		1
	Sukhbaatar										
	16(21)	(SK15) Khoroo #15 (Sharga morit)	1			1			1	1	
Construction waste	**Bayangol**										
	17(11)	(BG20) Khoroo #20 (Power Plant-4)			1		1	1		1	
	Bayanzurkh										
	18(19)	(BZ21) Khoroo #21 (Tsagaan Davaa)			1		1	1		1	
Mixed waste	**Khan-Uul**										
	19(4)	(KhU13) Khoroo #13 (Shuvuu)			1	1	1	1		1	
	Chingeltei district										
	20(6)	(Ch9) Khoroo #9 (Dalan davkhar)		1		1	1	1		1	
	Bayanzurkh										
	21(18)	(BZ2&21) Khoroos #2 & #21 (Selbe river)		1		1			1		1

Cleaning campaignes have been conducted several times in 2009. In districts such as Khan-Uul and Bayangol, the last cleaning was conducted in Oct 2009; and thus, it is supposed that the illegal dumping at the time of the survey was decreased.

f. Selected Sites

Based on the information the JET presented to the C/P, the EPWMD selected 10 from the visited sites as indicators for evaluation of improvements on illegal dumping and reported to the JET on 23 Nov 2009. The main description, location and present conditions of the selected sites are shown in the following table and figures:

Table F-21: Main Description of the Selected Sites

#	Sites	GPS data	Description
1	(KhU5)* Khoroo #5 (West of School-41)	635692 5303701 1281	The dumping place is in the middle of the ditch located in the west of the Secondary School #41. On both sides, there are ger areas. The content is solely household waste (ash included). Waste is dumped by residents during the nights. Although waste is removed 3 to 4 times a year (amount of removal is about 50 to 60 trucks), the amount of waste remains big in quantity as it was at the time of the survey. Last cleaning was done on 17 and 18 Oct 2009.
2	(KhU9) Khoroo #9 (Tain Street)	633239 5302434 1319	Waste is dumped illegally along the fence made of blocks at the outer edge of ger areas that is located in the north of White Gate in Yarmag. The content is solely household waste. Waste is dumped by residents during the nights in two ways: direct disposal by a household and joint disposal by 4 to 5 households. Although the place was cleaned 3 times from July 2009 (the last cleaning was conducted in early Oct), the amount of waste is still considerable.
3	(Ch12) Khoroo #12 (Ditch in the north of pig house & top of the mountain)	639551 5314137 1536 639011 5314016 1531	The covered area is very big: from 3 ditches laid at the back edge of ger areas (in the north from the central workshop of the CMPUA) to the backside of the mountain in the khoroo #12. By the ditches, there are newly settled ger households. The content of waste is household waste dumped by residing households who do not pay for waste collection service. Considerable area over the mountain is covered with waste brought by trucks, since the main ger areas are located at distances of 1 to 2 km at the opposite side of the mountain. Therefore, there is a possibility that dumpers are outsiders as well as the local residents. The amount of waste was impossible to estimate.
4	(BG10-1) Khoroo #10 (Str-15)	639932 5310572 1392	The dumping site is located under the high voltage pole on the street #15. As it is surrounded by gers, the residents dump waste habitually. The content is household waste. Although complete removals are done twice or three times a month, illegal dumping does not allow eliminating the site. The latest complete removal was done on 25 and 26 Oct 2009.
5	(BG10-2) Khoroo #10 (Str-12)	639662 5310307 1381	The location of illegal dumping is under the high voltage pole in the middle of ger area in the street #12. Content is household waste dumped by residents. There were occasions that waste was brought by small-scale trucks. Complete removal of waste is done once in 2 months. The latest was on 20 and 21 Oct 2009.
6	(SH4&7) Border of khoroos #4 and #7	635089 5311302 1312	The exact place of illegal dumping is difficult to identify due to its wide-spread waste. Generally, it is located in the east of former UCDS, separated by a mountain and accumulated for years. The illegal dumping at the place came into existence when UCDS was in operation since waste collection trucks and private transporters used to dump their waste at the place without entering UCDS. Although the city financed 13 mln Tg for the removal of the waste in Jun 2009, half of the waste remained since the budget was not sufficient for a complete removal. Regular cleaning is not conducted. However, the amount of waste dumped illegally has not increased after the closure of UCDS. As new settlements of gers have been extending to the area, it is supposed that the local residents who settled near the area have been dumping their waste. The content of waste is household waste.
7	(SK15)	643753	The location of the illegal dump point is in east side of main road

	Khoroo #15	5325729 1504	to Sharga Morit near the final stop of bus route of Sharga Morit. Illegal dumping at the point came into existence in July this year. Although the allowed disposal point is located at the distance of 200 to 300 m, people living in houses located in the east side of the road dumped their waste. Since cleaning was not conducted after its appearance, the amount of waste has become considerable. The waste spread area is around 60 m2, according to a rough estimation. The content of the waste is solely household waste and ash. As the area is summer camp area, relatively few households were residing at the time of the survey. However, the households still keep dumping their waste and coal ash at the point.
8	(BZ21) Khoroo #21	645696 5313240 1371 646345 5313392 1383 646967 5312599 1408 647080 5312261 1400	The dumping place is located in the north-west valley of Tsagaan Davaa mt. in the northern territory of the khoroo #21. The exact location is along the road that stretches out of ger area to the north. The distance between ger areas and the waste is getting shorter from time to time as ger areas extend gradually. Illegal dumping has been existed for years. The amount is too large. It is not known whether residents dump their household waste habitually. Anyhow, most of the waste is construction waste and transported by trucks from elsewhere of UB to the place. Cleaning or waste removal is not conducted.
9	(Ch9) Khoroo #9 (Dalan Davkhar grave)	640900 5311742 1390 641389 5311628 1363	The place of illegal dumping is the strip land or ditch along the road of Dalan Davkhar grave. The waste has been accumulated for years. Ger area is separated with the ditch from the grave. The content of the waste is household and construction waste. As for the construction waste, it seems that the local residents brought them on purpose to elevate the land so that they can extend their fences to the ditch-side. As for household waste, it is dumped not only by the local residents living along the ditch, but also trucks that carry wastes along the road (The road becomes a shortcut to the FDS for ger areas of the northern UB). As the informant says, the amount of waste dumped in this way is considerable. Complete removal of waste has not been conducted. Cleaning is not conducted regularly. The latest was done in July 2009.
10	(BZ2&21) Khoroo #2 and #21 (Selber river)	643946 5311786 1314	The exact location is along the river Selbe in the territory of khoroo #2 and #21. The content of the waste is mainly construction waste. Residing people bring construction waste in order to elevated land for the purpose to extend their fences to the river side. At the time of the survey, amount of household waste is very small. However, it had long been illegal dump site and residents throw their waste customarily to places where construction waste is dumped, according to the chief of the WSF. Household waste was removed completely this summer.

**The letters in "(KhU5)" stand for the district and the number indicates the khoroo where the site exists.*

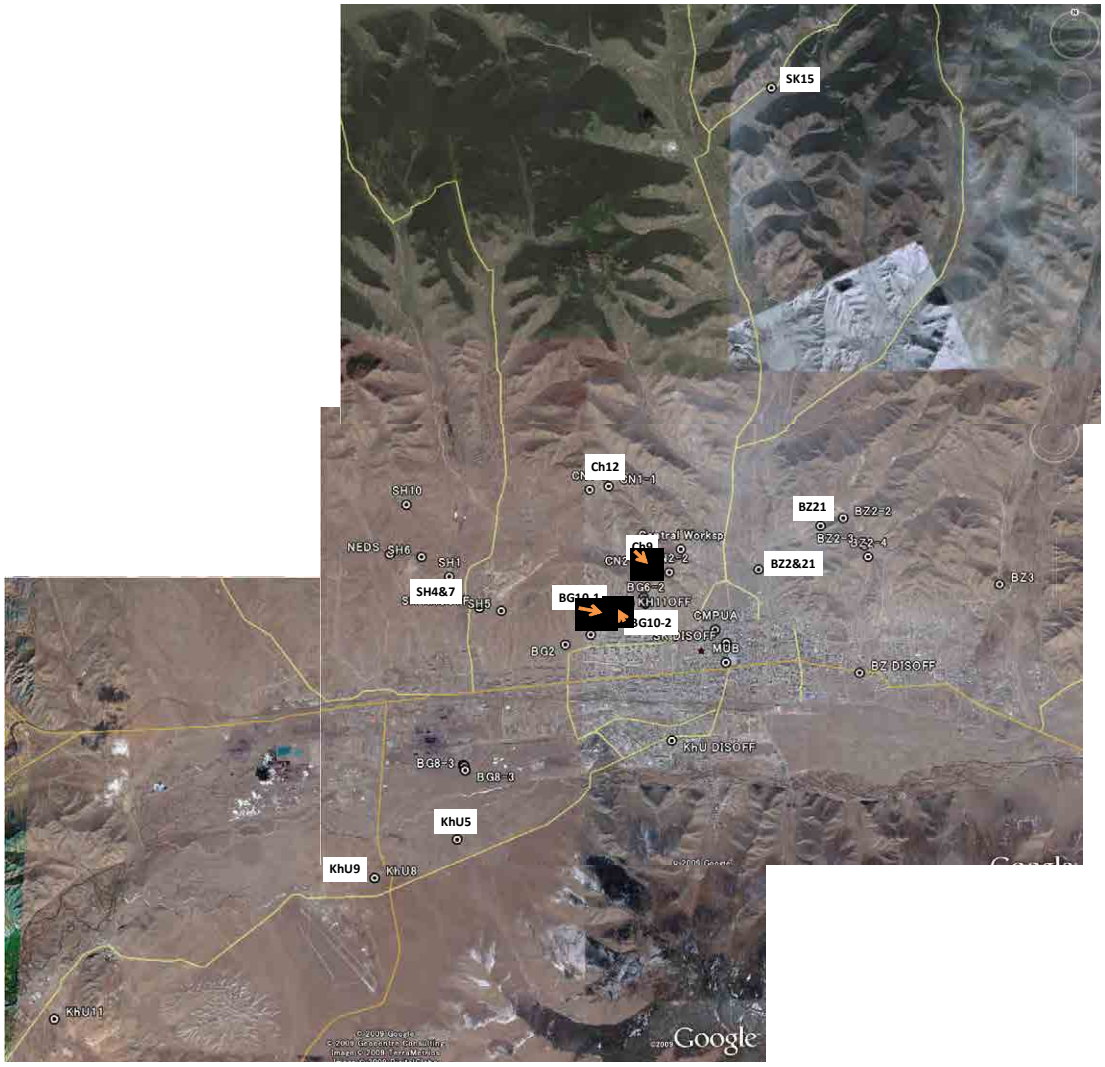


Figure F-7: The Location of the Selected Sites

Table F-22: :Present Conditions of the Sites

Site #1: KhU5

Site #2: KhU9

Site #3: Ch12

Site #4: BG10-1

Site #5: BG10-2

Site #6: SH4&7

Site #7: SK15

Site #8: BZ21

Site #9: Ch9

Site #10: BZ2&21

F.3 Waste Fee Collection Rate in Ger Area

	Apartment area		Ger area		Waste Fee supporsed to be Collected by Ger Area			Waste Fee actually collected (Sep 2009 to Aug 2008) : 1,000Tg Ikh:Indipendent Khoroo												Waste Fee Collection Rate %	Remarks
	Total		Total		Rate	Amount	Amount	2008				2009								1year Total	
	House holds	Popula tion	House holds	Popula tion	Tg/Month	1000Tg /Month	1000Tg /Year	9	10	11	12	1	2	3	4	5	6	7	8		
KUD			①		②	③=①X②	④=③x12Mth													⑤	⑥=⑤/④	
1	2,840	9,664	69	512	2,500	172.5	2,070.0															Up to Sep 2009.
2	1,847	7,901	38	175	2,500	95.0	1,140.0															there is no WSF
3	1,791	7,550	57	234	2,500	142.5	1,710.0															and TUK is
4	48	238	1,690	6,251	2,500	4,225.0	50,700.0	271	736	770	659	1,480	405	941	745	742	867	321	-	7,935	16%	operating and
5	0	0	1,356	5,855	2,500	3,390.0	40,680.0	153	662	662	298	938	1,041	673	758	447	487	155	-	6,270	15%	collecting Waste
6	0	0	1,678	7,826	2,500	4,195.0	50,340.0	686	43	629	282	624	700	424	423	279	560	111	-	4,757	9%	Fee
7	0	0	1,444	5,568	2,500	3,610.0	43,320.0	556	945	676	483	482	925	327	588	385	857	108	-	6,331	15%	
8	0	0	2,410	9,128	0	0.0	0.0													0		Indipendent Khoroo
9	0	0	3,697	13,153	2,500	9,242.5	110,910.0	161	767	590	387	685	945	530	596	335	707	110	-	5,811	5%	
10	650	2,581	1,153	4,247	2,500	2,882.5	34,590.0	259	220	447	297	638	436	514	427	281	618	107	-	4,242	12%	
11	1,067	3,999	402	1,663	0	0.0	0.0															No data
12	224	896	1,356	4,691	0	0.0	0.0															Indipendent Khoroo
13	108	435	895	3,005	0	0.0	0.0															Indipendent Khoroo
14	0	0	867	2,475	0	0.0	0.0															Indipendent Khoroo
Total	**8,575**	**33,264**	**17,112**	**64,783**		27,955.0	335,460.0	2,085	3,372	3,772	2,404	4,846	4,452	3,408	3,536	2,467	4,095	910		35,346	11%	
SHD			①		②	③=①X②	④=③x12Mth													⑤	⑥=⑤/④	
1	86	324	**3,071**	13,538	1,500	4,606.5	55,278	1,518.5	1,167.5	1,500.0	2,505.0	2,350.0	1,136.6	1,134.5	772.5	1,973.0	700.0	706.5	1,174.5	16,639	30%	
2	0	0	**1,135**	5,302	1,500	1,702.5	20,430	173.5	336.0	344.7	320.5	388.7	422.5	174.3	311.6	986.0	696.5	419.5	769.5	5,343	26%	
3	0	0	**2,764**	13,009	1,500	4,146.0	49,752	646.7	459.9	305.9	492.5	460.3	899.5	1,222.9	1,393.5	1,795.6	1,742.5	1,405.1	1,614.5	12,439	25%	
4	0	0	**2,668**	12,875	1,500	4,002.0	48,024	1,243.0	443.0	474.0	610.0	747.0	1,446.3	1,024.0	1,023.1	1,065.5	1,519.5	1,566.2	1,638.4	12,800	27%	
5	446	1,689	**1,910**	9,192	1,500	2,865.0	34,380	1,530.4	1,273.5	1,250.5	1,293.7	1,606.1	1,173.0	1,587.1	1,272.9	1,228.0	1,446.0	1,266.5	1,398.5	16,326	47%	
6	602	2,473	**1,126**	4,802	1,500	1,689.0	20,268	34.5	99.5	97.5	121.1	90.0	248.6	192.5	209.8	667.5	688.0	914.0	952.0	4,315	21%	
7	0	0	**2,583**	11,384	1,500	3,874.5	46,494	2,628.0	1,587.7	2,348.4	2,667.1	1,456.0	1,702.4	1,157.6	1,488.9	816.0	1,403.0	935.5	1,521.5	19,712	42%	
8	0	0	**1,677**	7,797	1,500	2,515.5	30,186	0.0	0.0	170.2	95.0	201.8	325.5	225.5	350.6	498.4	611.1	405.2	982.9	3,866	13%	
9	0	0	**1,796**	7,938	1,500	2,694.0	32,328	799.5	537.0	689.9	448.5	127.5	692.1	410.5	410.7	277.4	1,457.9	995.8	932.3	7,779	24%	
10	315	1,302	**2,082**	10,889	1,500	3,123.0	37,476	831.8	481.5	166.0	166.7	88.0	443.7	508.2	324.5	920.7	1,651.2	1,630.9	2,234.0	9,447	25%	
11	0	0	**2,562**	11,800	1,500	3,843.0	46,116	1,250.7	236.0	776.5	824.6	235.5	91.5	887.1	885.0	1,636.5	1,331.3	1,300.3	1,454.0	10,909	24%	
12	1,311	4,625	**551**	2,563	1,500	826.5	9,918	0.0	0.0	0.0	0.0	4.5	154.0	134.0	293.0	367.3	30.0	159.0	320.0	1,462	15%	
13	1,290	5,312	**425**	2,143	1,500	637.5	7,650	232.0	0.0	0.0	24.0	67.5	81.0	115.6	403.0	238.5	237.0	222.0	377.0	1,998	26%	
14	1,334	4,616	**987**	4,706	1,500	1,480.5	17,766	124.0	0.0	34.5	0.0	65.5	29.0	0.0	111.7	446.0	288.0	401.0	337.0	1,837	10%	
15	1,256	5,919	**386**	1,963	1,500	579.0	6,948	190.2	0.0	0.0	0.0	53.6	72.0	22.5	147.7	88.6	83.0	85.2	116.5	859	12%	
16	1,284	5,243	**292**	1,910	1,500	438.0	5,256	285.0	70.5	64.5	115.5	141.0	153.5	97.5	164.0	276.5	264.5	164.0	187.0	1,984	38%	
17	1,281	4,076	**400**	2,735	1,500	600.0	7,200	35.5	0.0	0.0	0.0	0.0	53.3	132.5	52.6	175.0	149.5	108.0	160.5	867	12%	
18	2,481	10,602	**150**	661	1,500	225.0	2,700	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	12.0	0.0	0.0	18	1%	
19	1,887	9,529	**48**	401	1,500	72.0	864	36.0	15.0	52.0	27.0	0.0	65.0	10.5	0.0	0.0	27.0	9.0	40.5	282	33%	
20	1,110	3,972	**1,073**	5,911	1,500	1,609.5	19,314	583.0	69.0	0.0	680.5	130.0	293.0	96.0	453.2	290.0	958.6	647.4	537.4	4,738	25%	
21	0	0	**1,643**	5,500	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0		Remote Khoroo
22	72	394	**2,210**	10,111	1,500	3,315.0	39,780	930.5	305.0	531.0	330.0	205.5	454.1	729.9	559.0	517.5	881.0	373.5	478.5	6,296	16%	
23	0	0	**2,530**	10,299	1,500	3,795.0	45,540	936.5	578.0	273.0	371.5	327.0	485.0	272.6	754.5	1,328.0	2,030.0	1,446.4	2,587.5	11,390	25%	
24	0	0	**1,560**	5,475	1,500	2,340.0	28,080	589.5	1,126.0	1,021.7	345.0	672.6	773.0	391.8	583.5	1,044.5	783.0	830.0	902.0	9,063	32%	
25	0	0	**2,271**	8,908	1,500	3,406.5	40,878	1,044.0	1,105.2	1,110.2	865.5	746.6	1,101.1	900.1	1,759.5	2,545.8	3,152.0	3,125.2	2,978.7	20,434	50%	
Total	**14,755**	**60,076**	**37,900**	**171,812**		54,386	652,626	15,643	9,890	11,211	12,304	10,165	12,296	11,427	13,725	19,188	22,143	19,116	23,695	180,802	**28%**	

	Apartment area		Ger area		Waste Fee supporsed to be Collected by Ger Area			Waste Fee actually collected (Sep 2009 to Aug 2008) : 1,000Tg Ikh:Indipendent Khoroo													Waste Fee Collection Rate %	Remarks
	Total		Total		Rate	Amount	Amount	2008				2009								1year Total	
	House holds	Popula tion	House holds	Popula tion	Tg/Month	1000Tg /Month	1000Tg /Year	9	10	11	12	1	2	3	4	5	6	7	8		
BGD			①		②	③=①X②	④=③x12Mth													⑤	⑥=⑤/④	
1	2,730	12,801	4	16	2,500	10.0	120															
2	1,198	6,800	0	0	2,500	0.0	0															
3	1,682	7,265	3	10	2,500	7.5	90															
4	2,304	10,786	7	12	2,500	17.5	210															
5	1,701	6,542	4	32	2,500	10.0	120															
6	2,607	11,566	18	48	2,500	45.0	540															
7	1,729	8,371	70	289	2,500	175.0	2,100															
8	2,242	9,786	8	39	2,500	20.0	240															
9	531	1,768	2,433	10,103	2,500	6,082.5	72,990	1,144	1,685	1,022	1,087	1,318	1,128	1,002	748	998	567	999	1,013	12,709	17%	
10	341	1,312	3,333	13,060	2,500	8,332.5	99,990	722	540	785	666	831	979	1,132	970	525	1,105	576	575	9,404	9%	
11	120	320	2,798	11,679	2,500	6,995.0	83,940	615	459	823	566	1,216	1,187	1,208	1,561	593	990	1,294	738	11,248	13%	
12	2,421	10,992	0	0	2,500	0.0	0															
13	1,004	4,560	0	0	2,500	0.0	0															
14	1,106	4,939	0	0	2,500	0.0	0															
15	1,311	5,010	1	6	2,500	2.5	30															
16	148	576	1,491	6,204	2,500	3,727.5	44,730	1,209	519	1,027	723	1,634	950	1,380	1,137	910	1,234	512	1,137	12,371	28%	
17	1,040	5,611	0	0	2,500	0.0	0															
18	1,689	8,046	4	21	2,500	10.0	120															
19	1,486	6,137	0	0	2,500	0.0	0															
20	477	2,072	478	1,951	0	0.0	0															Exempted
Total	**27,867**	**125,260**	**10,652**	**43,470**		25,435	305,220	3,690	3,202	3,658	3,041	4,999	4,243	4,722	4,415	3,026	3,895	3,380	3,462	45,732	**15%**	
ChD			①		②	③=①X②	④=③x12Mth													⑤	⑥=⑤/④	
1	960	3,913	0	0	2,500	0																
2	846	4,028	0	0	2,500	0																
3	1,275	4,595	0	0	2,500	0																
4	1,199	5,245	1	4	2,500	3																
5	1,141	5,231	0	0	2,500	0																
6	1,477	5,972	0	0	2,500	0																
7	0	0	2,342	11,876	2,500	5,855	70,260	0	0	399	1,038	2,209	765	620	1,006	1,100	443	301	1,001	8,881	13%	
8	0	0	1,148	4,816	2,500	2,870	34,440	831	0	51	1,152	750	563	800	983	1,064	636	412	683	7,925	23%	
9	0	0	1,592	7,454	2,500	3,980	47,760	1,437	1,355	300	403	1,167	468	385	1,033	1,006	650	980	701	9,885	21%	
10	0	0	1,447	7,327	2,500	3,618	43,410	878	1,295	449	437	823	1,238	513	961	990	730	858	1,083	10,254	24%	
11	0	0	1,434	6,308	2,500	3,585	43,020	1,311	0	1,048	1,156	669	905	870	1,067	630	882	518	1,094	10,150	24%	
12	0	0	2,456	12,209	2,500	6,140	73,680	1,065	1,850	584	1,194	741	1,825	255	1,420	1,653	1,127	1,133	1,236	14,082	19%	
13	0	0	1,666	7,851	2,500	4,165	49,980	1,495	0	411	923	0	420	388	920	1,282	766	1,009	1,000	8,614	17%	
14	0	0	1,658	8,552	2,500	4,145	49,740	960	0	1,037	613	840	1,033	1,053	1,526	1,201	561	560	1,823	11,205	23%	
15	0	0	1,665	8,430	2,500	4,163	49,950	1,121	1,345	465	603	888	263	1,045	899	1,195	469	682	420	9,393	19%	
16	0	0	2,136	9,500	2,500	5,340	64,080	0	1,110	0	0	0	678	673	999	1,154	871	1,453	1,019	7,955	12%	
17	0	0	2,374	10,152	2,500	5,935	71,220	767	1,205	107	961	1,066	1,460	1,128	874	1,012	1,009	1,198	1,228	12,014	17%	
18	0	0	2,152	9,926	2,500	5,380	64,560	1,192	0	2,180	0	1,743	1,198	640	981	690	830	1,282	877	11,612	18%	
19	0	0	1,238	6,070	2,500	3,095	37,140	545	0	419	0	851	798	749	693	1,256	474	255	500	6,538	18%	
Total	**6,898**	**28,984**	**23,309**	**110,475**		58,273	699,270	11,601	8,160	7,450	8,480	11,745	11,610	9,116	13,363	14,233	9,447	10,639	12,663	128,508	**18%**	

	Apartment area		Ger area		Waste Fee supporsed to be Collected by Ger Area			Waste Fee actually collected (Sep 2009 to Aug 2008) : 1,000Tg Ikh:Indipendent Khoroo												Waste Fee Collection Rate %	Remarks
	Total		Total		Rate	Amount	Amount	2008				2009								1year Total	
	House holds	Popula tion	House holds	Popula tion	Tg/Month	1000Tg /Month	1000Tg /Year	9	10	11	12	1	2	3	4	5	6	7	8		
BZD			①		②	③=①X②	④=③x12Mth													⑤	⑥=⑤/④	
1	1,524	5,753	0	0	2,500	0	0															
2	170	692	2,987	13,777	2,500	7,468	89,610	760	0	2,166	2,433	2,021	2,030	1,988	1,900	1,806	1,322	828	1,370	18,624	21%	
3	1,493	5,040	0	0	2,500	0	0															
4	2,366	8,629	404	2,469	2,500	1,010	12,120	0	56	435	103	0	58	117	86	260	115	275	0	1,505	12%	
5	1,043	4,307	2,107	8,697	2,500	5,268	63,210	1,175	855	1,557	2,081	1,600	1,728	1,372	1,720	2,007	1,589	1,556	1,893	19,133	30%	
6	1,991	8,617	186	1,188	2,500	465	5,580	0	41	210	93	0	216	0	112	255	0	85	0	1,012	18%	
7	1,800	7,698	0	0	2,500	0	0															
8	537	2,225	1,773	8,418	2,500	4,433	53,190	1,976	2,117	2,049	1,882	1,627	2,146	1,023	1,453	1,327	1,706	3,062	1,931	22,300	42%	
9	0	0	2,552	11,128	2,500	6,380	76,560	1,174	1,260	2,168	2,238	1,476	2,186	2,117	2,153	1,814	1,593	1,945	1,923	22,047	29%	
10	253	1,123	2,271	8,828	2,500	5,678	68,130	2,210	1,963	1,868	1,840	1,964	1,947	2,703	2,956	3,121	2,228	3,274	1,549	27,621	41%	
11	52	210	1,044	3,923	0	0	0													0		Remote Khoroo
12	0	0	2,792	12,455	2,500	6,980	83,760	2,028	2,845	2,705	2,601	2,395	2,735	2,106	2,883	2,648	1,766	1,825	2,068	28,603	34%	
13	319	1,436	1,593	7,606	2,500	3,983	47,790								1,599	2,049	2,434	1,829	1,470	9,381	20%	
14	431	1,828	2,097	7,036	2,500	5,243	62,910	2,430	2,043	2,157	2,186	1,955	2,116	1,918	2,790	1,529	3,473	1,299	1,453	25,349	40%	
15	1,356	5,696	0	0	2,500	0	0													0		
16	2,409	11,634	241	1,582	2,500	603	7,230	0	210	112	201	0	323	0	93	595	126	110	0	1,770	24%	
17	19	164	2,431	10,175	2,500	6,078	72,930	1,032	2,552	2,268	2,184	1,913	2,105	2,106	2,510	1,834	1,633	1,040	1,776	22,950	31%	
18	2,254	8,207	0	0	2,500	0	0													0		
19	326	1,218	1,758	7,977	2,500	4,395	52,740	1,670	1,475	1,225	1,706	1,629	2,417	982	913	1,211	1,029	901	983	16,142	31%	
20	0	0	2,099	6,564	0	0	0													0		Remote Khoroo
21	0	0	3,820	16,179	2,500	9,550	114,600	1,716	1,410	2,273	1,594	1,509	1,965	2,214	1,465	1,407	1,913	1,707	1,232	20,405	18%	
22	334	1,577	2,482	9,898	2,500	6,205	74,460	1,862	2,322	2,529	2,106	1,977	2,559	2,334	2,174	2,425	1,343	1,301	1,237	24,169	32%	
23	0	0	2,998	11,942	2,500	7,495	89,940	594	1,687	1,119	1,124	1,456	1,607	1,401	1,405	1,729	1,308	1,265	1,169	15,862	18%	
24	0	0	1,915	7,801	2,500	4,788	57,450	1,268	1,045	1,468	1,680	1,667	1,600	1,535	1,795	1,396	1,775	1,438	1,762	18,427	32%	
Total	**18,677**	**76,054**	**37,550**	**157,643**		86,018	1,032,210	19,893	21,880	26,310	26,051	23,188	27,738	23,914	28,007	27,413	25,351	23,738	21,816	295,299	**29%**	
SBD			①		②	③=①X②	④=③x12Mth													⑤	⑥=⑤/④	
1	1,149	4,327	41	185	2,500	103	1,230															
2	1,395	5,850	0	0	2,500	0	0															
3	1,514	6,885	0	0	2,500	0	0															
4	1,229	4,019	0	0	2,500	0	0															
5	1,254	5,253	0	0	2,500	0	0															
6	1,394	6,238	0	0	2,500	0	0															
7	1,980	7,874	0	0	2,500	0	0															
8	2,697	10,981	0	0	2,500	0	0															
9	0	0	2,026	9,374	2,500	5,065	60,780	1,483	1,764	1,729	1,842	1,815	2,154	1,879	1,585	1,617	1,460	545	968	18,840	31%	Independent Khoro
10	1,896	8,473	0	0	2,500	0	0															
11	0	0	2,029	10,162	2,500	5,073	60,870	1,300	1,950	1,900	1,780	1,590	1,836	1,915	1,350	1,780	1,440	1,110	0	17,951	29%	
12	0	0	1,863	7,302	2,500	4,658	55,890	970	889	1,385	1,365	1,762	1,265	1,372	1,052	1,875	1,165	1,052	1,165	15,317	27%	
13	0	0	1,760	7,734	2,500	4,400	35,200	867	1,145	-	-	-	-	1,407	1,541	1,474	1,072	1,005	603	9,114	26%	adjust theoritical in
14	0	0	1,581	6,610	2,500	3,953	23,715	1,165	1,053	1,053	1,515	-	-	-	-	1,032	1,156	-	-	6,973	29%	adjust theoritical in
15	0	0	1,832	8,350	2,500	4,580	54,960	1,875	1,188	1,444	1,288	1,640	1,849	1,130	2,256	1,517	860	760	1,620	17,427	32%	Independent Khoro
16	0	0	2,006	8,376	2,500	5,015	60,180	1,719	1,012	855	0	718	3,543	2,562	1,965	1,831	1,590	1,183	1,183	18,161	30%	
17	0	0	1,700	7,458	2,500	4,250	51,000	540	650	700	700	860	800	750	660	500	0	420	540	7,120	14%	
18	0	0	2,122	7,512	2,500	5,305	53,050	457	1,490	1,466	1,646	1,523	1,644	1,488	-	-	1,875	1,340	1,335	14,263	27%	adjust theoritical in
Total	**14,508**	**59,900**	**16,960**	**73,063**		42,400	508,800	10,375	11,140	10,532	10,136	9,908	13,091	12,502	10,409	11,626	10,618	7,414	7,414	125,165	**25%**	

F.4 Baseline Survey on Public Awareness for SWM

a. Purpose of Survey

Regarding "Prototypes of education materials for citizens are prepared" and "Public awareness raising campaign has been held xx times in UB City" set up as indicators of the output 5) "Development of human resources of EPWMD and District Officers for promoting public awareness and participation in SWM" in this project, the baseline survey was carried out for the following purposes;

1) To understand capacity, present condition, and needs for public education in the 6 pilot districts
2) To measure the degree of cooperation of each district for separate discharge and recycling, and the prevention of illegal dumping in the UB City
3) To clarify duties and responsibilities of the organizations related to SWM and public education.

In addition, these results of survey are taken as reference for selecting pilot site, and preparing training program and materials to strengthen the capacity of public education.

b. Method of Survey

The method of survey is shown below.

1. Survey method: Interview (questionnaire is used)
2. Target population: (1) Production and Service Department (PSD), i.e. Staff in charge of SWM in 6 pilot district offices
   (2) Department staff in charge of public education on SWM of each related ministries and government offices*
3. Period of survey: From December 17, 2009 to January 4, 2010
4. Number of questions: 14
5. Contents of questions: (1) Outline of each organization
   (2) Existing teaching tools on waste education in each district
   (3) Current state of environmental education (EE) in school education
   (4) Existing problem in conducting public education
   (5) Needs for public education tool
   (6) Degree of cooperation for the activities on separate discharge and prevention of illegal dumping
   (7) Others

* As for related ministries and government offices, the number of questions and the contents were slightly changed according to each organization's activities.

c. Results of Survey

c.1 Current State of Each District

c.1.1 Outline of Each District

All 6 pilot district offices have Production & Service Department (the number of the staff is 6 to 8 persons), and one member of the staff takes charge of SWM as a whole including public education. However, as for BZD, WSF takes charge of waste management business, and the

PSD staff is only in charge of monitoring and advising for WSF. In all district offices, the budget is not given to the public education on SWM but given to the activities such as cleanup campaign etc. However, as for WSF of BZD, the budget of 3 millions tg was given to the preparation of teaching-materials for public education in 2009.

c.1.2 Existing Teaching Tools on Waste Education in Each District

Although there is a difference in degree among each district, the teaching tools and activities on SWM are already implemented in all 6 districts. Moreover, the frequency and the number of times of those activities are recorded by every district in the annual report etc. As for SKhD and SBD, they establish general waste management program on their own and conduct public education activities positively.

Table F-23: Q2. Answer to "What kind of waste education materials do you have in your district at present?"

	KhUD	ChD	BGD	SKhD	BZD	SBD
Flier or PR magazine regarding waste reduction				✓	✓	✓
Plate or signboard to promote "no littering" or "banning on illegal disposal"	✓	✓	✓	✓	✓	✓
Campaigns such as "cleanup" and "eco bag"	✓	✓	✓	✓	✓	✓
Environmental events such as recycling fair	✓				✓	✓
Workshop or seminar on waste disposal manner	✓	✓	✓	✓	✓	✓
Guidance tools such as signboard or pamphlet for the promotion of waste separation.					✓	✓

c.1.3 Current State of Environmental Education (EE) in School Education

Although EE program is included in the curriculum of the primary and secondary schools in all 6 districts, about how far it is actually conducted is a question. Except for ChD, PSD of all districts answered that they had offered technical support to environmental activities in schools. However, it can be said that the waste issue does not have so high priority compared with air pollution, water pollution, deforestation, etc. in school education.

Table F-24: Q7. Answer to "What kind of themes and contents are discussed in EE?"

	KhUD	ChD	BGD	SKhD	BZD	SBD
Air pollution			✓	✓	✓	
Water pollution			✓	✓	✓	
Waste problem	✓					
Deforestation and desertification	✓		✓		✓	
We don't know		✓				✓

c.1.4 Existing Problem in Conducting Public Education

Each district answered to the question on existing problem in conducting public education as follows; 1) budget, 2) expertise, and public participation

Table F-25: Q11. Answer to "What kind of problems does your district have when conducting public education?"

	KhUD	ChD	BGD	SKhD	BZD	SBD
Budget	✓	✓	✓	✓	✓	✓
Expertise		✓	✓			
Education materials						
Public participation			✓		✓	

c.1.5 Needs for Public Education Tool

The Needs for public education tools of each district are as follows; 1) the signboard, 2) the poster, and the video or DVD, and 3) collections of good practices on EE activities.

Table F-26: Q12. Answer to "What kind of waste education materials would you like to prepare as the district office?"

	KhUD	ChD	BGD	SKhD	BZD	SBD
Signboard	✓	✓	✓	✓	✓	✓
Poster		✓		✓	✓	
Video or DVD	✓		✓		✓	
Collection of good practices on EE			✓		✓	
Text						

c.1.6 Degree of Cooperation for the Activities on Separate Discharge and Prevention of Illegal Dumping

Regarding the question "the UB City is now trying to implement waste separation at source in order to reduce the amount of waste and prevent illegal dumping, are you willing to cooperate with them?", all of the districts answered "yes".
As for waste separation and recycling, SBD has already implemented community recycling in the Apartment Area of khoroo 7, and they showed the idea that their experiences should be introduced to the other areas. As for prevention of illegal dumping, BGD and BZD mentioned that it was more important to take preventive measures through public education rather than just merely cleaning up waste so that illegal dumping would not recur.

c.1.7 Others

There are only few NGOs which conduct activities specialized in waste problem in the UB City, and almost all the environmental NGOs are mainly working for forestation and prevention of desertification. In SBD and BZD, the staff members support these NGOs to cleanup waste as part of forest conservation in a refuge.
While the activities of international NGOs such as the Soros Foundation and World Vision are very active, those of local NGOs are not so active. In KhUD, they have been conducting the SWM project (30,000US$) aiming at prevention of illegal dumping in Ger Area in collaboration with World Vision from 2007, and it also includes public education, which turned out to be successful. As for SKhD, they also have contact with local NGO that deals with the problem of illegal dumping.

c.2 Current Status of Each Related Organization

In the central government and the Municipality of Ulaanbaatar (MUB), the governmental agency considered to relate to the public education for SWM is as follows.

(1) Environmental Pollution and Waste management Department(EPWMD) of MUB
(2) Environmental Protection Department(EPD) of MUB
(3) Ministry of Education, Culture and Science(MECS)
(4) Ministry of Nature, Environment and Tourism(MONET)
(5) Ministry of Health(MOH）

When the survey was conducted to its department which takes charge of the SWM and public education in each of above mentioned organizations, it turned out that each of them are conducting public education activities on prevention and management of environmental pollution caused by waste within official authority. The contents of activity of each department are simply summarized below. A number in ( ) shows the number of the staff.

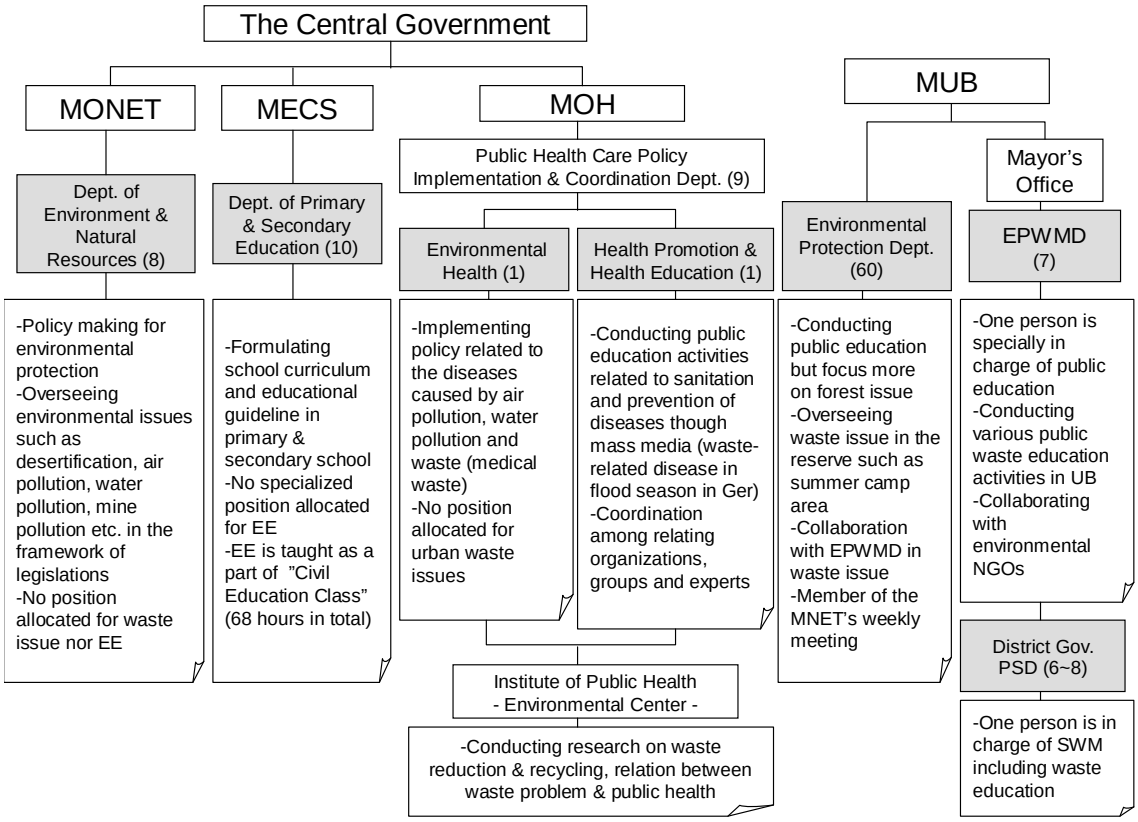


Figure F-8: Administrative organization chart that relates to SWM and public education in Mongolia

c.2.1 EPWMD

EPWMD is positioned as an organization which presides over SWM in the UB City but it has been just newly established in January, 2009. The independent activity of each district is left to the district though EPWMD can exercise the imperium to PSD of each district in the UB City, and EPWMD initiates the activity concerning SWM of the entire city. One member of 7 staffs takes charge of public education. EPWMD has installed signboard for prevention of illegal dumping and cleanup campaign etc., and offered technical and financial support for the environmental preservation activities of the university, and the social welfare organizations until now. However, in order for EPWMD to lead recycling promotion activity in the whole UB City in the future, further knowledge and experience on the public education need to be acquired. The current problems of EPWMD includes luck of budget, luck of collaboration with NGOs and other organizations, and luck of knowhow about how to prepare the waste education program. Moreover, they also focused on the school education, and carried out the painting contest and the poem contest under the slogan "For the healthier UB City where no waste exists" in the secondary school in 2009.

c.2.2 EPD

There are 60 staff members in EPD and 38 members out of them are working as Rangers in nature reserve in summer camp areas. There is no staff member specialized in waste education in EPD, but there is one Information Officer in charge of publicity work and conducts the waste PR activity. EPD participates in a weekly meeting organized by MONET from 2009 and always exchange information with MONET. EPWMD does control on the SWM in the MUB, but EPD is in charge of waste issue in nature reserve. The budget specialized in waste education is not allocated, but there is a budget for seminar and workshop in a general budget. Deputy Director showed the intention of getting involved in public education activities in this project.

c.2.3 MECS

The department in charge of school education in MECS is divided into a few levels (Primary & Secondary Education, Vocational Education), and there are 10 staff members in each level. There is no staff member who is specialized in EE in Dept. of Primary & Secondary Education, but there are 2 staff members in charge of making curriculum and standard for the primary and secondary education. The EE is being taught in a subject called the "Civil Education Class" (it seems that it is “Integrated Study” in Japan) as well as in a formal subject such as science and the mathematics. Moral education and health education are also included in "Civil Education Class" as well as EE, but it is decided by the free hand of each school to which subject is given the priority according to actual local situation and needs. 68 hours are assigned to "Civil Education Class" in a regular curriculum, and EE is taught on a theme called “Human Environment” for students from the 1st to 3rd grade, “Human & Nature” for students from the 4th to 5th grade, and “Human Society” for students from the 6th to 7th grade of the primary and secondary school. In addition, in another JICA project called "Teaching Improvement Project to Support Children's Development in Mongolia (2,006.4-2009.7)", various teaching textbooks for primary and secondary school teachers have been made; a lot of elements of EE are included in such teaching textbooks as "Primary Science: Human Being and Environment" or "Integrated Study ".

c.2.4 MONET

The Dept. of Environment and Natural Resources of MONET is the planning unit of environmental policy, and 8 staff members take charge of each theme (desertification, air pollution, water contamination, mine pollution, etc.) respectively. Although the budget for the position of waste problem has been cut due to insufficient budget, Deputy Director (just taken up this post from December, 2009) holds an additional post of a waste problem. The public education activities on waste have not been conducted so far. The most important issues for MONET are air pollution in the first place, followed by water contamination, desertification, mine pollution etc., and waste issue has not been given the high priority at present.

c.2.5 MOH

Although the Environmental Health section of MOH takes charge of the diseases brought about with waste problem, air pollution, and water contamination, and chemical problem, etc., as for waste, it only deals with medical waste but not municipal waste. Regarding public education, the Health Promotion and Health Education section takes charge of planning effective strategy in order to conduct public education on health problem or disease prevention through various media, as well as coordinating among various related organizations, groups and specialists. Although it is the duty of MOH that deals with the

health problem brought by illegal dumping in Ger Area, they have not stated yet to tackle with the municipal waste problem due to the lack of labor. Although MOH itself does not deal with municipal waste at present, one of the subordinate agencies of MOH called the Environmental Center in the Institute of Public Health (research organization on pollution) is now working for the problem of waste reduction and promotion of recycling. They are now implementing a project which researches on the amount of household waste and medical waste generated in the UB City and the relevance with the public health problem.

F.5 Waste flow in 2009

a. Current situation of solid waste management

We made the waste flow in 2009 in order to make each of project activities suitable for the present conditions and see graphically the current situation of solid waste management at target area. We basically used the data of the master plan as source of data for this waste flow unless it is mentioned.

b. The rate of population between apartment area and ger area

To grasp the rate of population between apartment area and Ger area is very important for checking the situation for solid waste management at the target area. The population (7 districts targeted on master plan) of 2010 had been estimated as 612,362 in apartment area, 375,318 in ger area, totally 987,680, apartment area was for 62%, ger area was for 38% based on the UB urban master plan, "Strategic Urban Development Plan in UBC". The population rate had been estimated that apartment area would be higher than ger area. However, according to the information by Ulaanbaatar Statistic Department in 2009, 406,622 are in apartment area, 670,607 are in ger area, 1,077,229 in total. The population rate are that 38 % is in apartment area, 62 % is in ger area which is opposite of the assumption.

Table F-27: Comparison for the population estimated by M/P in 2010 and present

Item	The target for 2010	At Present
	Estimated based on the population in 2006	Population at Dec 2009[2]
Population : 7 districts targeted on M/P	Apartment area : 612,362 Ger area : 375,318 Total : 987,680	Apartment area : 406,622 Ger area : 670,607 Total : 1,077,229

c. Generation amount of municipal waste

Generation amount of municipal waste has been calculated based on generation per unit investigated by *Development Study* as follows.

We used the data of the generation per unit and number of generation from the M/P, except the data related to population increase due to difficulty in getting those statistical information of 2009 and many of them are not disclosed at this moment. The figure will be modify, as the newest statistical data is disclosed.

[2] Household survey in Apartment, House and Ger, 2009, Department of Statistics Ulaanbaartar

Table F-28: Waste generation amount in UBC

Generation Source		Number of Generation Source	Unit	Generation Ratio (g/day)		Daily Generation Amount (ton/day)	
				Winter season	Summer season	Winter season	Summer season
Household Waste	Apart	406,622	g/person/day	288	256	117.1	104.1
	Ger	670,607	g/person/day	971	227	651.1	152.2
	Total	**1,077,229**	**g/person/day**	**713**	**238**	**768.2**	**256.3**
Commercial Waste (Restaurant)		51,798	g/chair/day	282	304	14.6	15.7
Commercial Waste (Other Shop)		3,727	g/shop/day	1350	1846	5.0	6.9
Office Waste		130,543	g/employee/day	146	203	19.1	26.5
Market Waste		5,394	g/stall/day	957	1936	5.2	10.4
School Waste		301,601	g/student/day	3.4	1.5	1.0	0.5
Hotel Waste		14,254	g/room/day	146	123	2.1	1.8
Business Total		-	-	-	-	**47.0**	**61.8**
Public Area Cleaning Waste		4,146,030	g/m2/day	**3.0**	**5.1**	**12.4**	**21.1**
Total						**827.6**	**339.2**

d. Generation amount of Construction waste

According to the "Situation of economic and society at UB city, Dec 2009 " by Statistic department of UBC, 420 construction activities have been conducted in 2009 and its total cost was 323,591.2 mil MNT. And 9971.2 mil. MNT have been expended for large scale renovations.. Generation amount of construction waste was estimated based on the generation amount per unit, which are shown the table above, investigated during the Development Study . In addition, majority of construction works are conducted in summer season due to the climate condition in Mongolia. Thus, it can be assumed that the generation amount in summer could be 4 times more than in winter.

- Generation amount in winter season : 93.9 tons/day
- Generation amount in summer season : 375.5 tons/day

e. Waste Flow

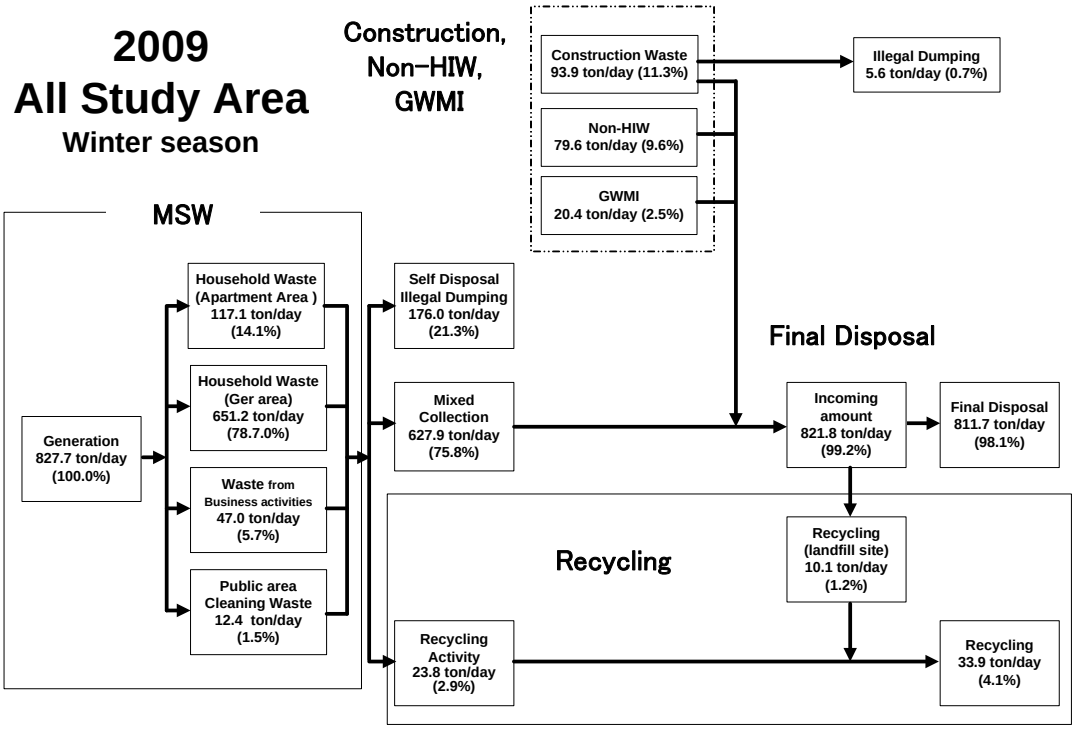


Figure F-9: Waste flow for UBC winter season in 2009

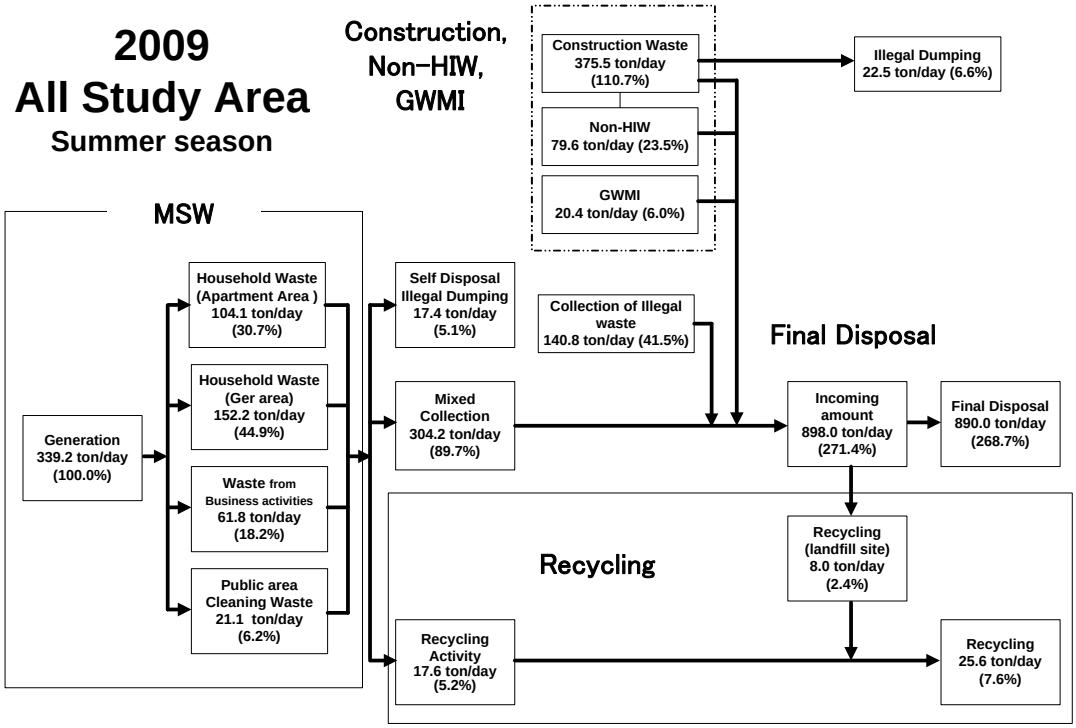


Figure F-10: Waste flow for UBC winter season in 2009

Table F-29: Basis and the calculation method of Waste flow

Item		Basis and the calculation method
(1-1)	MSW Generation	Refer to the table 2 Waste generation amount at UBC
(1-2)	Household Waste (Apartment Area)	
(1-3)	Household Waste (Ger Area)	
(1-4)	Waste from Business Activities	
(1-5)	Public Area Cleaning Waste	
(2-1)	Self Disposal / Illegal Dumping	(2-1) = (1-1)-(2-2)-(3-1)
(2-2)	Mixed Collection	(2-2) = (8)-((4-1)+(4-2))-(5)-(6)-(7)
(3-1)	Recycling Activity	Calculated based on the target value of M/P
(3-2)	Recycling (landfill site)	The record of recyclable materials took out from NEDS
(3-3)	Recycling	(3-3) = (3-1) + (3-2)
(4-1)	Construction Waste	Refer to "1.1.3 generation amount of construction waste " mentioned above
(4-2)	Illegal dumping amount of Construction waste	Calculated based on the target value of M/P
(5)	Industrial waste (IW)	Calculated based on the predicted value of M/P
(6)	Medical waste	Calculated based on the predicted value of M/P（rate of population）
(7)	Collection of Illegal Waste	Wastes illegally dumped at ger area on winter season are collected in summer season. Here, it is calculated as follows. (7) = (2-1) in summer × 0.8
(8)	Incoming amount	Record of the weigh bridge data at NEDS
(9)	Final disposal amount	(9) = (8) – (3-2)

F.6 Opinion Survey on Waste Collection at Ger Area

a. Objective of the Survey

Under Project Design Matrix (PDM), one of the project purpose is set to be "Waste collection cover rate in Ger area is increased to ## %)

This study is conducted to identify current waste collection cover rate in Ger area by doing questionnaire survey to the residents in Ger area.

This questionnaire survey will be conducted two more time at the mid and the end of the project. Same sample will be selected and asked in future.

At the same time, collection frequency, level of collection services, fee collection rate, and other questions were asked in order to investigate current waste collection service level from the point of residents.

b. Methods of Survey

b.1 Outline of the Survey

Two Ger khoroos are selected in each District and 40 households are selected from each Khoroo. EPWMD staff distributed questionnaire sheets to the target khoroo Government and staff of Khoroo Government distributed questionnaire sheets to each household as follows.

1. Survey Methods: Distribution of Questionnaire Sheets and Collecting Answers.
2. Target: Household living at Ger Khoroos in 6 Districts
3. Number of Respondent: 480 households(HH) living in Ger Khoroo
   （6 Districts x 2 Khoroos x 40 HH =480 HH）
4. Target Khoroo: 2 Khoroos in 6 Districts, 12 Khoroos in total.
5. Number of Question: 12
6. Main Question: (1) Level of Waste Collection Services
   (2) Particular of the Respondent

b.2 Selection of Target Khoroo

Selection of Ger Khoroos was made by the EPWMD staff. Each staff has responsible Districts so, each staff select two khoroos from his/her responsible districts.

b.3 Selection of Respondent

Selection of respondent from each Khoroo was made by the Khoroo Governor and instruction to the khoroo governor was made that selection should be at random.

c. Implementation

c.1 Collection of Answers

Khoroo Government staff has collected answer sheets and data was input in the Excel Format which is prepared in advance by the JET. These Excel file has been collected by EPWMD staff and results were analyzed by EPWMD and JET.

c.2 Survey Period

Answer sheets was filled in from 3 May 2010 to 13 May 2010. It took one month to collect these data in a digital format. It took another two weeks for analyzing the results.

c.3 Contents of the Question

c.3.1 Frequency of the Waste Collection and Its Regularity

In this part, frequency and regularity of the waste collection services were asked. Questions are;

1. Do you receive a waste collection services or not?
2. What is the frequency of the waste collection?
3. Do you receive waste collection services regularly?
4. Do you satisfy the waste collection services?
5. What is the appropriate frequency of waste collection?
6. What is the appropriate date for waste collection?

7 What is the reason you do not receive waste collection services.

c.3.2 General Question

General question to the respondent such as,

1. Address
2. Age
3. Sex
4. Educational background

were asked.

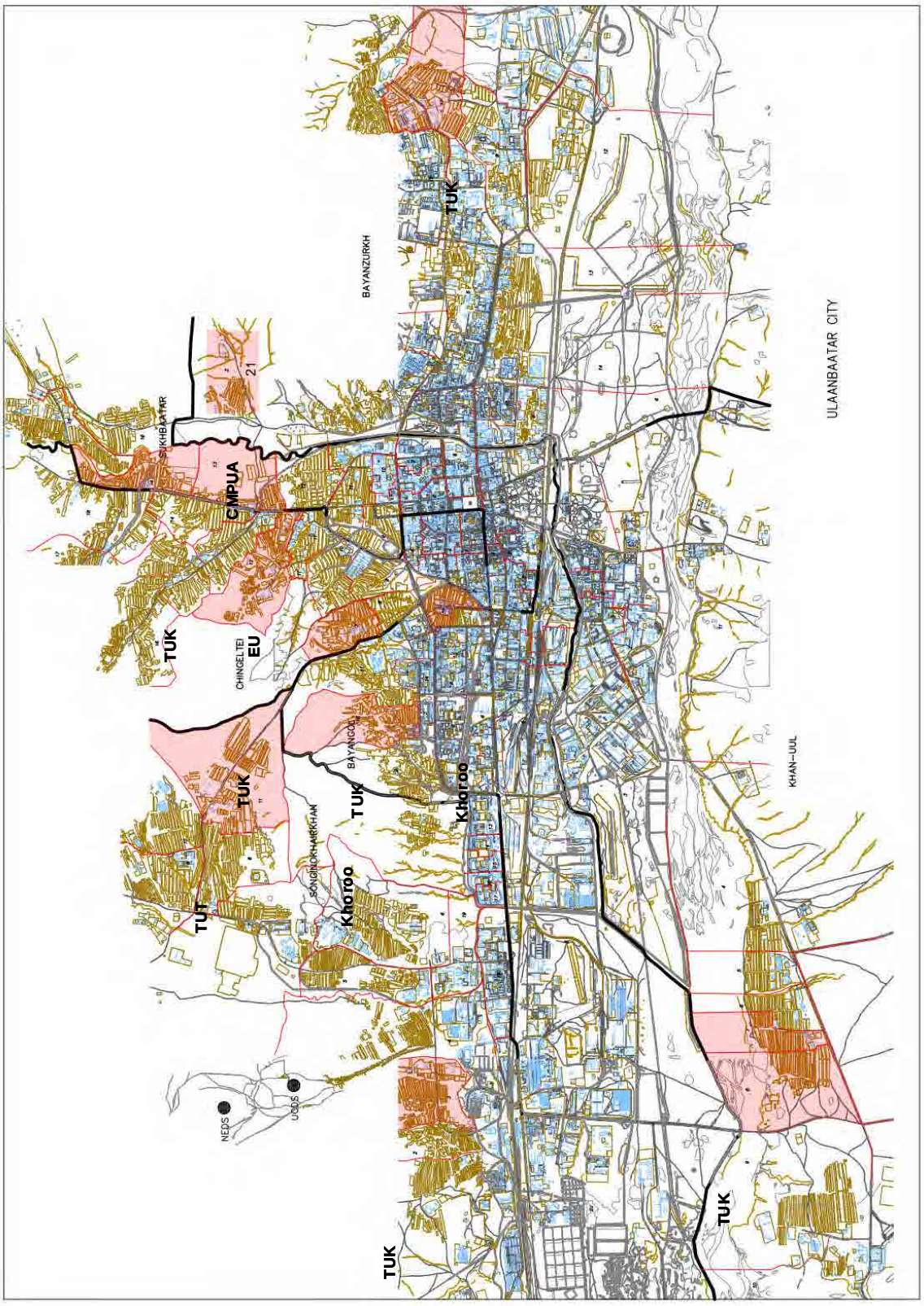


Figure F-11: Location of Target Khoroo

d. Results

d.1 Particular about Respondent

d.1.1 Address

480 questionnaire sheets were distributed and 471 answers were collected. Respondents are from following khoroos.

Table F-30: Address of Respondent and Other Particulars

District	Khoroo	Sub total	Total	Service provider	Fee collector
Bayangol	10	40	79	WSF	WSF
	16	39		WSF	WSF
Bayanzurkh	17	40	79	TUK	WSF
	21	39		CMPUA	WSF
Chingeltei	7	34	74	TUK	TUK
	12	40		TUK	TUK
Khan-Uul	7	40	80	TUK	WSF
	8	40		TUK	WSF
Sukhbaatar	13	39	79	EU*	WSF
	14	40		TUK	TUK
Songino-Khairhan	3	40	79	TUK	TUK
	11	39		TUT**	WSF
Total			471		

*EU – Emergency Unit of Sukhbaatar District Office

**TUT - Waste transportation unit of Songinokhairkhan District Office

d.1.2 Age and Sex of Respondent

Distribution of Age and Sex about respondent are presented below. Male is 41.4% and Female is 54.6 %. As for the age, 29% is 48 years old and more, other ages are more or less evenly distributed.

In Mongolia, population over 50 years old occupy only 14.3%[3] and respondent over 50 years old is much more than statistics this time.

Range of age is according to the practice in Mongolia according to EPWMD staff.

Table F-31: Distribution of Age and Sex

Age	male	female	Invalid	Total (number)	
18-23	12	19	1	32	6.8%
24-29	30	38		68	14.4%
30-35	26	46	1	73	15.5%
36-41	33	35		68	14.4%
42-47	31	44		75	15.9%
48 above	61	75	1	137	29.1%
Invalid	2		16	18	3.8%
Total	195	257	19	471	100.0%
Total	41.4%	54.6%	4.0%	100.0%	

d.1.3 Educational Background

32.5% of the respondents is secondary school graduate and 31.8% of the respondents is university graduate.

[3] "Capital City" statistical bulletin 2008

Table F-32: Educational background

Educational background	Number	Percent
1.University	150	31.8%
2.Special Secondary	84	17.8%
3.Secondary School	153	32.5%
4.Half Secondary School	53	11.3%
5.Primary School or no	10	2.1%
Invalid	21	4.5%
Total	471	100.0%

d.2 Waste Collection Services

d.2.1 Are you receiving waste collection services?

90.7 % of the residents who stay at Ger area is receiving waste collection services in overall. Highest is the residents in SBD which is 95% and lowest is in BGD and still 84.8%.

Table F-33: Receiving Waste Collection Services

District / Answer	Yes	(Percent)	No	(Percent)	Invalid	Total	(Percent)
BGD	67	(84.8%)	11	(13.9%	1	79	(100.0%
BZD	71	(89.9%)	8	(10.1%		79	(100.0%
ChD	66	(89.2%)	8	(10.8%		74	(100.0%
KhUD	75	(93.8%)	5	(6.3%)		80	(100.0%
SBD	76	(95.0%)	4	(5.0%)		80	(100.0%
SHD	72	(91.1%)	4	(5.1%)	3	79	(100.0%
Total	427	(90.7%)	40	(8.5%)	4	471	(100.0%

d.2.2 Waste Collection Frequency in Summer

22.7 % of the respondents received waste collection services over than once in a month and 49.7% received once in a month, 25.1% received less than once in a month.

Table F-34: Waste Collection Frequency in Summer

[Frequency per month]

District / Answer	1. More than once	2. Once	3. Less than once	4. Invalid	Total
BGD	14	28	29	8	79
	17.7%	35.4%	36.7%	10.1%	100.0%
BZD	11	46	22		79
	13.9%	58.2%	27.8%	0.0%	100.0%
ChD	16	30	28		74
	21.6%	40.5%	37.8%	0.0%	100.0%
KhUD	28	40	12		80
	35.0%	50.0%	15.0%	0.0%	100.0%
SBD	11	54	14	1	80
	13.8%	67.5%	17.5%	1.3%	100.0%
SHD	27	36	13	3	79
	34.2%	45.6%	16.5%	3.8%	100.0%
Total	107	234	118	12	471
	22.7%	49.7%	25.1%	2.5%	100.0%

d.2.3 Waste Collection Frequency in Winter

28.7 % of the respondents received waste collection services over than once in a month and 43.5% received once in a month, 24.0% received less than once in a month. According to the results, there is not much difference between summer and winter in terms of collection frequency.

Table F-35: Waste Collection Frequency in Winter

[Frequency per month]

District / Answer	1. More than once	2. Once	3. Less than once	4. Invalid	Total
BGD	20	22	27	10	79
	25.3%	27.8%	34.2%	12.7%	100.0%
BZD	21	37	20	1	79
	26.6%	46.8%	25.3%	1.3%	100.0%
ChD	10	32	32		74
	13.5%	43.2%	43.2%	0.0%	100.0%
KhUD	38	33	9		80
	47.5%	41.3%	11.3%	0.0%	100.0%
SBD	14	57	8	1	80
	17.5%	71.3%	10.0%	1.3%	100.0%
SHD	32	24	17	6	79
	40.5%	30.4%	21.5%	7.6%	100.0%
Total	135	205	113	18	471
	28.7%	43.5%	24.0%	3.8%	100.0%

d.2.4 Regular Waste Collection

64.1% of the respondents replied that waste collection services are irregularly. In SBD, more than 50% of the respondents replied that collection services are regular, hence in ChD, merely 10.8 % of the respondents replied it is regular.

Table F-36: Regular Waste Collection

District / Answer	1. Regularly	2. Irregularly	3. Invalid	Total
BGD	28	50	1	79
	35.4%	63.3%	1.3%	100.0%
BZD	25	54		79
	31.6%	68.4%	0.0%	100.0%
ChD	8	63	3	74
	10.8%	85.1%	4.1%	100.0%
KhUD	28	52		80
	35.0%	65.0%	0.0%	100.0%
SBD	42	38		80
	52.5%	47.5%	0.0%	100.0%
SHD	33	45	1	79
	41.8%	57.0%	1.3%	100.0%
Total	164	302	5	471
	34.8%	64.1%	1.1%	100.0%

d.2.5 Appropriateness of Current Waste Collection Frequency

40.6 % of the respondents replied collection frequency is appropriate. Hence, 48.2 % replied it is not appropriate, 9.8% replied I do not know. 56.3% in SBD and 46.3% in KhUD replied it is appropriate, 64.9% in ChD and 63.3 % in BGD replied it is not appropriate.

Table F-37: Appropriateness of Current Waste Collection Frequency

District / Answer	1. Yes Appropriate	2. No not enough	3. Do not know	4. Invalid	Total
BGD	19	50	8	2	79
	24.1%	63.3%	10.1%	2.5%	100.0%
BZD	36	37	6		79
	45.6%	46.8%	7.6%	0.0%	100.0%
ChD	18	48	8		74
	24.3%	64.9%	10.8%	0.0%	100.0%
KhUD	37	28	14	1	80
	46.3%	35.0%	17.5%	1.3%	100.0%
SBD	45	28	6	1	80
	56.3%	35.0%	7.5%	1.3%	100.0%
SHD	36	36	4	3	79
	45.6%	45.6%	5.1%	3.8%	100.0%
Total	191	227	46	7	471
	40.6%	**48.2%**	**9.8%**	**1.5%**	**100.0%**

d.2.6 Appropriateness of Waste Collection Frequency depend on Current Service Level

Same answer was analyzed depend on current service level. 51.2 % of the respondent, who received waste collection services over than once in a month, replied that the frequency is appropriate and 48.5 % of the respondent, who received once in a month, replied that the frequency is appropriate. There are not much differences. Hence, 74% of the respondents, who received waste collection services less than once in a month, replied that the frequency is not appropriate.

Based on the results, once in a month is the level of services which most of the people think it is appropriate.

Table F-38: Appropriateness of Waste Collection Frequency depend on Current Service Level

Frequency* /Answer	1. Yes Appropriate	2. No not enough	3. Do not know	4. Invalid	Total
1. More than once	62	48	9	3	121
	51.2%	**39.3%**	**7.4%**	**2.1%**	**100.0%**
2. Once	107	85	26	3	220
	48.5%	**38.7%**	**11.6%**	**1.1%**	**100.0%**
3. Less than once	21	86	9	1	116
	18.2%	**74.0%**	**7.4%**	**0.9%**	**100.0%**
Invalid	2	9	3	2	15
	10.0%	60.0%	20.0%	10.0%	100.0%
Total	191	227	46	7	471
	40.6%	**48.2%**	**9.8%**	**1.5%**	**100.0%**

d.2.7 Desire for Frequency of Waste Collection

38.2 % of the respondents replied once in a month, and 25.3% replied once in two weeks and 21.4% replied once in three weeks.

Table F-39: Desire for Waste Collection Frequency

District / Answer	Once in a week	Once in 2 weeks	Once in 3 weeks	Once in a month	Once in 1.5 month	Once in 2 month	Invalid	Total
BGD	11	25	17	23	2		1	79

	13.9%	31.6%	21.5%	29.1%	2.5%	0.0%	1.3%	100.0%
BZD	10	11	25	30	2	1		79
	12.7%	13.9%	31.6%	38.0%	2.5%	1.3%	0.0%	100.0%
ChD	7	20	17	27		2	1	74
	9.5%	27.0%	23.0%	36.5%	0.0%	2.7%	1.4%	100.0%
KhUD	5	24	20	27	1	3		80
	6.3%	30.0%	25.0%	33.8%	1.3%	3.8%	0.0%	100.0%
SBD	3	10	13	53			1	80
	3.8%	12.5%	16.3%	66.3%	0.0%	0.0%	1.3%	100.0%
SHD	10	29	9	20	1	5	5	79
	12.7%	36.7%	11.4%	25.3%	1.3%	6.3%	6.3%	100.0%
Total	46	119	101	180	6	11	8	471
	9.8%	**25.3%**	**21.4%**	**38.2%**	**1.3%**	**2.3%**	**1.7%**	**100.0%**

d.2.8 Desire for Waste Collection Data

53.9 % of the respondents replied Sunday, and next is Saturday. 93.5 % replied that the desired waste collection date is Weekends.

Table F-40: Appropriate Collection Date

District / Answer*	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Total
BGD	3	1			3	46	55	108
BZD	3	3				25	45	76
ChD	1	2		1	3	35	30	72
KhUD	1	2	1	1	1	42	47	95
SBD	4				2	35	54	95
SHD	1			1		24	51	77
Total	13	8	1	3	9	207	282	523
	2.5%	**1.5%**	**0.2%**	**0.6%**	**1.7%**	**39.6%**	**53.9%**	**100.0%**

d.2.9 The Reason why you do not receive Waste Collection Services

32.5 % of the respondents replied waste collection trucks are not coming, 20.0 % replied waste collection fee is expensive, 12.5 % replied waste is managed by himself.

Table F-41: The reason why you do not receive Waste Collection

District / Answer	1.Expensive	2. Not coming	3.Self-manage	4.Others	Invalid	Total
BGD	2	4		2		8
	25.0%	50.0%	0.0%	25.0%	0.0%	100.0%
BZD	2				2	4
	50.0%	0.0%	0.0%	0.0%	50.0%	100.0%
ChD	2	1	2	2		7
	28.6%	14.3%	28.6%	28.6%	0.0%	100.0%
KhUD	1	2		1		4
	25.0%	50.0%	0.0%	25.0%	0.0%	100.0%
SBD		4	3		4	11
	0.0%	36.4%	27.3%	0.0%	36.4%	100.0%
SHD	1	2			3	6
	16.7%	33.3%	0.0%	0.0%	50.0%	100.0%
Total	8	13	5	5	9	40
	20.0%	**32.5%**	**12.5%**	**12.5%**	**22.5%**	**100.0%**

d.2.10 How do you manage wastes?

40% of the respondents, who do not receive waste collection, replied waste is managed both inside and outside fence, 30% replied inside fence, 12.5 % replied outside fence.

Table F-42: How you manage your waste

District / Answer	1.Inside fence	2. Outside fence	3.Both	Invalid	Total
BGD	2		5	1	8
	25.0%	0.0%	62.5%	12.5%	100.0%
BZD	2			2	4
	50.0%	0.0%	0.0%	50.0%	100.0%
ChD	2		5		7
	28.6%	0.0%	71.4%	0.0%	100.0%
KhUD	2	1	1		4
	50.0%	25.0%	25.0%	0.0%	100.0%
SBD	3	4	3	1	11
	27.3%	36.4%	27.3%	9.1%	100.0%
SHD	1		2	3	6
	16.7%	0.0%	33.3%	50.0%	100.0%
Total	12	5	16	7	40
	30.0%	**12.5%**	**40.0%**	**17.5%**	**100.0%**

e. Findings

- 90 % of the respondents (residents in Ger area) received waste collection services.
- There is not much difference for frequency of waste collection services between in Summer and in Winter.
- It is high level waste collection services in KhUD and SBD, hence, low level waste collection services in ChD and BGD.
- 64.1% of the respondents replied the waste collection services are not regular.
- Regarding frequency of the waste collection, 40.6 % replied it is appropriate and 48.2 % replied it is not appropriate. 74% of the respondents who received waste collection services less than once in a month replied frequency is not appropriate.
- 95 % of the respondents desire waste collection frequency should be more than once in a month.
- More than 90 % of the respondents desire waste collection shall be done at week ends

F.7 Pilot Project (Waste Separation and Recycling)

F.7.1 Time & Motion Survey (Summary)

a. Objective of the Survey

The objective of the survey is to obtain basic information related to the current condition of waste collection services (waste collection routes, collection frequency and amount of wastes discharged by each type of organization) being conducted in 4 target khoroos selected for the Pilot Project on Waste Separation and Recycling in order for the JET to prepare a waste collection plan to be applied to the pilot project.

b. Methodology

b.1 Outline of the survey

1.	Method:	Taking records of every movement conducted by collection teams while following trucks working on waste collection.
2.	Duration:	1 week
3.	Survey target:	Collection trucks working on waste collection in the target khoroos of the pilot project.
4.	Number of the targets:	Basically, 1 truck in each khoroo
5.	Target areas:	The khoroos #5 & #7, Sukhbaatar district and the khoroos #1 & #7, Bayanzurkh district.
6.	Items of record:	Specifications of vehicles, contents of activities, duration, collected amounts, collection places etc.

b.2 Implementation of the Survey

Before commencing the survey, the JET had provided the waste collecting organizations that serve the target khoroos with sufficient information and obtained their approval for and cooperation on the implementation of the survey.

Throughout the implementation, the survey staff followed the collection trucks, tracked the whole cycle of waste collection conducted each day starting with the commencement of collection until the waste is disposed at NEDS after the last collection, recorded activities conducted by the collection team onto a specific sheet (record sheet), and analyzed the current conditions of waste collection.

b.3 Duration of the Survey

The durations of the surveys implemented in each khoroo are shown in the following table. The minimum number of trips conducted in a week is 8 trips, while the maximum is 12 trips in one khoroo.

Location	Duration	Day off	Total trip

Khoroo #5, SBD	7 days (23 Mar 2010 to 29 Mar, 2010)	1 day	12
Khoroo #7, SBD	7 days (15 Apr 2010 to 21 Apr 2010)	1 day	9
Khoroo #1, BZD	7 days (7 May 2010 to 13 May 2010)	1 day	11*
Khoroo #7, BZD	7 days (31 Mar 2010 to 6 Apr 2010)	2 days	8

*(Note): *2 of which were conducted by a truck that belong to Tsuzuku Yume Co. Ltd, a company that was not contracted for collection in the khoroo.*

b.4 Waste collection organization

The waste collection organizations are Tuzuku Yume Co. Ltd., (a private company) and the Emergency Unit (waste collection unit of Sukhbaatar district government) for the khoroos of Sukhbaatar district, while the CMPUA (a municipal company) for the khoroos of Bayanzurkh district as shown in the table below.

Location	Waste collection service provider
SBD khoroo #5	Tsuzuku Yume CO.,LTD.
SBD khoroo #7	Emergency Unit under Sukhbaatar district governor (EU)
BZD khoroo #1	City Maintenance Public Utility Agency under Ulaanbaatar Mayor (CMPUA)
BZD khoroo #7	City Maintenance Public Utility Agency under Ulaanbaatar Mayor (CMPUA)

b.5 Record Sheet

The record sheet used for the survey contained 12 items. They were: each activity, starting and ending time of each activity, duration of the activity, volume of the wastes collected, rotation number of loading plate, existence of separate collection at the source, number or name of apartments, existence of dust chutes (DC) in the apartment, number of watchmen or cleaning workers, name of organizations from which waste is collected, type of the organizations and blank space for special notes.

c. Results of the Survey

c.1 Types of the Collection Vehicles

A dump truck is used for collection in khoroo #7 of SBD, while compactor trucks are used for the rest of the target khoroos. The dump truck is not appropriate for collection in apartment khoroos since waste should be compacted due to its higher discharge amount and waste loading is quite difficult due to the truck's body specifications. Therefore, loading waste onto this truck requires 2 collection workers, while 1 is sufficient for a compactor truck.

Table F-43: Specifications of the Collection Trucks

Specifications	SBD, Khoroo #5	SBD, Khoroo #7	BZD, Khoroo #1	BZD, Khoroo #7
Type	Compactor	Dump truck	Compactor	Compactor
Registration No.	UBZ 61-59	UNB 23-54	UBV 77-09	UBV 77-10
Year made	1997	2009	1997	1997
Volume of Body	6.5 m3	17 m3	6.24 m3	6.24 m3
Loading Capacity	3.3 tons	3.0 tons	3.8 tons	3.8 tons
Crew	1 driver, 1 worker	1 driver, 2 workers	1 driver, 1 worker	1 driver, 1 worker
Company	Tsuzuku Yume	Emergency Unit	CMPUA	CMPUA

			
SBD khoroo#5	SBD khoroo#7	BZD khoroo#1	BZD khoroo#7

c.2 Trip Hours and Amounts of Collected Wastes by Trip

Detailed information of each trip is shown in the table below. As can be seen in the table, 12 trips were conducted in SBD-5 as the maximum, while the minimum is 8 trips conducted in BZD-7. Among the average amounts of waste per trip, the maximum amount was 3,600 kg in BZD-1, while the minimum was 2,868 kg in SBD-7. As for the latter, the work efficiency was the lowest since the collection team often worked until late in the evening, even after the closure time of the NEDS, due to inconvenience of the dump truck. Therefore, the driver had to take the truck to home with the loaded waste twice during the survey.

Table F-44: Details of the trips

	Trip no.	Date	Starting Time	Ending Time	Duration	Amount of Waste Transported
SBD #5	1	3/23	8:00	11:56	3:56	3,150 kg
	2	3/23	11:56	17:27	5:31	3,020 kg
	3	3/24	7:25	11:45	4:20	2,940 kg
	4	3/24	11:45	18:27	6:42	3,220 kg
	5	3/25	7:20	12:00	4:40	2,920 kg
	6	3/25	12:00	17:04	5:04	3,020 kg
	7	3/26	7:25	12:54	5:29	3,000 kg
	8	3/26	12:54	19:03	6:09	2,940 kg
	9	3/27	8:35	13:00	4:25	2,780 kg
	10	3/27	13:00	17:54	4:54	2,760 kg
	11	3/29	7:00	12:25	5:25	3,620 kg
	12	3/29	12:25	- *		3,440 kg
					Total, 56:35 Avg,5:08	**Total,36,810 kg Avg,3,068 kg**
SBD #7	1	4/15	8:35	15:46	7:11	2,740 kg
	2	4/15	15:46	21:40	5:54	2,360 kg
	3	4/16	8:10	16:16	8:06	3,060 kg
	4	4/16	16:16	22:52(09:18**)	6:36	2,300 kg
	5	4/17	8:50	17:31	8:41	3,080 kg
	6	4/19	8:05	13:44	5:39	3,390 kg
	7	4/19	13:44	20:27	6:43	2,440 kg
	8	4/20	9:25	16:50(08:15**)	7:25	2,720 kg
	9	4/21	7:30	18:43	11:13	3,720 kg
					Total,72:36 Avg,7:29	**Total,28,878 kg Avg,2,868 kg**
BZD #1	1	5/7	8:10	11:40	3:30	3,500 kg
	2	5/7	11:40	16:40	5:00	3,880 kg
	3	5/8	8:58	12:38	3:40	3,380 kg
	4	5/8	12:38	18:23	5:45	3,920 kg
	5	5/9	9:08	12:36	3:28	2,760 kg
	6	5/10	9:40	12:23	2:43	3,560 kg
	7	5/10	12:23	18:49	6:26	3,700 kg
	8	5/11	8:15	12:29	4:14	3,680 kg

	9	5/11	12:29	17:33	5:04	3,840 kg
	10	5/12	8:08	11:42	3:34	3,580 kg
	11	5/12	11:42	17:34	5:52	3,800 kg
					Total,49:16 Avg,4:28	**Total,39,600 kg Avg,3,600 kg**
BZD #7	1	3/31	8:27	12:10	3:43	3,640 kg
	2	3/31	12:10	17:17	5:07	2,520 kg
	3	4/2	9:25	12:09	2:44	2,920 kg
	4	4/2	12:09	16:46	4:37	2,040 kg
	5	4/3	8:55	12:52	3:57	2,840 kg
	6	4/5	9:34	12:37	3:03	3,260 kg
	7	4/5	12:37	17:20	4:43	3,820 kg
	8	4/6	8:58	15:21	6:23	3,240 kg
					Total,34:17 Avg,4:17	**Total,24,280 kg Avg,3,035 kg**

* *The survey was interrupted by an accident that occurred during the trip.*

** *The time was recorded the next morning when the truck dumped its waste collected the previous day.*

c.3 Collected Amount by Generation Source

The following table shows the amounts of wastes transported to NEDS during the survey from the two main generation sources, apartments and businesses. The respective proportions of waste generated at these sources in each area, that is the sub-total percentages below, are similar to that of the total, being 64% household waste and 36% business waste. The maximum daily amount was 3,579 kg for apartment waste collected in BZD-1; whereas, the minimum was 2,429 kg in SBD-7. Similarly, the maximum daily amount reached to 2,078 kg for business waste in BZD-1, while the minimum was 944 kg in BZD-7. The maximum daily total was 5,657 kg in BZD-1 and the minimum was 3,469 kg in BZD-7.

Table F-45: Amount of Waste Transported to NEDS (by type of generation source)

	Category	Daily Average	Weekly Amount	Sub Total Percentage	Grand Total Percentage
BZD1	*Apartment	3,579 kg	25,053 kg	63%	20%
	**Business	2,078 kg	14,547 kg	37%	11%
	BZD1 sub total	5,657 kg	39,600 kg	**100%**	31%
BZD7	Apartment	2,525 kg	17,672 kg	73%	14%
	Business	944 kg	6,608 kg	27%	5%
	BZD7 sub total	3,469 kg	24,280 kg	**100%**	19%
SBD5	Apartment	3,272 kg	22,906 kg	62%	18%
	Business	1,986 kg	13,904 kg	38%	11%
	SBD5 sub total	5,259 kg	36,810 kg	**100%**	29%
***SBD7	Apartment	2,429 kg	17,001 kg	62%	13%
	Business	1,508 kg	10,554 kg	38%	8%
	SBD7 sub total	3,937 kg	27,556 kg	**100%**	21%
Total	**Apartment**	11,805 kg	82,633 kg	**64%**	
	Business	6,516 kg	45,613 kg	**36%**	
	Grand Total	**18,321 kg**	**128,246 kg**	**100%**	

* *"Apartment" stands for household wastes.*

** *"Business" stands for the wastes discharged by business entities and organizations.*

*** *Amounts of wastes transported by other trucks are also included.*

c.4 Collection Routes

The table below shows the most typical collection routes for each khoroo.

In BZD-1, wastes from apartments without DC are collected in the mornings, and those of both apartments without DC and of businesses are collected in the afternoons every Mon, Wed and Fri. As for the rest of the days except Thur, the day-off, wastes generated by apartments with DC and specified business entities or organizations are collected.

In BZD-7, wastes discharged by apartments are collected together with those of business entities/organizations every Mon, Wed and Fri, while the waste generated at apartments with DC is collected every Tue and Sat.

Table F-46: Typical Collection Routes in BZD Khoroos

No.	**BZD-1**		DP Type	Schedule	**BZD-7**		DP Types	Schedule
1	22	AP	TDP	yes	23	AP	TDP	yes
2	19, 21	AP	TDP	yes	DP on street	BS	DPo	yes
3	18	AP	TDP	yes	24	AP	TDP	yes
4	17a	AP	TDP	yes	115,116,29,58	AP	TDP	yes
5	17	AP	TDP	yes	24	AP	TDP	yes
6	Sansar-23	AP	TDP	yes	30	AP	TDP	yes
7	20	AP	ODP	yes	Sansar Hotel,bank,restaurant	BS	mixed	yes
8	26a	AP	TDP	yes	DP on street	BS	DPo	yes
9	16	AP	TDP	yes	31	AP	TDP	yes
10	14, 15	AP	TDP	yes	DP on street	BS	DPo	yes
11	101, 102, 103	AP	TDP	yes	DP on street	BS	DPo	yes
12	Anod bank	BS	ODP	yes	Shunkhlai	BS	TDP	yes
13	27, 28	AP	TDP	yes	DP on street	BS	DPo	yes
14	26	AP	TDP	yes	37a	AP	Other	yes
15	25	AP	TDP	yes	37b,38b,40,57L	AP	TDP	yes
16	8 kiosks along the road	BS	TDP	yes	57S	AP	TDP	yes
17	24	AP	TDP	yes	Auto service	BS	TDP	yes
18	Naranbulag	BS	TDP	yes	Gerel Center	BS	TDP	yes
19	23	AP	TDP	yes	Taiji Hotel	BS	ODP	yes
20	shops, barbers and supermarket	BS	TDP	yes	41,41a,59	AP	TDP	yes
21	Veni, Gun molor, New, Elsen tsag, Hotel, plus shops	BS	TDP	yes	Buudai Hotel	BS	ODP	yes
22	Illegally dumped behind the 52 apart.	BS	DPo	yes	Fresh SM, MCPC	BS	TDP	yes
23	52, 30	AP	TDP	yes	D8,36g, church, bank, Ham factory)	BS	TDP	yes
24	4/1, 4/2	AP	TDP	yes	BZD #1Hospital	BS	ODP	yes
25	Sky shopping center	BS	ODP	yes	38a	AP	ODP	yes

(Note):

1. Types of the Discharge Points (**DP**): 1) **DC:** dust chute; 2) **TDP**: a temporary discharge point where residents or watchmen place their wastes just before or at the same time with the arrival of collection trucks; 3) **ODP**: an outside discharge point where containers, fenced areas etc are arranged into which residents are allowed to discharge their wastes at anytime; 4) **DPO**: a discharge point where wastes are habitually open-dumped directly on the street (the figure below shows the images of each type of DPs);
2. **AP:** apartments, **BS:** business entities and organizations;
3. **Schedule**: shows whether wastes are collected in accordance with scheduled time informed to the residents; and
4. The part of the table that has not been shaded represents the collection points of the 1st trip and the shaded part shows those of the 2nd trip of the day.

Figure F-12: Image of Each Type of DPs

			
DC	TDP	ODP	DPO

As for the SBD-5, waste is collected from apartments without DC along the same route every morning as shown in the table below. The afternoon collection usually covers apartments with DC and business entities or organizations; however, the route differs daily and there is no fixed schedule since wastes are collected when storage places of those generation sources become full.

In SBD-7, most of the apartments are equipped with DC and the organizations usually place containers outside their facilities. Therefore, waste collection is usually conducted on-demand basis when the DCs and the containers become full and there are no fixed routes in waste collection.

Table F-47: Typical Collection Routes in SBD khoroos

No.	**SBD5**		type	schedule	**SBD7**	type	type	schedule
1	39,52	AP	DPO	yes	11	AP	ODP	no
2	6,30	AP	TDP	yes	Smile	BS	ODP	no
3	5	AP	ODP	yes	Electricity supply	BS	TDP	no
4	11-14,28,30	AP	DPO	yes	10 (illegal)	AP	DPO	no
5	48	AP	DPO	yes	Chuluunbaatar	BS	TDP	no
6	24,25,26	AP	ODP	yes	9-1E	AP	DC	no
7	6th school	BS	ODP	no	9-2E	AP	DC	no
8	New wind	BS	TDP	no	9-4E	AP	DC	no
9	Sansar SM	BS	TDP	no	9-3E	AP	DC	no
10	Time out	BS	TDP	no	Labor welfare service center	BS	ODP	no
11	Mongolian BBQ	BS	ODP	no	Selbe plaza	BS	TDP	no
12	JS-tower	BS	DPO	no	6-2E	AP	DC	no
13					6-1E	AP	DC	no
14					6-5E	AP	DC	no
15					6-4E	AP	DC	no
16					6-3E	AP	DC	no
17					7-8E	AP	DC	no
18					7-7E	AP	DC	no
19					7-6E	AP	DC	no
20					40	AP	DPO	no
21					4-3E	AP	DC	no

In order to identify whether there is a collection schedule, collection time at each type of discharge points have been compared as follows:

Collections at discharge points of apartments: Among the types of the discharge points, the most scheduled collections occur at TDPs accounting for 62.3% of the total scheduled collections. On the contrary, the most unscheduled collections occur at DCs occupying 70.3% of the total unscheduled collections.

Among the khoroos, collections in BZD-1 are the most scheduled (occupying 44.7% of the total scheduled collections), while those in SBD-7 are the most unscheduled since no scheduled collections were identified in the khoroo during the survey.

Table F-48: Proportion of Scheduled and Unscheduled Collections Conducted from Apartments in Each khoroo in the Respective Grand Totals, by types of DPs

	Types of Discharge Points	BZD1	BZD7	SBD5	SBD7	Grand Total
Scheduled Collections	DC	3.8%	9.1%	0.0%	0.0%	12.9%
	TDP	37.1%	20.6%	4.5%	0.0%	62.3%
	ODP	3.8%	2.3%	6.4%	0.0%	12.5%
	DPO	0.0%	0.6%	9.5%	0.0%	10.0%
	Others	0.0%	2.3%	0.0%	0.0%	2.3%
Sub Totals		**44.7%**	**32.6%**	**20.5%**	**0.0%**	**100.0%**
Unscheduled Collections	DC	0.0%	0.0%	18.2%	52.1%	70.3%
	TDP	0.0%	0.0%	1.2%	0.0%	1.2%
	ODP	0.0%	0.0%	0.0%	12.7%	12.7%
	DPO	0.0%	0.0%	0.0%	4.8%	4.8%
	Others	0.0%	0.0%	10.9%	0.0%	10.9%
Sub Totals		**0.0%**	**0.0%**	**30.3%**	**69.7%**	**100.0%**

Collections at discharge points of business entities and organizations: Among the types of DPs, the most scheduled collections occur at TDPs accounting for 44.7% of the total scheduled collections. The most unscheduled collections occur at DPOs accounting for 31.4% of the total unscheduled collections. Contrary to those of apartments, the differences among the proportion of scheduled collections at each type of discharge points are not so big.

Among the khoroos, collections from business entities (or organizations) in BZD-1 are the most scheduled (occupying 33.2% of the total scheduled collections), while those in SBD-7 are the most unscheduled since no scheduled collections were identified in the khoroo during the survey.

Table F-49: Proportion of Scheduled and Unscheduled Collections Conducted from Business Entities/Organizations in Each Khoroo in the Respective Grand Totals, by types of DPs

	Types of Discharge Points	BZD1	BZD7	SBD5	SBD7	Grand Total
Scheduled Collections	TDP	15.0%	19.0%	10.7%	0.0%	44.7%
	ODP	17.1%	8.6%	2.7%	0.0%	28.3%
	DPO	0.0%	19.0%	7.0%	0.0%	25.9%
	Others	1.1%	0.0%	0.0%	0.0%	1.1%
Sub totals		33.2%	46.5%	20.3%	0.0%	100.0%
Unscheduled Collections	TDP	3.8%	0.0%	3.8%	21.0%	28.6%
	ODP	0.0%	0.0%	9.5%	21.0%	30.5%
	DPO	1.9%	0.0%	17.1%	12.4%	31.4%
	Others	0.0%	0.0%	0.0%	9.5%	9.5%
Sub total		5.7%	0.0%	30.5%	63.8%	100.0%

c.5 Wastes Discharged from Apartments

The amounts of household wastes and generation rates by types of discharge points are shown in the tables below.

Focusing on the types of DPs, the amount of wastes collected from DCs is the biggest at 33,879 kg (41% of the total amount), while that collected from DPOs is the smallest equaling 6,310 kg (7.6%) if the category "others" is excluded (Table 0-51 and 0-52).

Amount of wastes collected from TDPs is the biggest in the BZD-1, while no waste was collected from DPOs. Similarly, the amount of TDP waste was the biggest in BZD-7. As for the SBD-5, the amount of DC wastes is the biggest; and also, the amount of DPO waste was the biggest among those in all target khoroos. The biggest amount of DC waste was identified in SBD-7 in comparison with those of all the khoroos. No TDP wastes were collected in this khoroo.

Overall, the amount of wastes collected from TDP is bigger in BZD; whereas, the amounts of DC and DPO wastes are bigger in SBD.

When focusing on unit amounts (the daily amount generated by a person or the daily collected amount per person), the biggest value belongs to BZD-1 reaching to 0.68 kg/day/person, while that in BZD-7 was the smallest calculated as 0.34 kg/day/person. The overall average is 0.48 kg/day/person.

Table F-50: Calculation of Generation Rates for Household Waste

Location	Daily Average	Population*	Generation Rate
BZD1	3,579 kg	5,253	0.68 kg/day/person
BZD7	2,525 kg	7,461	0.34 kg/day/person
SBD5	3,272 kg	5,112	0.64 kg/day/person
SBD7	2,429 kg	6,733	0.36 kg/day/person
Total	**11,805 kg**	**24,559**	**0.48 kg/day/person**

**Source: Data provided by the khoroo office. The figure includes only those residing in the apartments covered during the survey.*

Table F-51: Amounts of Collected Household Wastes by Types of DPs

(unit: kg)

Khoroos	Types of Discharge Points					Total
	DC	TDP	ODP	DPO	Others	
BZD1	7,493	15,402	2,159	0	0	25,053
BZD7	5,001	9,814	1,276	377	1,204	17,672
SBD5	8,449	2,458	3,643	4,771	3,586	22,906
SBD7**	12,936	0	2,903	1,162	0	17,001
Total	**33,879**	**27,673**	**9,981**	**6,310**	**4,790**	**82,633**

Table F-52: Proportion of Wastes Collected at Each Type of DPs in the Total Amount of Household Wastes

Khoroos	Types of Discharge Points					Total
	DC	TDP	ODP	DPO	Others	
BZD1	9.1%	18.6%	2.6%	0.0%	0.0%	30.3%
BZD7	6.1%	11.9%	1.5%	0.5%	1.5%	21.4%
SBD5	10.2%	3.0%	4.4%	5.8%	4.3%	27.7%
SBD7*	15.7%	0.0%	3.5%	1.4%	0.0%	20.6%
Total	**41.0%**	**33.5%**	**12.1%**	**7.6%**	**5.8%**	**100.0%**

** Wastes collected by other truck operated in the khoroo are also included.*

c.6 Wastes Discharged from Business Entities/Organizations (Business Waste)

The amounts of business wastes and their proportion of the total business waste are shown in the tables below by each type of discharge point.

According to the tables, the amount of the ODP wastes is the biggest among all types of DPs, equal to 22,150 kg (49% of the total), and that of the TDP waste is the smallest as it was 8,946 kg (20%). Observing khoroo by khoroo, the amounts the ODP and TDP wastes collected in BZD-1 are the biggest among those in all the target khoroos. On the other hand, the DPO waste is the smallest. As for BZD-7, the amount of the DPO wastes is the biggest among those of other types of DPs collected in the khoroo. In SBD-5, the biggest amount belongs to the ODP, while that of TDP is the smallest (this amount is also the smallest among those in other khoroos). As for the SBD-7, the wastes collected from the ODP accounts for the biggest proportion of waste collected in the khoroo.

Table F-53: Amount of Collected Business Wastes by Types of Discharge Points

(unit: kg)

Khoroos	Types of Discharge Points					Total
	DC	TDP	ODP	DPO	Others	
BZD-1	-	3,534	10,064	229	719	14,547
BZD-7	-	1,962	671	3,975	0	6,608
SBD-5	-	1,471	7,096	5,336	0	13,904
SBD-7**	-	1,978	4,319	2,614	1,643	10,554
Total	**-**	**8,946**	**22,150**	**12,154**	**2,362**	**45,613**

Table F-54: Proportion of Wastes Collected at the Types of DPs in the Total Amount of Business Wastes

Khoroos	Types of Discharge Points					Total
	DC	TDP	ODP	DPO	Others	
BZD-1	-	8%	22%	1%	2%	32%
BZD-7	-	4%	1%	9%	0%	14%
SBD-5	-	3%	16%	12%	0%	30%
SBD-7*	-	4%	9%	6%	4%	23%
Total	**-**	**20%**	**49%**	**27%**	**5%**	**100%**

** Wastes collected by an additional truck dispatched at the same time are also included.*

c.7 Working Hours Spent for Each Activity Conducted during a Trip and the Efficiency

The average hours spent for the activities conducted in a trip have been compiled in the table below (as there were occasions where the drivers and collection workers did not have lunch, the averages calculated in the table cover only trips during which they had lunch).

The average trip hour calculated in SBD-7 is the longest in comparison with those in other khoroos, equaling 7 hours and 29 minutes. The shortest is 4 hours 17 minutes per trip calculated for BZD-7. The major part of the trip hours is spent on collection activity (the activity related to loading wastes onto trucks). Traveling also occupies a bigger proportion of the trip hours. The average duration from entering till coming out of NEDS is 8 minutes. Recycling means activities related to selling collected recyclables to the recyclers located near the NEDS by collection workers and it takes 9 minutes on average.

The waste collection in BZD-1 was the most efficient in terms of either trip efficiency

(amount of waste collected in a unit of average trip hours) or collection efficiency (amount of waste collected in a unit of loading hours) since the rate of the respective efficiencies were 13.43 kg/min and 25.9 kg/min. The most inefficient collection was conducted in SBD-7 (trip efficiency rate was calculated as 6.39 kg/min and that of collection efficiency was 9.31 kg/min).

Although there are considerable differences among the loading productivities of khoroos, there are almost no bigger differences among those of the trip totals implicating that the productivities of all activities except loading are almost at a same level.

Table F-55: Hours Spent on Activities Conducted in a Trip

(unit=>hours:minutes)

Activities Conducted in a Trip	Hours Spent for Each Activity and Their Proportion of the Trip Hours							
	BZD1		BZD7		SBD5		SBD7	
1.Preparation	0:00	0.0%	0:00	0.0%	0:00	0.0%	0:01	0.4%
2.Collection or Loading	2:19	52.0%	2:36	60.9%	3:25	66.6%	5:08	68.6%
3.Moving	1:30	33.7%	1:10	27.5%	0:53	17.2%	1:20	17.8%
4.Repair	0:00	0.2%	0:00	0.0%	0:01	0.4%	0:03	0.7%
5.Disposal	0:07	2.7%	0:08	3.2%	0:09	3.2%	0:09	2.1%
6.Fuel	0:00	0.0%	0:00	0.0%	0:01	0.4%	0:00	0.0%
7.Recycle	0:10	4.0%	0:08	3.2%	0:10	3.4%	0:08	2.0%
8.Lunch **	0:27	4.6%	0:34	5.0%	0:46	7.6%	0:30	3.0%
9.Others	0:07	2.8%	0:00	0.3%	0:05	1.8%	0:24	5.4%
Average trip hours	**4:28**	**100.0%**	**4:17**	**100.0%**	**5:08**	**100.0%**	**7:29**	**100.0%**
Average Waste Transported in a Trip (based on the weighbridge data)	3,600 kg		3,035 kg		3,068 kg		2,868 kg	
Average Trip Efficiency	**13.43 kg/min**		**11.81 kg/min**		**9.96 kg/min**		**6.39 kg/min**	
Average Collection Efficiency	**25.90 kg/min**		**19.46 kg/min**		**14.96 kg/min**		**9.31 kg/min**	

c.8 Collection Efficiencies at Types of Discharge Points

The rates of collection efficiencies at each type of discharge point are calculated in the table below.

Efficiency of collection activity at DPs of apartments: The most efficient collection is conducted at the TDPs where the average rate of collection efficiency is 31.09 kg/min, while the collections at ODPs are usually the most inefficient as the rate is 11.37 kg/min. As for the other types of DPs, the efficiency rates are 12.15 kg/min for the DCs and 14.02 kg/min for the DPOs; and therefore, these types of DPs can be considered as inefficient.

Collection efficiency at DPs of business entities and organizations: According to the calculation, the most efficient collection seems to be at the TDP with the average rate of 17.30 kg/min, while the ODPs can be considered the most inefficient ones as the rate at this type of DPs is 14.47 kg/min, excluding the type “others”. However, it can be considered that there was no big difference between the two types of DPs.

Table F-56: Efficiencies of Collection Activity at Types of DPs

(unit: kg/min)

Generation Sources	Types of DPs	BZD-1	BZD-7	SBD-5	SBD-7*	Total
Apartments	DC	22.71	12.76	13.61	8.95	12.15
	TDP	36.24	31.97	15.56		31.09
	ODP	17.13	13.02	15.70	6.90	11.37
	DPO		28.99	14.41	10.96	14.02
	Others		22.72	15.13		16.52
Business Entities and Organizations	TDP	21.95	15.69	13.75	15.95	17.30
	ODP	22.52	11.99	16.20	7.33	14.47
	DPO	16.37	19.20	15.83	13.00	16.01
	Others	20.55			10.67	12.50

** Wastes collected by an additional truck dispatched at the same time are also included.*

c.9 Recyclables Collected by Collection Workers

The amounts of recyclables collected by collection workers during waste collection and the relative earnings are compiled in the Table 0-57. According to the table, the biggest quantity of recyclables in a trip was collected in SBD-5 (57.9 kg/trip accounting for 1.7% of the amount of waste transported in a trip) and the relative earnings were 7,577 tg. The smallest amount of recyclables was collected BZD-7 (25.3 kg, which was 0.8% of the trip total and 3,035 tg).

In general, collection workers in SBD collected more recyclables in terms of their weights during a trip than those in BZD. In any of the khoroos, the earnings from the recyclables account for quite a big part of the total monthly earning by the collection workers including their salary.

Table F-57: Recyclables Collected by Collection Workers

(unit: kg)

Trip No.	BZD1		BZD7		SBD5		SBD7	
	Recyclables	Total	Recyclables	Total	Recyclables	Total	Recyclables	Total
1	25.1	3,500	28.1	3,640	70.0	3,150	100.2	2,740
2	26.4	3,880	27.6	2,520	24.8	3,020	0.0	2,360
3	28.6	3,380	4.0	2,920	41.1	2,940	121.9	3,060
4	6.1	3,920	62.0	2,040	88.2	3,220	0.0	2,300
5	17.4	2,760	22.8	2,840	46.5	2,920	83.6	3,080
6	24.9	3,560	21.6	3,260	34.2	3,020	31.6	3,390
7	80.7	3,700	25.2	3,820	57.6	3,000	25.7	2,440
8	14.8	3,680	10.9	3,240	82.7	2,940	0.0	2,720
9	30.6	3,840			76.7	2,780	88.0	3,720
10	25.6	3,580			33.4	2,760		
11	64.9	3,800			81.2	3,620		
12					*-	3,440		
Total	345.2	39,600	202.3	24,280	636.4	36,810	451.0	25,810
Avg (per trip)	31.4 (0.9%)	3,600	25.3 (0.8%)	3,035	57.9 (1.7%)	3,068	50.1 (1.7%)	2,868

** The survey was interrupted by an accident occurred to the target vehicle.*

Table F-58: Earnings from Recyclables

Trip No.	BZD1	BZD7	SBD5	SBD7
1	5,120 tg	4,740 tg	6,320 tg	11,290 tg
2	4,170 tg	4,360 tg	2,816 tg	
3	5,250 tg	1,600 tg	2,830 tg	12,670 tg
4	1,090 tg	6,150 tg	8,000 tg	
5	4,050 tg	5,600 tg	4,330 tg	13,770 tg
6	4,390 tg	2,800 tg	3,970 tg	6,500 tg
7	10,500 tg	3,150 tg	3,820 tg	4,080 tg

8	3,350 tg	1,400 tg	5,160 tg	
9	5,600 tg		5,310 tg	19,885 tg
10	4,000 tg		3,510 tg	
11	10,200 tg		9,540 tg	
12				
Total	57,720 tg	29,800 tg	55,606 tg	68,195 tg
Avg (per trip)	5,247 tg/ trip	3,725 tg/ trip	5,055 tg/ trip	7,577 tg/ trip

c.10 Weighbridge Registration System at NEDS

The actual information about trucks, provided directly by the drivers or the supervising companies within this survey and that registered by the weighbridge at NEDS during the implementation of this survey, are compared in the Table 0-59.

According to the results, all the collection trucks were registered by the weighbridge system definitely; however, there was not even correct information in the records registered by the system regarding the number of khoroos where the trucks have been operating. In addition to this, the system registered the name of the company which supervises the truck 23-54 UNB as “District WSF”, but not the “Emergency Unit”, the actual supervising organization. Also, the type of the khoroo where this truck serves was recorded as ger khoroo, but not apartment khoroo.

Table F-59: Comparison of Weighbridge Records against Actual Information

Registration No. of Trucks	Sources	Districts	Khoroos	Companies	Types of Khoroos
61-59 UBZ	Weighbridge	Sukhbaatar	Khoroo #3	"Tsuzuku yume" - /WSF/	Apartment
	Actual	Sukhbaatar	Khoroo #5	"Tsuzuku yume" - /WSF/	Apartment
23-54 UNB	Weighbridge	Sukhbaatar	Khoroo #8	Sukhbaatar district WSF	Ger area
	Actual	Sukhbaatar	Khoroo #7	Emergency Unit of SBD office	Apartment
77-09 UBV	Weighbridge	Bayanzurkh	Khoroo #18	CMPUA	Apartment
	Actual	Bayanzurkh	Khoroo #1	CMPUA	Apartment
77-10 UBV	Weighbridge	Bayanzurkh	Khoroo #1	CMPUA	Apartment
	Actual	Bayanzurkh	Khoroo #7	CMPUA	Apartment

In addition to this, the average amounts of waste per trip under normal conditions were calculated for each collection truck based on the weighbridge monthly data (the data of whole month, Mar 2010 was used) and compared with those recorded throughout this survey. In the khoroo #5 of SBD, there was almost no difference between the values calculated from the monthly data and recorded during the survey. However, in khoroo #7, SBD and khoroo #7, BZD, the amount of waste transported during the survey exceeds that of normal condition. On the contrary, the amount of waste recorded during the survey is less than the average value calculated for the normal condition in khoroo #1, BZD.

Table F-60: Comparison of Amounts of Average Trip Wastes Transported in March 2010 and during This Survey

Data	61-59 UBZ (SBD-5)	23-54 UNB (SBD-7)	77-09 UBV (BZD-1)	77-10 UBV (BZD-7)
Average trip wastes transported during this survey	3,068 kg/ trip	2,868 kg/ trip	3,600 kg/ trip	3,035 kg/ trip
Average trip wastes transported in March 2010	3,059 kg/ trip	3,610 kg/ trip	3,310 kg/ trip	3,640 kg/ trip

(Note):
1. *The figures in the table are the trip averages calculated from all the data that belong to each category.*
2. *All data of both categories was measured by the same weighbridge installed at NEDS.*

d. Findings

1. The proportion of the business wastes (those discharged by public organizations are also included) in the total collected amounts is about 1/3 in each target khoroo since these khoroos are located in the central UBC.
2. The collection schedule is almost fixed in BZD, while the collections in SBD can be considered as not scheduled.
3. Waste collection at TDP is often scheduled both for apartments and business entities/organizations; whereas, the most unscheduled collections occur at DCs for apartments and at DPOs for business entities/organizations.
4. Among the types of DPs, the biggest amount of waste is collected from DCs for apartments and ODPs for business entities/organizations.
5. Collection in BZD is the more efficient than that in SBD. The main reason for the inefficiency in SBD results from the most inefficient collection being conducted in khoroo #7 of the district, which, in turn, resulted from the dump truck.
6. The type of DPs where the highest rates of collection efficiency occur is the TDP for both apartments and business entities/organizations. On the contrary, the most inefficient collection occurs at the ODP for both apartments and business entities. However, there was no big difference between the same type of DPs of apartments and business entities.
7. The overall generation rate calculated from the collected amount is 0.48 kg/day/person, exceeding 0.297 kg/day/person for winter and 0.264 kg/day/person for summer, the rates calculated in the Master Plan for the year 2009.
8. The higher the rates of collection efficiency in a khoroo, the less the collectable recyclables in the khoroo for collection workers. The proportion of recyclables in the total wastes is usually 1% to 2%.
9. Among the data registered by the weighbridge system, there is either correct information or incorrect one. This is because of the out-of-date database inputted into the system at the time of installment. For example, the system fills automatically all necessary data such as khoroos of collection, types of residential areas and so on using its database for any trucks after inputting their registration numbers. As the database has not been updated since its installment, the registration does not reflect the changes in the data that have occurred until the present. Although the system registers some of data correctly for the present, these data can be changed in any time from now on. Also, vehicles are sometimes dispatched to other areas; and then, the data to be registered by the system will differ from the reality.

e. Recommendations

1. As the amount of wastes discharged by business entities and public facilities occupies 1/3 of the total waste collected in each khoroo, activities related to improvement of discharge manner and source separation should also cover these institutions during the implementation of the pilot project.
2. In order to achieve habitual separate discharge and collection by residents, punctual collection along fixed points at fixed times will be the prerequisites. However, the

implementation at apartments with DCs where the biggest amounts of wastes are discharged seems to remain a problem since these collections are usually unscheduled. Countermeasures such as closure of DCs should be planned and enforced during the pilot project.

3. The inefficiency of the dump truck that has been operating in one of the khoroos has been preventing the punctual collection in the khoroo. Immediate change of the truck into a compactor is preferable.

4. In the Master Plan, it was assumed that the daily waste generation rate would increase in proportion with the GPD growth, taking the value in the year 2005 as a base. Therefore, the annual growth of the daily waste generation rate per capita was projected as 5.5%. However, the GDP growth rates of Mongolia in 2007 and 2008 were considerable resulting in possible changes in residents' lifestyles and increases in the generation rate. In order to identify the current level of waste generation rate, a waste amount survey should be conducted.

5. Data reliability of the weighbridge registration system must be ensured in such ways as introduction of data update principles as this data is essential for calculation of contract payments to be paid to waste collection organizations. In order to maintain accountability and fairness of the data, the registered data should also be provided to waste collection organizations.

6. According to the results of this survey, the TDPs are the discharge point where waste collections are conducted most efficiently. In order to expand generation sources with this type of DP for a better efficiency, the cooperation by residents and watchmen in apartments; respective staffs in charge of SWM in business entities or public organizations; and the punctual implementation in collection schedule will be the prerequisites.

7. The success in BZD resulted mainly from the efforts made by the district WSF on development of residents' cooperation. The WSF inspectors are usually present at sites together with collection trucks throughout waste collection. One of the biggest roles of the inspectors during waste collection lay with improvement of communication between the collection team and the residents. However, the roles of SBD inspectors are limited to coming rarely to collection sites and observing work progresses. Therefore, efforts in enforcement of rules, regulations and functions of the system should be made through the inspectors of the WSFs.

F.8 Waste amount transported to NEDS

Weighbridge date of UCDS (Jan. 2008 – Dec 2008)
Collection amount – All Company by Duureg by Waste generation source,
unit: ton /month

2008.01	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	2569.5	7.0	1883.0	109.7	45.8	464.2	389.7	1.0	84.7	0.0	5,554.5
Bayanzurkh	2107.6	37.4	2537.0	122.4	118.6	77.1	53.7	0.0	105.2	0.0	5,158.9
Sukhbaatar	1301.4	10.3	1951.2	95.0	43.7	100.5	16.3	0.0	0.0	0.0	3,518.3
Songino Khairkhan	845.6	0.0	3263.1	51.6	37.6	112.7	65.6	0.0	3.9	0.0	4,380.0
Khan-Uul	343.6	1.4	327.3	41.9	0.0	136.9	124.3	0.0	0.0	0.0	975.4
Chingeltei	720.2	6.0	2060.6	25.8	0.0	54.8	87.4	0.0	36.4	0.0	2,991.2
Total	**7,887.8**	**62.1**	**12,022.1**	**446.4**	**245.7**	**946.1**	**736.9**	**1.0**	**230.2**	**0.0**	**22,578.2**
2008.02	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	2808.4	14.8	2159.2	62.4	35.8	550.5	543.5	0.0	103.9	0.0	6278.6
Bayanzurkh	1903.8	7.1	2685.6	43.4	127.9	118.6	65.2	2.8	93.6	0.0	5047.9
Sukhbaatar	1200.9	4.4	1563.2	56.1	57.6	83.3	26.8	0.0	0.0	0.0	2992.3
Songino Khairkhan	869.0	0.0	3447.9	12.3	35.7	178.2	99.0	0.0	5.0	0.0	4637.1
Khan-Uul	347.6	1.0	218.5	42.9	0.0	114.7	94.2	0.0	6.0	0.0	824.8
Chingeltei	712.4	3.0	1647.0	14.9	0.0	34.4	1.4	0.0	16.3	0.0	2429.4
Total	**7,832.1**	**30.3**	**11,721.4**	**232.1**	**257.1**	**1,079.7**	**830.1**	**2.8**	**224.7**	**0.0**	**22210.1**
2008.03	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	3254.2	26.5	2569.1	216.5	15.4	527.7	269.8	3.9	87.7	7.7	6978.4
Bayanzurkh	1957.5	26.8	3209.9	89.7	121.0	123.0	45.1	2.4	125.3	0.0	5700.7
Sukhbaatar	1504.5	5.1	2024.8	145.8	67.3	196.1	33.6	2.7	5.8	0.0	3985.6
Songino Khairkhan	1020.4	14.1	4683.8	50.5	91.0	150.7	203.0	0.0	29.1	0.0	6242.5
Khan-Uul	573.9	5.4	295.4	195.1	7.7	237.3	122.1	0.0	0.0	0.0	1436.8
Chingeltei	745.8	6.9	2255.0	39.5	3.1	30.5	5.5	0.0	32.7	5.1	3123.9
Total	**9,056.3**	**84.7**	**15,038.0**	**737.1**	**305.6**	**1,265.2**	**679.1**	**8.9**	**280.6**	**12.7**	**27488.0**
2008.04	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	4043.3	34.4	3109.8	275.6	51.6	700.0	706.2	5.1	103.3	0.0	9029.4
Bayanzurkh	2155.1	24.8	2692.5	102.4	125.3	194.0	24.4	0.0	129.9	4.0	5352.3
Sukhbaatar	1548.2	8.2	1656.4	117.1	92.8	142.4	44.7	0.0	8.4	0.0	3618.2
Songino Khairkhan	1283.1	12.2	5224.7	89.6	95.8	192.4	179.2	0.0	17.8	2.8	7097.5
Khan-Uul	564.3	5.3	337.1	174.8	0.0	246.2	323.9	0.0	1.4	1.4	1654.4
Chingeltei	751.8	12.4	1900.6	14.3	2.8	41.3	10.9	0.0	17.8	0.0	2651.8
Total	**10,345.8**	**97.3**	**14,721.1**	**773.7**	**368.4**	**1,516.3**	**1,289.2**	**5.1**	**278.5**	**8.2**	**29403.6**
2008.05	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	4930.8	322.9	2011.8	429.9	54.7	640.8	668.7	0.0	84.5	13.5	9151.5
Bayanzurkh	2524.5	35.1	2678.2	92.8	72.7	158.5	5.5	0.0	121.8	69.1	5758.2
Sukhbaatar	1878.2	9.2	1597.0	92.6	32.6	163.8	170.2	0.0	2.9	0.0	3946.4
Songino Khairkhan	1178.4	15.7	4836.4	150.9	58.0	234.6	111.6	0.0	15.1	21.7	6622.3
Khan-Uul	674.6	2.7	593.7	429.3	0.0	238.6	411.1	0.0	0.0	0.0	2285.0
Chingeltei	851.6	6.1	1521.2	25.5	0.0	67.7	12.2	0.0	12.1	0.0	2496.3
Total	**12,038.1**	**391.6**	**13,178.3**	**1,215.0**	**218.0**	**1,498.9**	**1,379.3**	**0.0**	**236.5**	**104.3**	**30259.8**
2008.06	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	4852.6	179.6	1562.2	260.0	55.0	828.6	81.9	3.5	202.0	12.4	8037.8
Bayanzurkh	2529.3	46.4	1927.5	46.3	64.1	234.4	0.9	0.0	171.0	74.8	5094.6
Sukhbaatar	1837.5	16.8	1100.0	201.8	45.5	280.4	1.0	0.0	0.9	0.0	3483.9
Songino Khairkhan	1296.5	9.4	3575.3	43.2	70.8	351.2	113.4	0.0	2.6	153.2	5615.4
Khan-Uul	607.3	12.2	335.6	280.4	22.6	430.9	269.4	0.0	0.0	4.3	1952.6
Chingeltei	828.3	7.9	1698.3	28.9	0.0	67.5	3.0	0.0	0.0	0.0	2634.0
Total	**11,951.4**	**272.3**	**10,198.8**	**860.6**	**257.9**	**2,192.9**	**469.7**	**3.5**	**376.5**	**244.7**	**26818.2**

2008.07	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	4219.2	75.9	1344.8	641.4	65.4	721.6	201.6	0.0	267.6	0.0	7537.5
Bayanzurkh	2188.3	8.3	1282.0	76.7	34.6	169.4	7.1	0.0	146.9	0.0	3913.3
Sukhbaatar	1609.4	2.1	1054.3	246.8	43.3	164.1	2.7	0.0	0.0	0.0	3122.6
Songino Khairkhan	1167.7	36.8	2102.6	51.5	54.6	185.2	112.3	1.1	0.0	0.0	3711.9
Khan-Uul	718.2	27.6	313.0	454.4	0.7	217.0	463.6	0.0	0.0	0.0	2194.5
Chingeltei	847.6	12.8	1074.0	32.1	2.8	62.5	0.0	0.0	0.0	0.0	2031.7
Total	**10750.5**	**163.4**	**7170.7**	**1502.8**	**201.4**	**1519.8**	**787.4**	**1.1**	**414.5**	**0.0**	**22511.6**
2008.08	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	4331.7	0.0	1254.2	495.9	109.2	866.6	204.3	2.5	248.0	5.6	7518.1
Bayanzurkh	2338.5	0.0	1458.0	166.5	63.0	278.9	9.8	0.0	220.2	0.0	4536.0
Sukhbaatar	1623.4	0.0	672.1	303.6	43.0	190.6	1.4	0.0	2.9	0.0	2836.9
Songino Khairkhan	900.8	2.2	1632.3	76.5	63.9	291.8	163.1	0.0	20.1	0.0	3150.7
Khan-Uul	586.2	5.2	116.3	532.9	0.0	377.3	473.9	0.0	0.0	0.0	2091.7
Chingeltei	858.0	6.3	1171.7	66.9	0.0	78.4	0.0	0.0	4.0	0.0	2185.2
Total	**10638.7**	**13.6**	**6304.6**	**1642.3**	**279.1**	**2083.7**	**852.5**	**2.5**	**495.1**	**5.6**	**22317.7**
2008.09	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	4050.3	20.9	1348.8	420.8	58.0	800.9	138.2	1.4	139.3	0.0	6978.6
Bayanzurkh	2634.9	8.2	1419.6	153.6	37.4	137.8	30.4	1.5	147.8	99.3	4670.4
Sukhbaatar	1803.4	4.8	864.4	561.0	74.7	202.4	31.0	7.4	2.9	2.7	3574.7
Songino Khairkhan	1363.2	20.6	4066.6	62.8	83.6	274.9	245.8	3.0	9.0	577.7	6707.1
Khan-Uul	558.3	2.7	249.7	408.8	0.8	328.9	254.1	0.0	0.0	17.1	1820.3
Chingeltei	797.4	4.0	1185.9	3.2	0.8	46.4	2.9	0.0	0.0	0.0	2040.6
Total	**11207.5**	**61.1**	**9155.0**	**1610.2**	**255.2**	**1791.3**	**702.4**	**13.2**	**299.0**	**696.8**	**25791.7**
2008.10	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	4101.2	64.6	1082.1	454.8	51.8	948.0	374.3	0.9	130.6	0.0	7208.3
Bayanzurkh	2440.2	30.3	1950.8	95.7	54.8	210.3	32.3	0.0	144.8	117.1	5076.4
Sukhbaatar	1632.7	5.7	855.9	124.1	70.8	126.0	2.4	0.0	0.0	61.8	2879.2
Songino Khairkhan	1110.4	2.1	2275.4	146.5	55.7	548.3	351.8	3.5	5.0	31.4	4530.0
Khan-Uul	464.1	4.0	190.4	247.4	3.0	237.0	133.4	6.7	4.3	0.0	1290.4
Chingeltei	811.2	6.6	1214.2	5.9	8.6	33.5	0.0	0.0	24.7	1.0	2105.5
Total	**10559.7**	**113.3**	**7568.7**	**1074.4**	**244.7**	**2103.1**	**894.2**	**11.1**	**309.4**	**211.3**	**23089.8**
2008.11	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	3719.5	20.1	1202.7	374.6	36.6	835.1	235.9	0.0	75.7	0.0	6500.2
Bayanzurkh	1841.0	17.0	1898.3	128.8	29.4	223.0	0.0	0.0	117.7	0.0	4255.2
Sukhbaatar	1281.2	10.3	1038.0	38.1	29.9	118.0	8.5	0.0	0.0	0.0	2524.0
Songino Khairkhan	784.5	9.3	1967.5	54.4	31.3	385.7	157.1	0.0	5.7	0.0	3395.4
Khan-Uul	379.2	0.0	193.3	285.5	0.3	305.9	75.1	2.9	0.0	0.0	1242.0
Chingeltei	664.6	6.2	1590.5	13.9	0.0	112.1	2.6	0.0	12.8	0.0	2402.7
Total	**8670.1**	**62.9**	**7890.3**	**895.3**	**127.5**	**1979.8**	**479.2**	**2.9**	**211.8**	**0.0**	**20319.5**
2008.12	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	2308.1	10.4	588.9	64.2	51.5	461.2	82.3	0.0	85.2	0.0	3651.9
Bayanzurkh	1191.5	21.0	1524.4	61.2	15.1	84.2	4.0	0.0	79.0	0.0	2980.4
Sukhbaatar	872.7	0.0	584.7	43.5	5.8	148.8	0.0	0.0	0.0	0.0	1655.5
Songino Khairkhan	657.3	4.8	1156.0	16.4	15.8	128.9	43.5	0.0	0.0	0.0	2022.7
Khan-Uul	298.4	0.0	108.6	39.5	0.0	97.4	77.4	0.0	0.0	0.0	621.2
Chingeltei	445.1	3.2	955.2	6.5	0.6	21.6	0.0	0.0	16.3	0.0	1448.5
Total	**5773.1**	**39.3**	**4917.9**	**231.2**	**88.8**	**942.1**	**207.2**	**0.0**	**180.6**	**0.0**	**12380.1**

Average from Jan 2008 to Dec 2008 **23,762.4** ton/month

Weighbridge date of UCDS (Jan. 2009– Dec 2009)
Collection amount – All Company by Duureg, by Waste generation source,

unit: ton /month

2009.01	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	3165.1	2.5	1115.2	37.7	92.4	720.2	185.9	3.0	144.1	3.1	5,469.2
Bayanzurkh	1890.6	19.4	2399.0	47.8	25.5	156.7	4.8	2.9	103.6	0.0	4,650.2
Sukhbaatar	1210.0	3.1	1004.3	10.2	6.3	110.6	3.1	0.0	5.0	0.0	2,352.5
Songino Khairkhan	1095.7	7.3	2412.3	29.6	61.4	204.7	47.6	0.0	8.6	0.0	3,867.2
Khan-Uul	334.1	0.0	119.6	271.1	0.7	105.8	141.1	0.0	0.0	0.0	972.4
Chingeltei	656.2	0.0	2306.2	5.3	4.5	79.5	4.1	10.2	26.4	0.0	3,092.5
Total	**8,351.7**	**32.3**	**9,356.6**	**401.5**	**190.8**	**1,377.5**	**386.6**	**16.0**	**287.7**	**3.1**	**20,403.9**
2009.02	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	3714.5	31.4	1356.6	48.9	67.5	722.5	262.3	0.0	98.1	0.0	6301.7
Bayanzurkh	1459.5	16.8	2688.4	33.2	45.1	126.0	13.3	0.0	171.3	0.0	4553.6
Sukhbaatar	1293.3	8.4	1500.7	13.2	2.1	133.4	12.4	0.0	0.0	0.0	2963.6
Songino Khairkhan	1134.8	8.0	3151.8	29.4	16.8	207.9	61.0	0.0	3.3	0.0	4612.9
Khan-Uul	277.1	1.2	116.5	159.7	0.0	201.1	180.3	0.0	0.0	0.0	935.9
Chingeltei	676.1	0.0	2176.3	19.0	4.2	60.7	0.0	0.0	31.8	0.0	2968.1
Total	**8,555.2**	**65.9**	**10,990.3**	**303.4**	**135.7**	**1,451.6**	**529.4**	**0.0**	**304.4**	**0.0**	**22335.8**
2009.03	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	3633.6	13.3	1268.9	76.3	142.9	773.7	528.6	4.4	88.8	0.0	6530.5
Bayanzurkh	1992.3	71.0	2348.5	34.5	52.0	123.3	3.4	0.0	338.8	7.2	4971.0
Sukhbaatar	1765.4	8.5	1163.6	10.8	2.3	134.4	7.6	0.0	0.0	0.0	3092.5
Songino Khairkhan	1671.1	3.9	3449.1	20.3	94.6	238.6	87.0	0.0	9.2	0.0	5573.7
Khan-Uul	586.5	0.0	241.6	176.9	14.4	225.5	149.9	0.0	0.0	0.0	1394.8
Chingeltei	887.2	5.0	2271.0	6.3	5.5	43.1	8.0	0.0	22.7	0.0	3248.7
Total	**10,536.0**	**101.7**	**10,742.6**	**325.1**	**311.6**	**1,538.7**	**784.4**	**4.4**	**459.5**	**7.2**	**24811.1**
2009.04	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	3398.7	4.5	1369.4	139.2	112.3	1020.6	558.7	3.4	118.7	89.3	6814.7
Bayanzurkh	2020.6	8.8	3272.4	60.1	49.6	315.1	20.9	3.5	152.8	490.9	6394.7
Sukhbaatar	1841.6	0.0	1135.3	7.1	0.8	214.1	4.0	2.7	11.0	13.5	3230.0
Songino Khairkhan	1425.7	0.0	3146.8	65.7	76.8	480.8	217.5	0.0	25.9	11.9	5451.1
Khan-Uul	478.0	4.2	308.2	168.8	10.7	348.6	197.1	1.7	0.0	11.5	1528.9
Chingeltei	865.1	10.0	2499.1	11.8	9.7	111.0	2.1	0.0	16.7	26.0	3551.5
Total	**10,029.7**	**27.5**	**11,731.2**	**452.6**	**259.9**	**2,490.3**	**1,000.3**	**11.3**	**325.0**	**643.1**	**26971.0**
2009.05	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	3931.8	4.1	695.6	326.2	234.2	601.1	884.8	0.0	89.6	0.0	6767.4
Bayanzurkh	4771.2	0.0	3638.2	283.2	2.1	206.9	45.9	0.0	141.9	1485.1	10574.5
Sukhbaatar	2064.5	5.4	907.2	80.4	9.4	129.6	23.6	0.0	0.0	12.5	3232.5
Songino Khairkhan	1315.3	3.1	4846.2	76.9	25.9	341.1	214.7	0.8	11.6	2425.4	9260.9
Khan-Uul	223.9	0.0	421.4	377.9	8.3	264.7	649.4	0.0	0.0	0.0	1945.5
Chingeltei	625.2	0.2	2232.4	35.1	24.2	177.5	3.4	0.0	38.7	8.8	3145.4
Total	**12,931.8**	**12.7**	**12,740.9**	**1,179.7**	**304.1**	**1,720.8**	**1,821.9**	**0.8**	**281.7**	**3,931.8**	**34926.3**
2009.06	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	3101.1	46.1	550.1	158.5	236.4	572.5	539.9	5.3	40.8	0.0	5250.6
Bayanzurkh	1711.1	0.0	2265.4	332.0	5.4	362.4	21.2	0.0	0.0	323.5	5021.1
Sukhbaatar	1701.3	7.8	672.1	70.6	0.0	134.3	5.7	0.0	0.0	0.0	2591.7
Songino Khairkhan	1065.5	143.8	2795.5	72.1	329.4	345.1	257.6	0.0	56.9	44.9	5110.8
Khan-Uul	89.4	0.0	312.4	206.2	5.6	155.6	772.2	0.0	0.0	0.0	1541.3
Chingeltei	673.6	3.8	1844.0	0.0	94.5	171.3	0.0	0.0	43.5	0.0	2830.8
Total	**8,342.0**	**201.6**	**8,439.5**	**839.3**	**671.3**	**1,741.3**	**1,596.6**	**5.3**	**141.2**	**368.4**	**22346.3**

2009.07	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	9093.6	0.5	622.5	63.5	222.1	540.0	439.2	3.3	64.6	154.1	11203.5
Bayanzurkh	4434.6	0.0	1475.4	207.4	4.9	172.0	15.6	1.9	0.0	0.0	6311.7
Sukhbaatar	1001.8	3.0	419.7	59.7	3.1	183.8	9.0	0.0	0.0	0.0	1680.1
Songino Khairkhan	796.5	25.0	1702.3	95.1	48.8	250.9	246.9	0.0	12.7	11.0	3189.2
Khan-Uul	35.3	0.0	261.4	193.7	2.6	158.2	530.2	0.0	0.0	0.0	1181.6
Chingeltei	586.9	0.0	969.9	6.9	85.1	227.1	0.0	0.8	34.2	0.0	1910.9
Total	**15948.7**	**28.5**	**5451.3**	**626.4**	**366.7**	**1532.0**	**1240.9**	**5.9**	**111.6**	**165.1**	**25477.0**
2009.08	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	1902.1	460.4	501.2	148.5	208.9	559.1	644.0	6.5	37.4	0.0	4468.0
Bayanzurkh	1210.8	0.0	1574.1	87.2	6.5	161.2	13.8	1.4	0.0	57.2	3112.2
Sukhbaatar	1065.9	1.0	583.4	37.2	0.0	192.1	16.9	0.0	0.0	0.0	1896.4
Songino Khairkhan	133.2	60.5	1245.5	43.9	256.9	168.5	175.9	1.3	55.9	16.8	2158.4
Khan-Uul	43.8	0.0	248.4	180.1	1.2	150.0	633.4	0.0	0.0	0.0	1256.9
Chingeltei	605.7	0.0	1044.4	51.7	110.9	74.0	0.0	0.3	33.4	0.0	1920.5
Total	**4961.5**	**521.9**	**5196.9**	**548.6**	**584.4**	**1304.9**	**1484.0**	**9.5**	**126.7**	**74.0**	**14812.4**
2009.09	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	3075.0	221.9	740.3	277.6	273.3	615.8	445.8	5.8	55.6	0.0	5711.2
Bayanzurkh	1708.8	1.8	1995.9	94.6	3.6	177.8	21.5	3.1	0.0	154.0	4161.2
Sukhbaatar	1418.4	0.4	923.9	456.6	0.0	270.7	66.9	0.6	0.0	0.0	3137.5
Songino Khairkhan	1386.7	133.4	2366.9	40.4	265.2	831.1	235.5	0.7	11.2	112.9	5384.0
Khan-Uul	94.2	0.0	354.5	127.2	4.5	196.5	361.0	0.0	0.0	0.0	1137.9
Chingeltei	822.0	0.0	1850.8	341.6	152.2	78.6	0.0	1.1	41.2	0.0	3287.4
Total	**8505.2**	**357.5**	**8232.2**	**1338.0**	**698.9**	**2170.4**	**1130.7**	**11.4**	**108.0**	**266.9**	**22819.2**
2009.10	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	3438.2	34.6	949.1	353.4	170.2	584.7	422.4	5.3	93.7	45.7	6097.1
Bayanzurkh	1969.3	6.3	2237.7	134.0	1.0	163.1	34.5	6.5	0.0	162.0	4714.5
Sukhbaatar	1951.9	1.7	1213.1	304.3	0.0	405.3	162.9	0.4	0.0	0.0	4039.7
Songino Khairkhan	1279.8	90.1	2762.1	53.4	324.3	543.4	269.8	1.2	49.7	23.1	5396.9
Khan-Uul	137.9	0.0	443.4	215.2	3.4	156.2	114.8	0.0	0.0	0.0	1070.9
Chingeltei	1012.4	0.0	1351.8	221.0	138.0	106.2	0.0	0.4	39.4	0.0	2869.2
Total	**9789.5**	**132.7**	**8957.2**	**1281.4**	**636.9**	**1958.9**	**1004.5**	**13.8**	**182.8**	**230.8**	**24188.4**
2009.11	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	2948.8	0.0	743.6	206.7	125.2	371.5	417.5	6.9	19.9	0.0	4840.1
Bayanzurkh	1812.4	0.0	2821.3	351.2	0.6	124.9	21.0	4.2	2.3	63.6	5201.4
Sukhbaatar	1653.9	0.0	1206.2	98.2	1.1	195.1	31.2	0.0	0.0	0.0	3185.7
Songino Khairkhan	1360.5	6.8	2731.4	91.9	220.3	164.3	132.3	2.2	0.0	0.0	4709.7
Khan-Uul	177.9	0.0	400.1	188.1	0.0	71.3	25.4	0.0	0.0	0.0	862.9
Chingeltei	590.7	0.0	1618.1	14.4	249.6	99.1	0.0	1.0	39.7	0.0	2612.5
Total	**8544.1**	**6.8**	**9520.6**	**950.6**	**596.8**	**1026.3**	**627.3**	**14.3**	**61.9**	**63.6**	**21412.2**
2009.12	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	2827.6	4.8	879.2	125.0	242.4	467.5	865.5	6.2	30.9	0.0	5449.1
Bayanzurkh	1600.9	0.0	3043.3	50.1	59.1	108.2	15.4	4.9	3.9	0.0	4885.7
Sukhbaatar	1853.3	0.0	1595.9	56.6	0.0	106.8	0.0	0.0	0.0	0.0	3612.6
Songino Khairkhan	1197.2	0.0	3422.2	25.1	186.3	121.5	117.7	4.8	0.0	0.0	5074.8
Khan-Uul	360.5	0.0	136.7	177.2	0.0	111.8	75.2	0.0	0.0	0.0	861.5
Chingeltei	753.8	0.0	1752.0	23.3	243.1	127.0	0.0	26.3	33.0	0.0	2958.4
Total	**8593.3**	**4.8**	**10829.3**	**457.2**	**730.9**	**1042.8**	**1073.8**	**42.2**	**67.9**	**0.0**	**22842.1**

Average from Jan 2009 to Dec 2009 **23,612.1** ton/month

Weighbridge date of UCDS (Jan. 2010– Jun 2010)
Collection amount – All Company by Duureg, by Waste generation source,

unit: ton /month

2010.01	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	2749.8	0.0	1028.4	62.3	226.6	512.4	767.8	4.5	29.2	0.0	5,381.1
Bayanzurkh	1504.0	0.0	3671.9	80.7	54.4	139.3	24.4	8.9	0.0	0.0	5,483.7
Sukhbaatar	2065.0	0.0	1602.4	27.1	0.0	83.9	36.8	0.0	0.0	0.0	3,815.2
Songino Khairkhan	1441.3	0.0	2978.0	26.7	243.6	89.6	169.4	2.9	17.9	0.0	4,969.4
Khan-Uul	358.4	0.0	77.3	77.8	0.0	114.7	189.3	0.0	0.0	0.0	817.6
Chingeltei	798.3	0.0	1916.1	38.0	202.0	64.6	0.0	1.2	40.0	0.0	3,060.2
Total	**8,916.8**	**0.0**	**11,274.2**	**312.6**	**726.7**	**1,004.6**	**1,187.7**	**17.5**	**87.2**	**0.0**	**23,527.2**
2010.02	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	2550.5	0.0	679.2	33.1	253.0	352.3	593.9	1.6	52.2	0.0	4515.9
Bayanzurkh	1409.3	0.0	3096.6	107.6	48.3	120.8	3.4	4.9	0.0	0.0	4790.9
Sukhbaatar	1548.9	0.0	1367.4	32.5	0.0	84.3	35.9	0.0	0.0	0.0	3069.1
Songino Khairkhan	1107.6	0.0	2807.0	23.0	150.8	126.6	233.6	1.9	9.3	0.0	4459.7
Khan-Uul	273.1	0.0	61.4	35.1	0.0	86.4	174.6	0.0	0.0	0.0	630.7
Chingeltei	649.8	0.0	1416.4	30.2	225.1	78.6	0.0	1.1	28.2	0.0	2429.5
Total	**7,539.3**	**0.0**	**9,428.0**	**261.5**	**677.2**	**849.2**	**1,041.4**	**9.5**	**89.7**	**0.0**	**19895.9**
2010.03	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	2965.5	0.0	1003.3	56.5	291.2	572.5	723.5	1.7	41.5	0.0	5655.8
Bayanzurkh	1643.4	0.0	3586.9	94.8	56.0	113.8	4.8	11.6	0.0	0.0	5511.4
Sukhbaatar	1954.3	0.0	1555.0	110.3	0.0	83.0	1.1	0.0	0.0	0.0	3703.6
Songino Khairkhan	1454.6	0.0	3313.4	52.5	200.1	140.0	285.5	10.8	8.3	0.0	5465.2
Khan-Uul	358.7	0.0	49.3	91.5	0.0	227.2	462.3	0.0	0.0	0.0	1188.9
Chingeltei	707.4	0.0	1752.2	8.8	294.9	88.1	0.0	0.3	28.8	0.0	2880.5
Total	**9,084.0**	**0.0**	**11,260.0**	**414.3**	**842.3**	**1,224.7**	**1,477.2**	**24.4**	**78.6**	**0.0**	**24405.5**
2010.04	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	3215.9	0.0	990.0	168.7	302.3	679.4	632.1	2.3	47.6	0.0	6038.3
Bayanzurkh	1867.4	0.0	3622.3	78.5	86.6	97.5	5.9	8.1	3.3	0.0	5769.6
Sukhbaatar	2174.8	0.0	1455.3	142.6	8.9	134.0	3.5	0.0	0.0	0.0	3919.0
Songino Khairkhan	1054.2	0.0	4406.4	44.5	252.8	294.2	414.5	18.6	17.0	36.4	6538.7
Khan-Uul	460.2	0.0	104.7	99.1	0.0	339.9	433.1	0.0	0.0	0.0	1437.1
Chingeltei	890.3	0.0	1933.2	12.0	140.2	67.2	0.0	0.0	31.0	0.0	3073.8
Total	**9,662.9**	**0.0**	**12,511.9**	**545.5**	**790.8**	**1,612.1**	**1,489.1**	**28.9**	**99.0**	**36.4**	**26776.5**
2010.05	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	3184.5	177.5	1001.6	140.1	180.6	760.5	645.9	2.5	52.2	0.0	6145.3
Bayanzurkh	2171.3	0.0	4593.7	118.3	85.4	131.3	29.8	0.9	0.0	0.0	7130.6
Sukhbaatar	2540.3	0.0	1551.8	55.7	4.4	162.3	42.3	0.0	0.0	0.0	4356.8
Songino Khairkhan	1067.3	0.0	3957.5	42.0	208.5	295.3	592.3	17.5	15.9	0.0	6196.4
Khan-Uul	61.0	0.0	59.4	95.8	0.0	172.9	102.1	0.0	0.0	0.0	491.2
Chingeltei	924.8	0.0	2274.9	13.3	299.8	168.7	0.0	0.0	4.9	0.0	3686.3
Total	**9,949.1**	**177.5**	**13,438.8**	**465.3**	**778.6**	**1,691.0**	**1,412.4**	**20.9**	**73.0**	**0.0**	**28006.6**
2010.06	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol	2531.6	145.3	1014.6	171.9	134.6	748.5	454.1	0.0	55.2	0.0	5255.7
Bayanzurkh	1912.7	0.0	3130.9	137.5	3.4	145.8	65.1	3.6	3.7	2.4	5405.0
Sukhbaatar	2429.2	0.0	1559.0	85.1	0.0	241.5	3.2	0.0	0.0	0.0	4318.0
Songino Khairkhan	1222.8	0.0	3933.6	92.2	199.2	197.6	245.1	0.0	36.9	21.7	5948.9
Khan-Uul	12.0	0.0	12.1	134.1	15.3	2005.3	96.9	0.0	0.0	0.0	2275.8
Chingeltei	930.6	0.0	1651.9	9.4	276.7	196.8	0.0	0.0	53.9	0.0	3119.3
Total	**9,038.9**	**145.3**	**11,302.1**	**630.2**	**629.3**	**3,535.4**	**864.4**	**3.6**	**149.6**	**24.1**	**26322.8**

2010.07	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol											0.0
Bayanzurkh											0.0
Sukhbaatar											0.0
Songino Khairkhan											0.0
Khan-Uul											0.0
Chingeltei											0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
2010.08	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol											0.0
Bayanzurkh											0.0
Sukhbaatar											0.0
Songino Khairkhan											0.0
Khan-Uul											0.0
Chingeltei											0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
2010.09	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol											0.0
Bayanzurkh											0.0
Sukhbaatar											0.0
Songino Khairkhan											0.0
Khan-Uul											0.0
Chingeltei											0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
2010.10	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol											0.0
Bayanzurkh											0.0
Sukhbaatar											0.0
Songino Khairkhan											0.0
Khan-Uul											0.0
Chingeltei											0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
2010.11	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol											0.0
Bayanzurkh											0.0
Sukhbaatar											0.0
Songino Khairkhan											0.0
Khan-Uul											0.0
Chingeltei											0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
2010.12	Apartment	Dam/Canal	Ger area	Construction	Road	Org./mixed	Factory	Hospital	Market	Illegal waste	Total
Bayangol											0.0
Bayanzurkh											0.0
Sukhbaatar											0.0
Songino Khairkhan											0.0
Khan-Uul											0.0
Chingeltei											0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Average from Jan 2010 to Jun 2010 **24,822.4** ton/month

Section G
Activities not specified in PDM

G Activities not specified in PDM

G.1 Plan of Improving Solid Waste Management in Bulgan Aimag Center

G.1.1 Background

Currently, Ministry of Nature, Environment and Tourism (MNET) instructed each city to formulate MP of solid waste management, and allocated some budget for implementation of the plan.

The JET held workshops for formulation and implementation of SWM MP for Central Provincial Cities based on experience in Ulaanbaatar from June 28th 2011 for 3 days. Officers in charge of solid waste management were invited from 11 Aimag Centers.

At the workshop, the officers from each City requested JET to conduct site inspection and technical advices.

The JET visited 3 Aimag Center (Bulgan, Erdenet, Darkhan) for inspection of solid waste management and consulted with Governors and the persons concerned from July 4th 2011 to July 6th 2011.

The governor of Bulgan requested JET to provide technical advices and draft improvement plan for disposal site to improve the current conditions urgently. The JET drafted this plan to respond to the request.

G.1.2 Purpose

To investigate current situation of solid waste management in Bulgan city, and formulate plan for improving current situation with solving problems. Especially, final disposal site in the situation of open damping is improved to be managed disposal site without affecting surrounding environment. Improvement plan shall be feasible one with consideration of size of cities, budget and amount of wastes.

G.1.3 Current Situation of Solid Waste Management

a. Summary of Bulgan City

Bulgan city is prefectural capital, and 12,486 people (2011) live in the city. 3,746 residents live in apartment districts (30%), and 8,741 residents live in gel districts (70%). Stock farming and agriculture are main industries. There are plenty of forests.

b. Generated amount of waste in Bulgan city

There has not been investigated amount of waste in the past, so generated amount is unknown. Unit generation amount in Ulaanbaatar city (kg/day/person) is used to calculate. results are

about 7.3ton/day.

Table G-1: Generated amount of waste in 2011

	Apartment	Gel	Business	Total
Generated amount (kg/day)	1,049	5,288	995	7,332

However, an area per gel is larger than that of Ulaanbaatar because almost all households keep livestock, so excrements of livestock are generated as a waste.

c. Collect and Transport

Collecting and transporting solid waste are operated by City Maintenance Company (Public Company) used mechanics owned by Bulgan city. Bulgan city owns following equipment.

KO440(6m3) 1

Bongo(4m3) 1

Tractor(2.4m3) 2

Figure G-1: Collect mechanics owned by Bulgan city

The amount of collection and transportation of solid waste is calculated by records of disposal site.

Table G-2: Collection and Transportation of Bulgan city (trip/month)

Truck Type	Capacity	Month			Average Monthly Trip
		Apr	May	Jun	
	m3	trip/mth	trip/mth	trip/mth	trip/mth
KO440 Truck	6	65	82	67	71.3
Nissan Bongo	4	88	98	172	119.3
Tractor	2.4	101	212	257	190.0

The number of trips per month is different from truck types. There is high possibility that the trucks are breakdown often. If the efficiency of trucks were set 80%, about 40m3 solid wastes were collected and transported. It is considered to collect almost all generated wastes.

Table G-3: The amount of collected and transported in Bulgan city (cubic volume/day)

Truck Type	Capacity	Average Monthly Trip	Carrying Efficiency	Monthly Collection Volume	Daily Collection Volume
	m3	trip/mth	%	m3	m3

KO440 Truck	6	71.3	80%	342.4	13.7
Nissan Bongo	4	119.3	80%	381.8	12.7
Tractor	2.4	190.0	80%	364.8	14.6
Total				1184.5	41.0

d. Last Disposal Site

The last disposal site is located at 4.5km southeast in Bulgan city and has been used for about 30 years. There is flat land, and flowing river from west. It needs paying attention to an outflow of leach ate.

The last disposal site has no heavy mechanics, so the waste is just dumped at enterable and flat place. The transported waste has been spread increasingly.

There is a gel beside an access road to disposal site, and number of trips is recorded. The records are composed of vehicle number, vehicle capacity, enter and exit time. The driver should sign to the record and received tickets. These tickets are proofs of payment to drivers. The payment is based on trip.

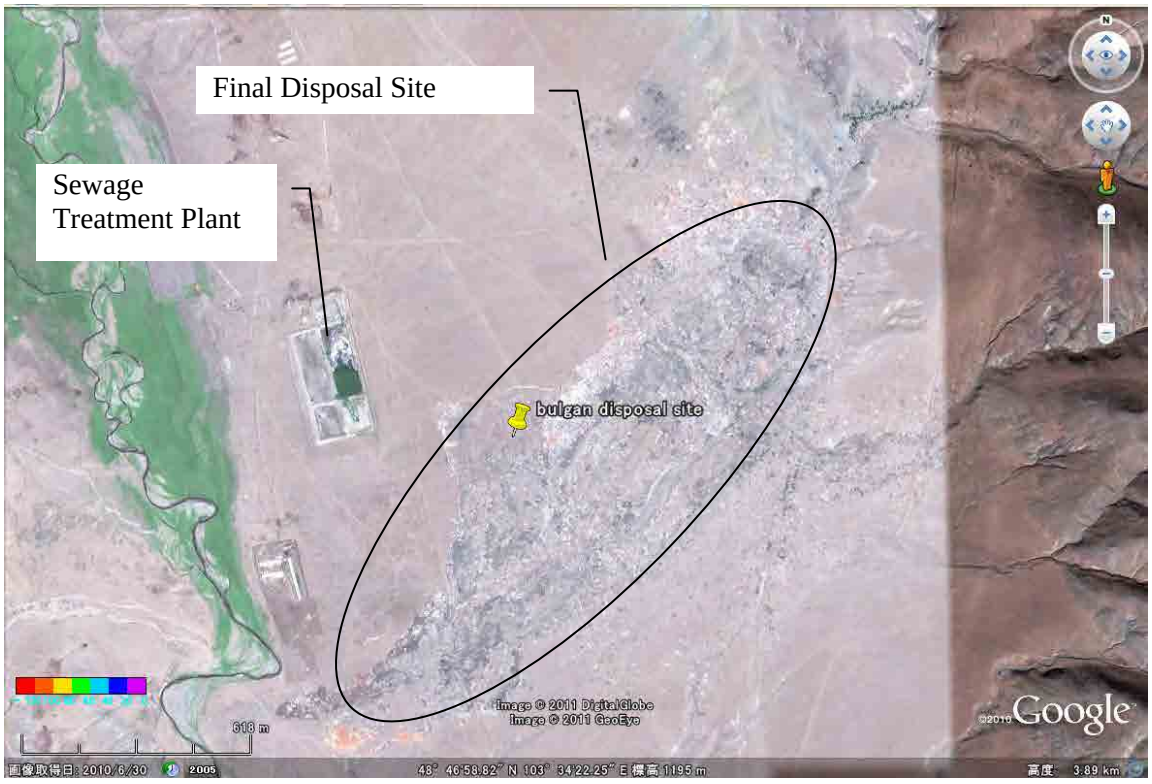


Figure G-2: The Last disposal site of Bulgan city

A recent photograph is shown below.

Figure G-3: The whole view seen from slope of east side

G.1.4 Improvement plan

a. Collection and Transportation

As a part of improvement plan, necessary numbers of collection vehicles are calculated by excel sheet which was used at workshop in June.

Conditions are considered as waste in apartment district is collected by compactor, and waste in gel district is collected by 6ton dump truck.

The result shows that one 8m3 compactor and two 6ton dump truck are enough. However, waste generated from apartment are small, two 6ton dump trucks are enough to collect.

Type of Truck	Load Capacity	unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Compactor	8m3	Nos	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
Dump truck	10m3	Nos	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.5	1.6	1.6

Tractors will be used to collect wastes at places where dump trucks are difficult to access.

In conclusion, current composition of collect vehicles is not necessary to be changed, and plan to procure one 6m3 dump truck is recommended to prepare for breakdown of the equipment.

b. Recycle

Priority for recycling should be place for huge amount of excrement generated from gel firstly. Excrement of live stock is recyclable as fertilizer or fuel. Reduction of discharging animal excrement should be promoted to the households in ger area.

Secondly, separation of valuables (glasses, aluminum cans, PET) at generation source should be encouraged through education to residents. PR tools made through pilot projects Ulaanbaatar city can be used with minor modification to suite the situation in the City.

c. Final Disposal

Improvement of Final disposal site is planned with following priorities.

1. Construct a embankment dam using old wastes to set a boundary of disposal site clearly.
2. Direct collect companies to bring wastes inside embankment dam.
3. The incoming wastes shall be pushed and compacted in small area using the equipment.
4. Cover with soil in once a month.

At the first phase, big embankment dam is not necessary to construct, The area within embankment dam is just enough for the waste in 2 to 3 years. Phased extension should be carried out in order to same initial investment.

c.1 Design of Disposal Site

c.1.1 Final Disposal Amount

The final disposal amount is calculated by records of collection vehicles from April to June.

Table G-4: The amount of collect and transport in Bulgan city（m3/day）

Truck Type	Capacity	Average Monthly Trip	Carrying Efficiency	Monthly Collection Volume	Daily Collection Volume
	m3	trip/mth	%	m3	m3
KO440 Truck	6	71.3	80%	342.4	13.7
Nissan Bongo	4	119.3	80%	381.8	12.7
Tractor	2.4	190.0	80%	364.8	14.6
Total				1184.5	41.0

There is no measuring equipment, so density and weight of wastes is unknown when wastes are brought, but the density is calculated as follows assumed 100% collection rate is achieved.

7.32 ton ÷ 41.0 m3 = 0.18 t/m3 nearly equals to 0.2 ton / m3

The amount of disposal waste of a year is

41.0 m3/day × 0.2 ton/m3 × 365 day = 2993 ton/year

It is necessary to fill in about 3,000 tons a year.

Light equipment is assumed to be used for compression. If the density were 0.5ton/m3, necessary capacity of disposal site is

3,000 ton/year ÷ 0.5 ton/m3 = 6,000 m3/year

c.1.2 Design of Size of Disposal Site

Bulgan disposal site is located at flat place, so following disposal site is constructed. This calculation is done by excel sheet used in the workshop. The workshop participants can calculate by themselves.

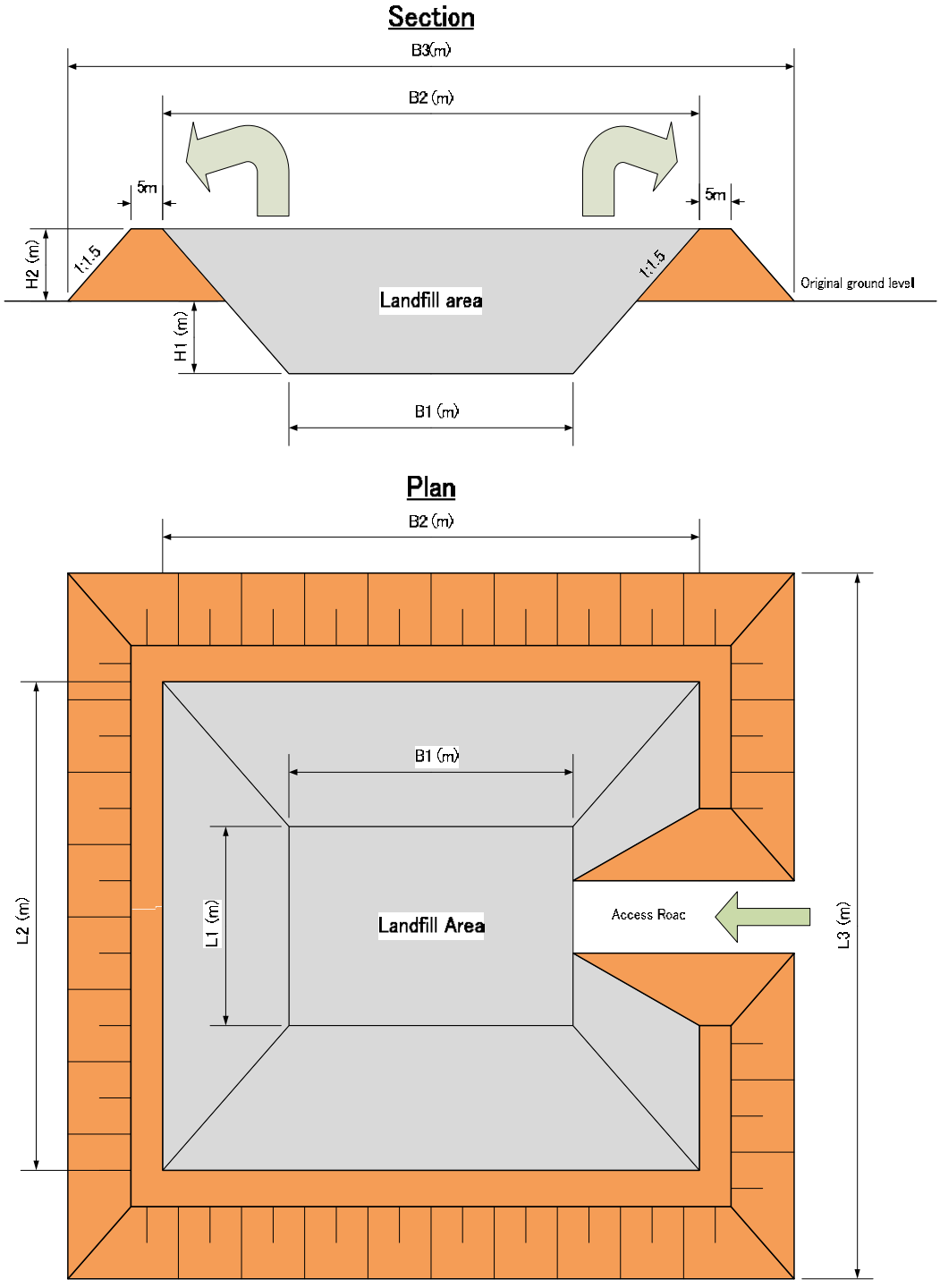


Figure G-4: Shape and Size of disposal site

The size of disposal site is calculated. The Excel Sheet is used to calculate and the result is following. The necessary size of disposing for 3 years wastes is calculated, but it is possible to adjust the size depending on budget.

B1 Landfill volume calculation

To calculate landfill site volume to match with accumulated required landfill volume (ARLV)
Step 1: Accumulated required landfill volume (ARLV)
Step 2: Input approximate land area (Width and length)

					Formula
1	Required landfill volume	Vlr=	18,000	m^3	For 3years (2011～2013)
2	Planed bottom length	B1=	100.0	m	
3	Planed bottom width	L1=	100.0	m	
4	Calculated bottom area	A1=	10,000	m^2	A1=B1xL1

Step 5: Input estimated height of landfill site

5	Proposed Height	H1+H2=	1.8	m	
6	Calculated top length	B2=	105.4	m	B2=B1+5x2+1.5x(H1+H2)x2
7	Calculated top width	L2=	105.4	m	L2=L1+5x2+1.5x(H1+H2)x2
8	Calculated top area	A2=	11,109	m^2	A2=B2xL2
9	Calculated landfill volume	Vlc=	18,998	m^3	Vlc=(A1+A2)/2x(H1+H2)
			OK		Vlr is biger than Vlc => OK If Vlr is smaller than Vlc => back to step 2

B2 Soil balance calculation

To calculate soil balance between excavation and embankment filling
Step 10: Input excavate height

10	Proposed excavate height	H1=	0.00	m	
11	Calculated embankment height	H2=	1.80	m	
12	Proposed excavate soil volume	Ves=	0	m^3	Ves=(A1+(B1+1.5xH1x2) x(L1+1.5xH1x2))/2xH1
13	Required embankment soil volume	Vev=	6,121	m^3	Vev=(5+5+H2x1.5x2)/2xH2 x(B2+5+L2+5)x2

Dimension of landfill site

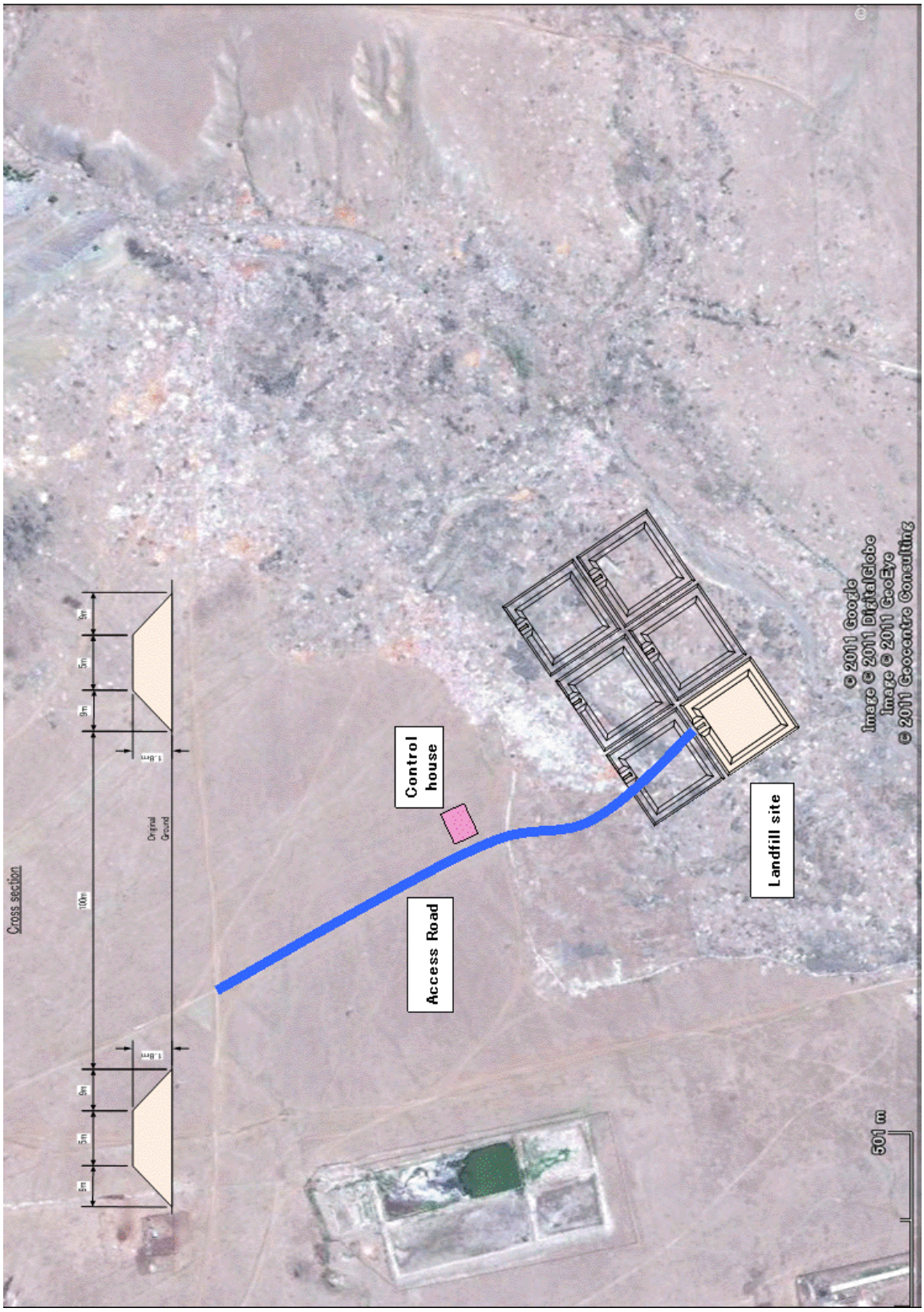
Required width	**B=**	**120.8**	**m**
Required length	**L=**	**120.8**	**m**
Required area	**A=**	**14,592.6**	**m^2**
Receivable volume	**Vlc=**	**18,998**	**m^3**
Bottom length	B1=	100.0	m
Bottom width	L1=	100.0	m
Top length	B2=	105.4	m
Top width	L2=	105.4	m
Excavate depth	H1=	0.0	m
Embankment height	H2=	1.8	m

The size of filling wastes for 3 years is 120 m × 120 m square.

c.1.3 Location of New Disposal Site

New disposal site are constructed using the old existing wastes for embankment dam. Proposed location according above size is shown in following figures.

Exact location of the new disposal site can be adjusted according to the condition on site. But possibility for future extension shall be considered in advance.



c.1.4 Procurement of Equipment

As for proper management of disposal site, daily operation of landfilling is important than

construction of the facilities. To conduct sanitary landfill, heavy machine is necessary to push and compact wastes from collection vehicles and minimize surface area exposing to air and rain.

3 bulldozers are required to operate in UBC disposal site with daily incoming amount of wastes is over 1000 ton. However, as for Bulgan city, only less than 10tons of wastes are coming to disposal site, even one bulldozer is much more than enough to conduct landfill operation, so keeping bulldozer at disposal site permanently is not a sustainable plan.

Procurement of wheel type loader with excavator shown below is recommended .

Figure 1: Wheel type loader with Excavator

Advantages of this equipment are

1. Tire excavators are easy to move on paved roads. (Trailer is necessary in case bulldozers mobilize.)

2. Trimming of slopes, excavating and loading soil are possible by excavator function.

3. Pushing and compaction of wastes are possible by shovel function.

4. In case the machine is not needed, it can be used for cleaning up illegal dump site and repairing roads.

5. Constructing new disposal site is possible by using this machine with dump trucks.

c.1.5 Construction of Disposal Site

Construction of disposal site is operated by this equipment with dump trucks. The steps are

1. Set exact location of disposal site by survey.

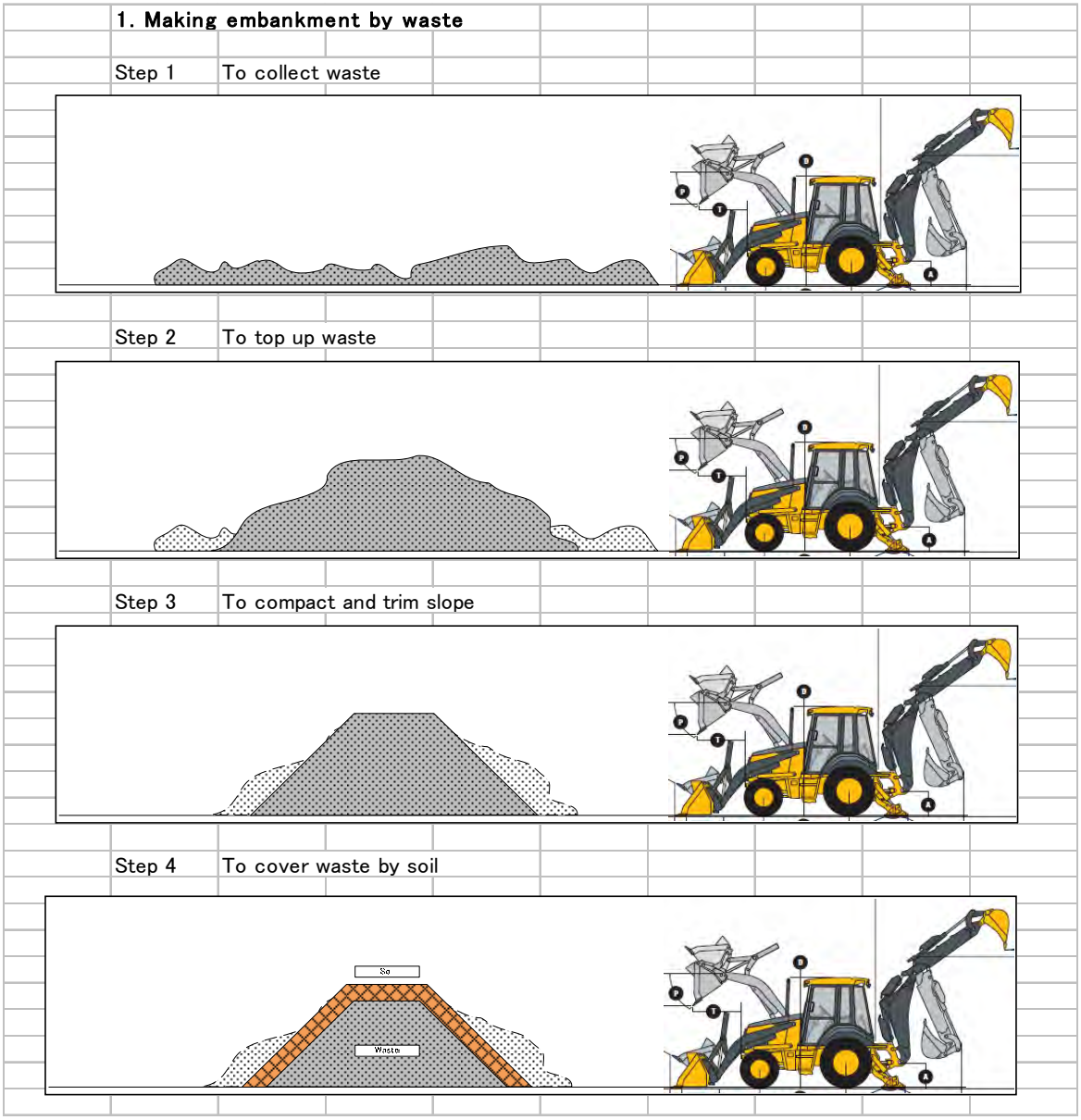
2. location of embankment dam is set by survey

3. Construct a embankment dam using this equipment and dump trucks.

4. Excavate soil inside embankment dam and this soil is used for cover embankment dam.

Theses steps shall be illustrated as follows.

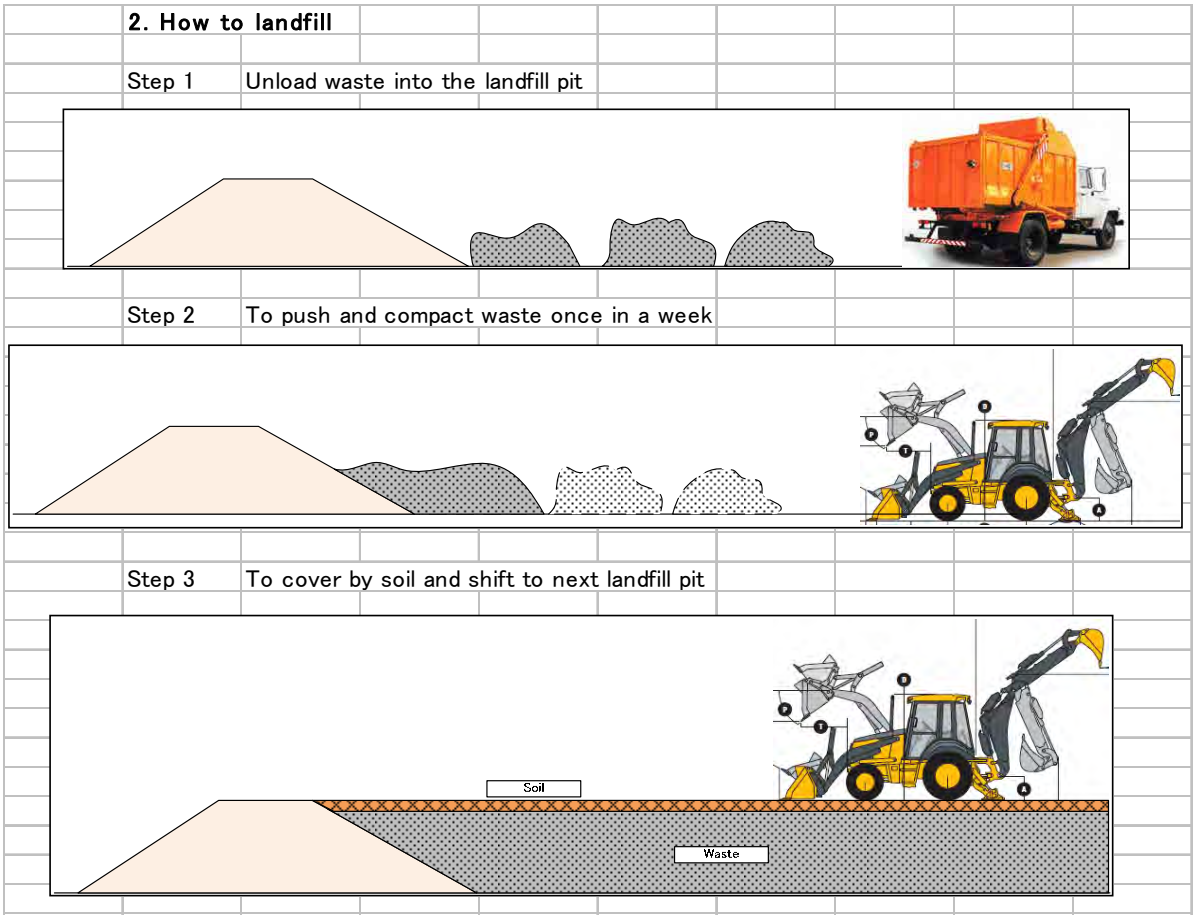
c.1.6 Construction of Embankment Dam



c.1.7 Operation of Disposal Site

Operation of disposal site can be carried out by using this machine as well. Considering incoming amount of wastes, once in a week is enough to mobilize this machine. Incoming wastes shall be pushed and compacted in a designated area and preparation for next week operation shall be done.

These steps are illustrated as follows.



G.1.5 Conclusion

The Director of Nature Environment and Tourism and the Governor have high awareness of improving solid waste management. Therefore, assistance from MONET will contribute effectively. As a result, following recommendations will be made.

1. Wheel shovel with excavator shall be procured using MONET fund for improvement of solid waste management in Aimag.

2. City government shall allocate budget for operation of this equipment in order to utilize MONET fund.

3. Construction of new disposal site shall be commenced once this equipment is procured.

4. Procurement of one 6 ton dump truck will be recommended using other source of funding in order for preparation of breakdown of the trucks.

5. Priority for recycling is set for reducing discharge amount of animal excreta from ger households. Education and PR activities to the residents will be encouraged.

G.2 Assistance for Tender of Waste Collection Vehicle：Technical Specification Document

G.2.1 List

		Compactor Truck				Dump Truck
	unit	①JHA5100ZYS	②JHA5071ZYS	③JHA5080ZYS	*④GT085-563-M*	*⑤FTR33FLD*
Chassis		china isuzu	china isuzu	china foton	*Japan Isuzu*	*Japan Isuzu*
Body		china shinmaywa	china shinmaywa	china shinmaywa	*Japan Shinmaywa*	*Japan Shinmaywa*
Body Volume	m3	10 m3	5.7 m3	5.7 m3	8.4 m3	10 m3
Hopper Volume	m3	0.6 m3	0.6 m3	0.6m3	1.1 m3	
Hydraulic Pressure	Mpa	20.6 Mpa	17.7 Mpa	17.7 Mpa	20.6 Mpa	
Chassis		五十鈴	五十鈴	北京福田	ISUZU FSR33F	ISUZU Japan
Length	m	7,250	6,210	6,305	7,005	6,505
Width	m	2,250	1,880	2,030	2,220	2,670
Height	m	2,800	2,280	2,360	2,940	2,770
wheel base	m	3,815	3,360	3,360	3,700	
Front Tread	m	1,680	1,504	1,730		
Rear Tread	m	1,650	1,425	1,590		
Engine		Diesel	Diesel	Diesel	Diesel	Diesel
Displacement		5193 cc	2999 cc	3760 cc	8226 cc	8226 cc
Power		129KW/2600rpm	96KW/3400rpm	105KW/2600rpm	129kw/2800rpm	147kw/2850rpm
Torque		500Nm/1500-2000rpm	280Nm/1700rpm	450Nm/1200-2200rpm	461Nm/1700rpm	500Nm/1700rpm
Gear		MT6	MT?	MT4	MT5	MT6
Tyre						
Front Tyre		8.25R20	7.5R15	7.5R16	8.25-20-14PRLT	9.00-20-14PRLUG
Rear Tyre		8.25R20	7.0R16	7.0R16	8.25-20-14PRLT	9.00-20-14PRLUG
Chassis Weight	kg	2,970	1,900	2,560		
Body Weight	kg	3,250	2,360	2,360		
Empty Weight	kg	6,220	4,260	4,920	6,435	5,915
Pay Load	kg	3,585	2,910	3,380	4,500	6,000
Passenger weight	kg	195	130	195		165
Total Weight (GVW)	kg	10,000	7,300	8,495	11100	12,080

G.2.2 Technical Specification Document（FOTON-chassis 5.7m3 Compactor）

Specification for Compactor Truck （JHA5080ZYS）

1. General

JHA5080ZYS compactor truck is composed of chassis and body. chassis is BJ1089VEJEA-FD and body is GT053. Body has functions of compacting wastes during loading and unloading wastes from body by discharging plate. JHA5080ZYS compactor truck can collect and transport wastes safely, sanitary, and saving manpower.

2. Main Size and Capacity

2.1 Overall

2.1.1Size of Chassis （Length）（Width） （Height）

Outside Dimension ·····································6305mm×2030mm×2360mm

Wheel base ···································3360 mm

Tread （Front/Rear）·····························1730/1590mm

Front/Rear Overhung・・・・・・・・・・・・・・・・・・・・1095/1850mm

2.1.2Weight

Full Load・・8495kg

Empty Load・・ 4920kg

Pay Load (Carrying Capacity)・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・3380kg

2.1.3Travelling

Minimum Rotation Radius・・・・・・・・・・・・・・・・・・・・・・・・・・・15 m

Lowest Clearance・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・180 mm

Approach angle/departure angle・・・・・・・・・・・・・・・・・・・・21/16 °

2.2 Chassis

2.2.1 Chassis

Type ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・北京福田 BJ1089VEJEA-FD (Foton)

Axle number ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・2

Wheel drive ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・4×2

Tire Size・・・・・・・・・・・・・・・・・・・・・・・・・・・・《轮胎规格》

Tire numbers ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・6

2.2.2 Engine

Number ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ISF3.8s3141

Type ・・・・Indirect 4 cylinder, liquid cooler
Diesel Engine with Intercooler Turbo

Fuel ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Diesel

Displacement ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・3760 ml

Power ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・105/2600(kw/rpm)

Maximum Torque・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・450/1200-2200 (N m/rpm)

2.2.3 Cabin

Color・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・white

Type ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Steel Made Single Flat Cabin

Riding Capacity・・3 person

2.2.4Trasnmission

Type ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・《变速器型式》

Number of Gear ・・4 gears

2.2.5 Clutch

Type ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Dry Single Plate

2.2.6 Handle

Type ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Left handle

2.2.7Suspension

Type ・・・・・・・・・・・・・・・Rigid Axle Suspension、
Leaf Spring Double cylinder shock absorber (DCSA)
Number of Leaf Spring(Front/Rear) ・・・・・・・・・・・・・・・・・・・・・・・・3+1/6+7

2.2.8Front Axle

Type・・・・・・・・・・・・・・・・・・・・・・・・・・・・・I shape forged steel

2.2.9 Rear Axle

Type・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Banjo type
Final Gear Ratio・・・・・・・・・・・・・・・・・・・・・・・・・・・・・4.11

2.2.10 Chassis Frame

Frame Cross Section・・・・・・・・・・・・・・・・・・・・・・・・・・・195×60×5
Joint・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Rivet

2.2.11 Break System

Break・・・・・・・・・・・・・・・・・・・・・・・・・Front Disc Break/Rear Drum Break
Parking Break・・・・・・・・・・・・・・・・・・・・・・・・・・・・Center Drum
Emergency Break・・・・・・・・・・・・・・・・・・Interlocked with Parking Break
Auxiliary Brake・・・・・・・・・・・・・・・・・・・・・・・・・・・・Exhaust type

2.2.12Electricity

Rated voltage ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・24 v
Battery ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・100AH*2
Fuel tank・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・80 L

2.3 Body

2.3.1 Body Dimension (Length) (Width) (Height)

Effective Dimension・・・・・・・・・・・・・・・・・・・・・・・・・・2515mm×1715mm×1320mm
Effective Volume・・・・・・・・・・・・・・・・・・・・・・・・・・・・・5.7 m^3

2.3.2 Hopper Dimension

Dimension of Hopper Inlet・・・・・・・・・・・・・・・・・・・・・・・・・・・・1420mm×850mm
Minimum Height of Hopper Inlet・・・・・・・・・・・・・・・・・850mm
Hopper Volume・・・・・・・・・・・・・・・・・・・・・・・・・・・・・0.6 m^3

2.3.3 Capacity

Loading Time・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・1 Cycle around 13～15 seconds
Discharge Time・・・・・・・・・・・・・・・・・・・・・・・・・・・・around 18 seconds
Discharge method・・・・・・・・・・・・・・・・・・・・・・・・・・・Horizontal Push out type

2.3.4 Hopper Volume

Hopper Volume・・・・・・・・・・・・・・・・・・・・・・・・・・・・around 75 L

3. Special Feature

This truck is composed of chassis and body. body is composed of body itself, loading device, discharge plate. loading device and discharge plate are powered by hydraulic cylinder equipped in the body and have following features.

3.1 Pressing plate will function strongly with down, compress and up process. Bulk wastes can be loaded with compression function.

3.2 Discharge plate inside body move towards from automatically when wastes are loaded and compacted. Therefore, compaction of wastes loaded is efficient.

3.3 Self Rock Cylinder

Hydraulic Cylinders for Opening and Closing Hopper have special check valve so, in case hydraulic hose is damaged, hopper should not close. It is safety features for workers during operation.

3.4 Emergency stop device, alarm system for hopper open and close, inter rock switch for hopper close, automatic scraping device at hopper,. are equipped and safety operation will be secured during waste collection and washing as well.

4. Structure

4.1Loading Device

Loading will be conducted by press plate which is equipped at hopper with hydraulic devices. Wastes are crushed and compacted by press plate and further compacted inside the body with discharge plate.
Position of discharge plate is adjustable during loading.

4.2Unloading Device

Hopper open and close cylinder will open the hopper portion and discharge plate push out the loaded waste to outside. This operation will be conducted from inside cabin automatically.

4.3Hopper

Hopper is a strong structure made of steel and anti weather high tensile steel plate is used for the place where it is possible to be rust, and anti worn out high tensile steel plate is used for the main frame and the place where it is possible to be wear out..

4.4 Body

It is a strong structure with anti worn out high tensile steel plate is used at main places in order to improve anti rust performance.

4.5Hydraulic Device

Oil pump powered by PTO will push hydraulic oil through control valve to each hydraulic cylinder and enact waste loading, open and close hopper and discharge wastes.

4.5.1Hydraulic Pump

Type・・Gear Pump

Standard Rotation ・・・・・・・・・・・・・・・・・・・・・・・・・・・Around 1000 rpm

Pump Capacity ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Around 50 L／min

4.5.2Hydraulic Actuator

Press Cylinder・・・double acting cylinder

Pack Cylinder・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・double acting cylinder

Rock Cylinder ・・double acting cylinder

Lift Cylinder(self rock system)・・・・・・・・・・・・・・・・・・・double acting cylinder

Ejection Cylinder ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Plural stages double acting cylinder

4.5.3 Control Valve ・・4 connection solenoid valve

4.5.4 Maximum Pressure・・・・・・・・・・・・・・・・・・・・・・・Around17.7 MPa(Around 180 kgf/cm^2)

4.5.6 Operation Device

Each cylinder will be controlled by solenoid valve through electric signals

(1)Operation Device inside Cabin

1. PTO is operated by a lever equipped inside cabin.
2. Panel Switch in the Cabin
   a. Change Switch(Loading・Unloading)
   b. Hopper Switch(Open・Close)
   c. Discharge Plate Switch(Front・Back)
   d. Discharge Switch

(2)Switch at Hopper

1. Left Rear
   a. Alarm Buzzer Button to inform Driver
   b. Single/Continuous Operation Button

c. Start Button

d. Down Button(Stop Button)

e. Up Button

f. Press Plate Reverse Button

g. Emergency Stop Button

(d、e、f is for single operation)

2. Right Rear

a. Emergency Stop Button

3. Hopper blow

a. Emergency Stop Press Plate

4.5.7 Hopper Rock Device and Prevention of Waste Water Leakage Device

Body and Hopper will be automatically rocked through hooks equipped at right and left rear. Seal packing is attached between hopper and body in order not to leak waste water.

5. Safety Device

5.1 Solenoid check valve was equipped with hydraulic cylinder for hopper open and close.

5.2 Protection switch for hopper closure is attached at rear body. Indication ramp is equipped in the cabin.

5.3 Protection bar for hopper closure is equipped at the rear body.

5.4 Emergency stop bars equipped below hopper inlet.

5.5 Emergency stop button is equipped at both side of hopper inlet.

5.6 Alarm buzzer rings during open and closure of hopper.

5.7 Loading operation can not be implemented in case hopper is unrocked.

5.8 During loading operation, in case hopper is opened, loading operation is automatically ceased.

5.9Prevention device for operation mistake

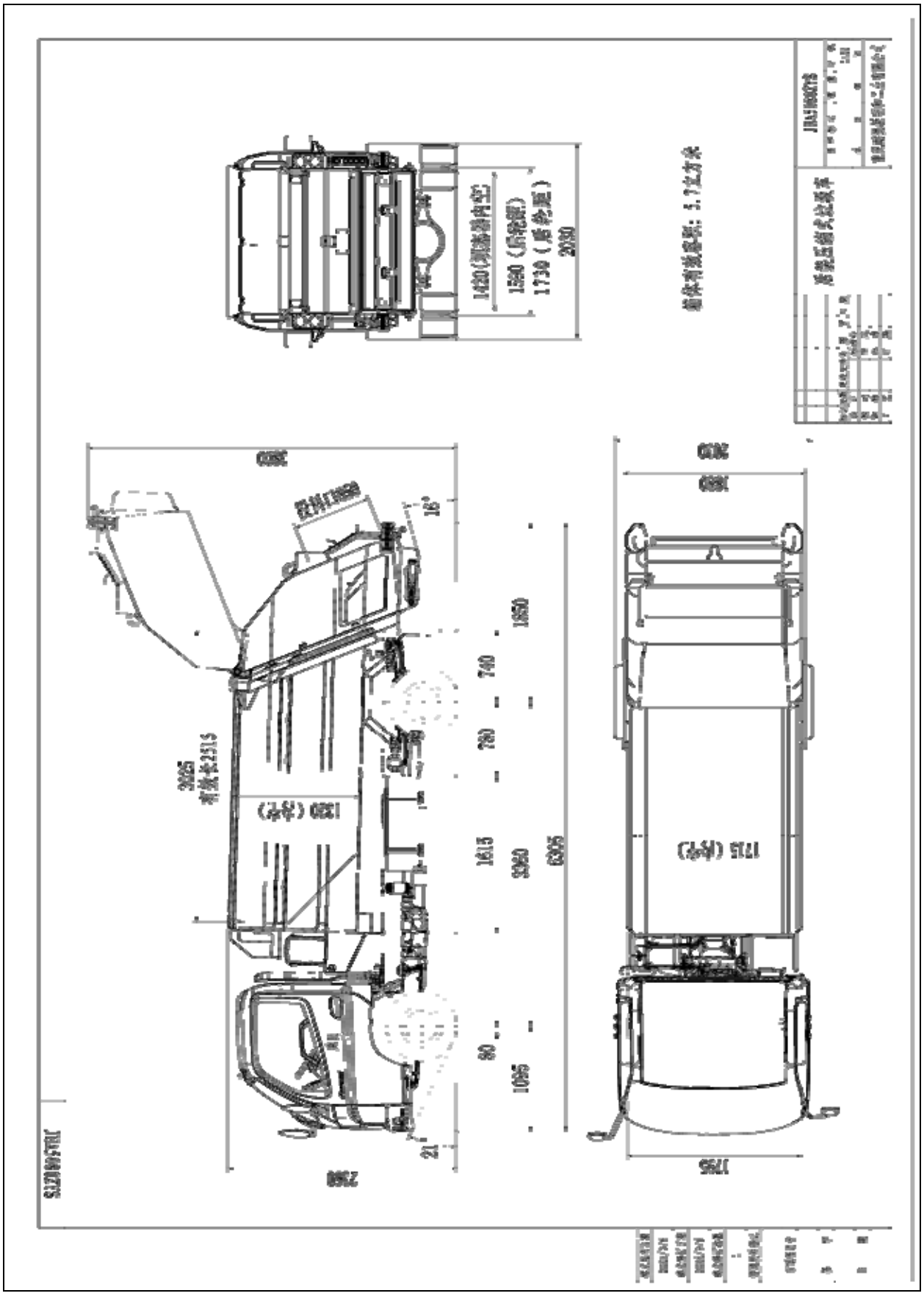
Sweep out restriction

Sweep out operation is automatically cancelled when the hopper's opening angle is 45 degrees or less.

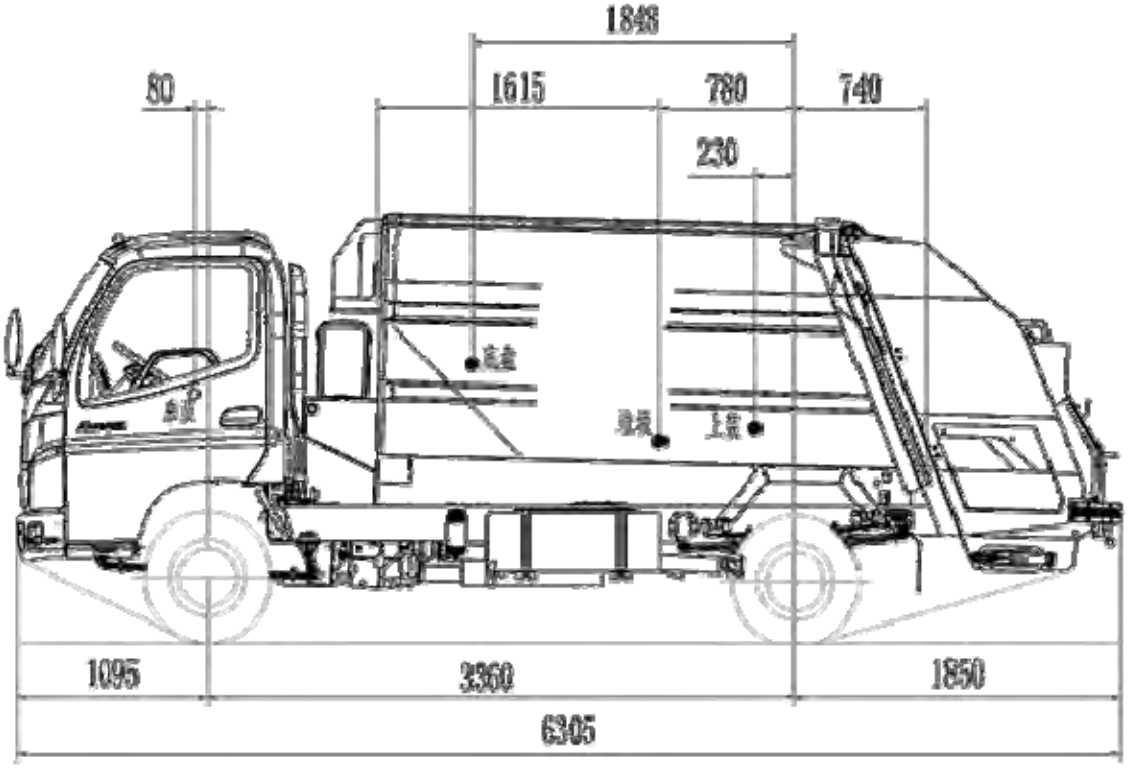
5.10 Hooking confirmation ramp in cabin.

6. Painting Body

After acid cleaning and phosphorylation treatment and surface preparation with under splaying, urethane paint will be applied with customers request color.



JHA5080ZYS重量计算				
	合计（kg）	前轮分布（kg）	后轮分布（kg）	重心（距后轮中心）
底盘	2560	1408	1152	1848
上装	2360	162	2198	230
车辆重	4920	1570	3350	1072
垃圾	3380	785	2595	780
乘员	195	200	-5	3440
整车总重	8495	2555	5940	1011
前轴载荷分布比例				
空载	1570/4920*1000=32% ＞ 20%			
满载	2555/8495*1000=30% ＞ 20%			



G.2.3 Technical Specification Document（ISUZU-chassis 10.2m3 Compactor）

Specification for Compactor Truck （JHA5100ZYS）

1. General

JHA5100ZYS compactor truck is composed of chassis and body. chassis is QL1100TKARY and body is GT100. Body has functions of compacting wastes during loading and unloading wastes from body by discharging plate. JHA5100ZYS compactor truck can collect and transport wastes safely, sanitary, and saving manpower.

2. Main Size and Capacity

2.1 Overall

2.1.1Size of Chassis （Length）（Width） （Height）

Outside Dimension ·····7250mm×2250mm×2800mm

Wheel base ·····3815 mm

Tread （Front/Rear)·····1680/1650mm

Front/Rear Overhung·····1100/2325mm

2.1.2Weight

Full Load·····10000kg

Empty Load····· 6220kg

Pay Load (Carrying Capacity)·····**3585kg**

2.1.3Travelling

Minimum Rotation Radius·····15 m

Lowest Clearance·····215 mm

Approach angle/departure angle·····21/16 °

2.2 Chassis

2.2.1 Chassis

Type ·····五十铃 QL1100TKARY

Axle number ·····2

Wheel drive ·····4×2

Tire Size·····9. 5R17. 5, 8.25-20, 8. 25R20

Tire numbers ·····6

2.2.2 Engine

Number ·····4HK1-TC

Type ····Indirect 4 cylinder, liquid cooler, direct injection Diesel Engine with Intercooler Turbo

Fuel ·····Diesel

Displacement ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・5193 ml

Power ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・129/2600(kw/rpm)

Maximum Torque・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・500/1500-2000 (N m/rpm)

2.2.3 Cabin

Color・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・White

Type ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Steel Made Single Flat Cabin

Riding Capacity・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・3 person

2.2.4Trasnmission

Type ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・《变速器型式》

Number of Gear ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・.空档齿轮

2.2.5 Clutch

Type ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Hydraulic Control, 膜片弹簧, Dry Single Plate

2.2.6 Handle

Type ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Left handle

2.2.7Suspension

Type ・・・・・・・・・・・・・・・・・Rigid Axle Suspension、Leaf Spring with double acting shock absorber

Number of Leaf Spring(Front/Rear) ・・・・・・・・・・・・・・・・・・・・・・・・8/10+6

2.2.8Front Axle

Type・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・I shape forged steel, 端拳式

2.2.9 Rear Axle

Type・・・整体式冲焊桥壳全浮式半轴，螺旋伞齿轮和准双曲面齿轮传动

Final Gear Ratio・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・4.1

2.2.10 Chassis Frame

Frame Cross Section・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・216×70×6

Joint・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Rivet

2.2.11 Break System

Break・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Hydraulic Assist Drum Break

Parking Break・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Central Drum Break

Emergency Break・・・・・・・・・・・・・・・・・・・・Interlocked with Parking Break

~~Auxiliary Brake・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・Exhaust type~~

2.2.12Electricity

Rated voltage ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・24 v

Battery ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・70AH*2

Fuel tank・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・100 L

2.3 Body

2.3.1 Body Dimension （Length） （Width） （Height）

Effective Dimension・・・・・・・・・・・・・・・・・・・・・・・・・・2980mm × 2060mm × 1660mm

Effective Volume・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・10.2 m^3

2.3.2 Hopper Dimension

Dimension of Hopper Inlet・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・1700mm × 960mm

Minimum Height of Hopper Inlet・・・・・・・・・・・・・・・・・900mm

Hopper Volume・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・0.6 m^3

2.3.3 Capacity

Loading Time・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・1 Cycle around 20 seconds

Discharge Time・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・around 25 seconds

Discharge method・・・・・・・・・・・・・・・・・・・・・・・・・・・・Horizontal Push out type

2.3.4 Hopper Volume

Hopper Volume・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・around 140 L

3. Special Feature

This truck is composed of chassis and body. body is composed of body itself, loading device, discharge plate. loading device and discharge plate are powered by hydraulic cylinder equipped in the body and have following features.

3.1 Pressing plate will function strongly with down, compress and up process. Bulk wastes can be loaded with compression function.

3.2 Discharge plate inside body move towards from automatically when wastes are loaded and compacted. Therefore, compaction of wastes loaded is efficient.

3.3 Self Rock Cylinder

Hydraulic Cylinders for Opening and Closing Hopper have special check valve so, in case hydraulic hose is damaged, hopper should not close. It is safety features for workers during operation.

3.4 Emergency stop device, alarm system for hopper open and close, inter rock switch for hopper close, automatic scraping device at hopper,. are equipped and safety operation will be secured during waste collection and washing as well.

4. Structure

4.1Loading Device

Loading will be conducted by press plate which is equipped at hopper with hydraulic devices. Wastes are crushed and compacted by press plate and further compacted inside the body with discharge plate.
Position of discharge plate is adjustable during loading.

4.2Unloading Device

Hopper open and close cylinder will open the hopper portion and discharge plate push out the loaded waste to outside. This operation will be conducted from inside cabin automatically.

4.3Hopper

Hopper is a strong structure made of steel and anti weather high tensile steel plate is used for the place where it is possible to be rust, and anti worn out high tensile steel plate is used for the main frame and the place where it is possible to be wear out..

4.4 Body

It is a strong structure with anti worn out high tensile steel plate is used at main places in order to improve anti rust performance.

4.5Hydraulic Device

Oil pump powered by PTO will push hydraulic oil through control valve to each hydraulic cylinder and enact waste loading, open and close hopper and discharge wastes.

4.5.1Hydraulic Pump

Type･･Gear Pump

Standard Rotation ････････････････････････････Around 1000 rpm

Pump Capacity ･････････････････････････････････Around 50 L／min

4.5.2Hydraulic Actuator

Press Cylinder･･････････････････････････････････････double acting cylinder

Pack Cylinder･･････････････････････････････････････double acting cylinder

Rock Cylinder ･･double acting cylinder

Lift Cylinder(self rock system)････････････････････double acting cylinder

Ejection Cylinder ･･････････････････････････････････････Plural stages double acting cylinder

4.5.3 Control Valve ・・4 connection solenoid valve

4.5.4 Maximum Pressure・・・・・・・・・・・・・・・・・・・・・・Around20.6 MPa（Around 210 kgf/cm^2）

4.5.6 Operation Device

Each cylinder will be controlled by solenoid valve through electric signals

（1）Operation Device inside Cabin

1. PTO is operated by a lever equipped inside cabin.
2. Panel Switch in the Cabin
   a. Change Switch（Loading・Unloading）
   b. Hopper Switch（Open・Close）
   c. Discharge Plate Switch（Front・Back）
   d. Discharge Switch

（2）Switch at Hopper

1. Left Rear
   a. Alarm Buzzer Button to inform Driver
   b. Single/Continuous Operation Button
   c. Start Button
   d. Down Button(Stop Button)
   e. Up Button
   f. Press Plate Reverse Button
   g. Emergency Stop Button
   （d、e、f　is for single operation）
2. Right Rear
   a. Emergency Stop Button
3. Hopper blow
   a. Emergency Stop Press Plate

4.5.7 Hopper Rock Device and Prevention of Waste Water Leakage Device

Body and Hopper will be automatically rocked through hooks equipped at right and left rear. Seal packing is attached between hopper and body in order not to leak waste water.

5. Safety Device

5.1 Solenoid check valve was equipped with hydraulic cylinder for hopper open and close.

5.2 Protection switch for hopper closure is attached at rear body. Indication ramp is equipped in the cabin.

5.3 Protection bar for hopper closure is equipped at the rear body.

5.4 Emergency stop bars equipped below hopper inlet.

5.5 Emergency stop button is equipped at both side of hopper inlet.

5.6 Alarm buzzer rings during open and closure of hopper.

5.7 Loading operation can not be implemented in case hopper is unrocked.

5.8 During loading operation, in case hopper is opened, loading operation is automatically ceased.

5.9Prevention device for operation mistake

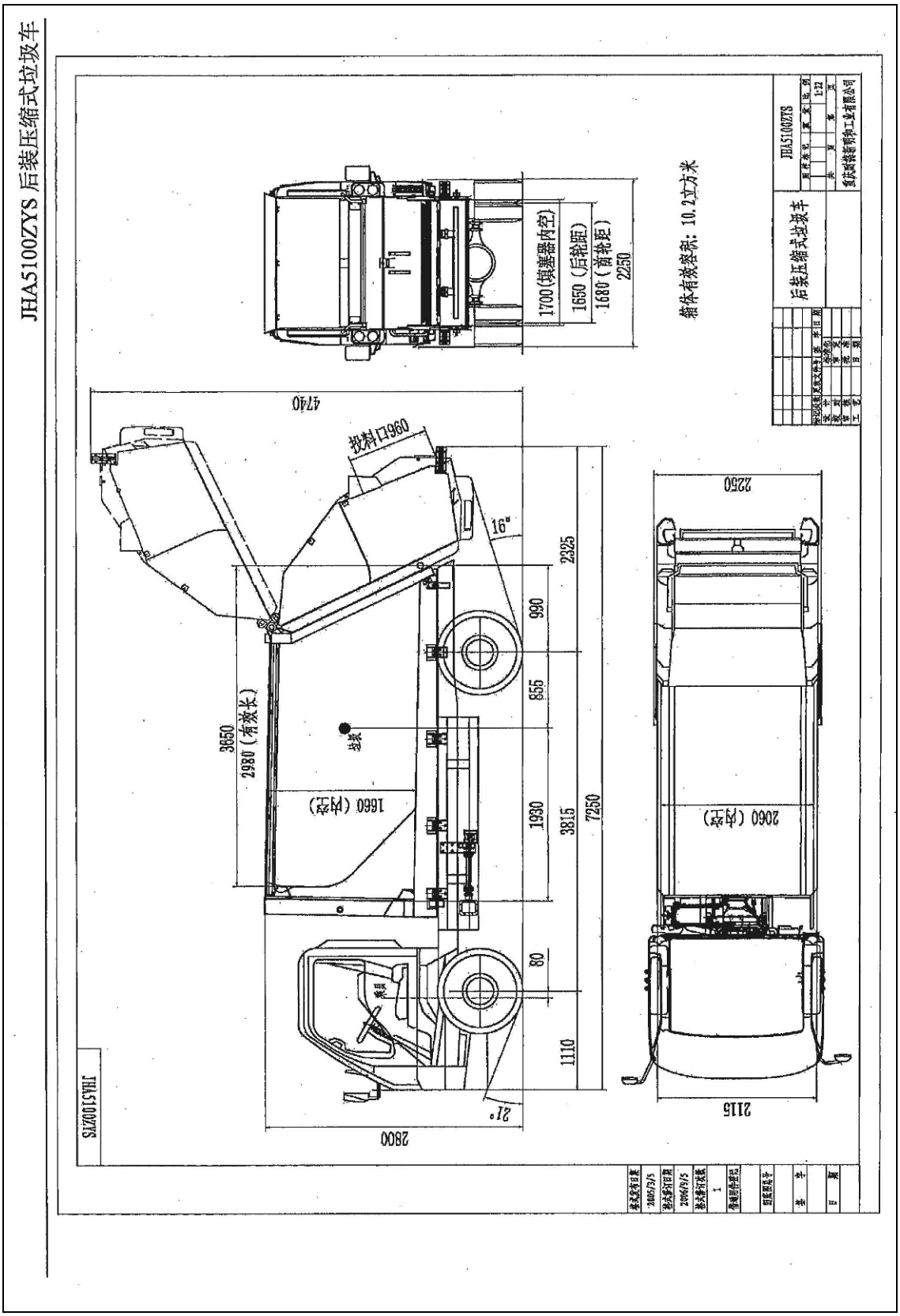
Sweep out restriction

Sweep out operation is automatically cancelled when the hopper's opening angle is 45 degrees or less.

5.10 Hooking confirmation ramp in cabin.

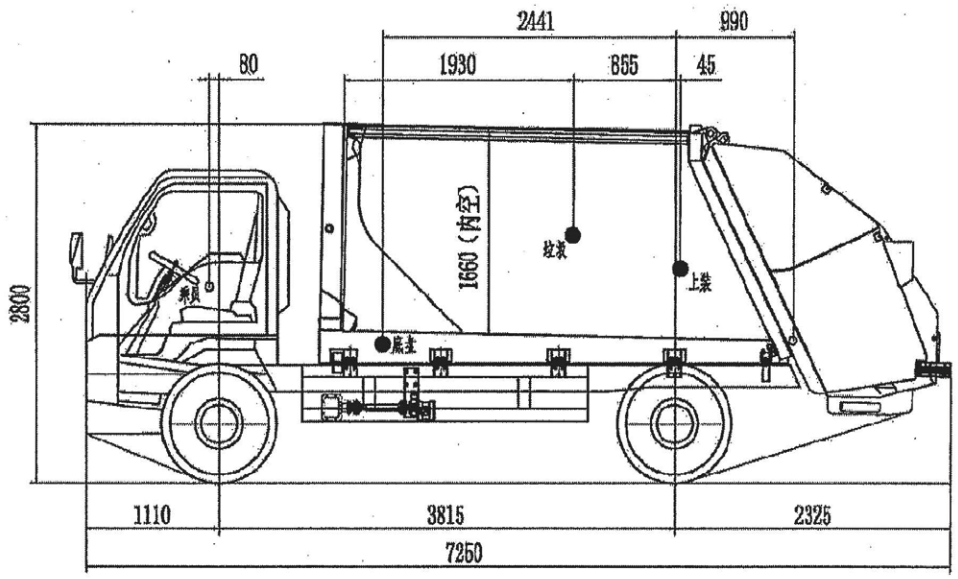
6. Painting Body

After acid cleaning and phosphorylation treatment and surface preparation with under splaying, urethane paint will be applied with customers request color.


JHA5100ZYS 后装压缩式垃圾车
JHA5100ZYS
后装压缩式垃圾车
箱体有效容积：10.2立方米
1700(填塞器内空)
1650(后轮距)
1680(前轮距)
2250
4740
960
投料口
16°
2325
990
855
1930
3815
7250
80
1110
21°
2800
3650
2980(有效长)
1660(内宽)
2250
2060(内宽)
2115

JHA5100ZYS 后装压缩式垃圾车

JHA5100ZYS重量计算				
	合计（kg）	前轮分布（kg）	后轮分布（kg）	重心（距后轮中心）
底盘	2970	1900	1070	2441
上装	3250	-38	3288	-45
车辆重	6220	1862	4358	1142
垃圾	3585	803	2782	855
乘员	195	199	-4	3895
整车总重	10000	2864	7136	1093
前轴载荷分布比例				
空载	1862/6220*100%=30% > 20%			
满载	2864/10000*100%=28.6% > 20%			



G.3 Estimation for Running Cost of RPF facility

G.3.1 Comparison of Estimation

a. Estimation by KOICA

KOICA Estimation

	Description	unit	Quantity	Rate MNT	Amount MNT	Remarks	
	Conditions						
	8 hours /day operation x 300 days 38 people are working Incoming Waste: Mix collection waste from apartment Incoming waste amount : 80 ton/day RPF production: 1.6 ton/day Residue 80%						
Operation Cost estimated by KOICA							
A	Variable Cost						
1	Electricity	kwh	767,004	87.87	67,396,641	767004kwh/300day = 2557kwh/day	
2	Fuel	liter	18,180	1,450	26,361,000	Excavator, Folk Lift 18180liter/300day =60liter/day	
3	Water	ton	120	1,105	132,600		
4	Maintenance and Repair cost	%	1	3,219,000,000	32,190,000	1% of Total Budget	
	Sub total				126,080,241		
B	Labour Cost						
1	Labor cost	month	12	5,700,000	68,400,000	38p * 150,000MNT/Mth	
2	Other Expense	%	5	68,400,000	3,420,000		
3	Insurance	%	0.3	3,219,000,000	9,657,000		
	Sub total				81,477,000		
	Total Cost				207,557,241		
Income from selling valuables for one year (300days)							
	Glass	kg	1,814,400	10	18,144,000	6,048	kg/day
	Cardboard	kg	696,000	40	27,840,000	2,320	kg/day
	Paper	kg	4,363,200	30	130,896,000	14,544	kg/day
	Plastic	kg	2,553,600	70	178,752,000	8,512	kg/day
	Iron	kg	306,000	30	9,180,000	1,020	kg/day
	Aluminium	kg	143,700	450	64,665,000	479	kg/day
	Sub Total				429,477,000		
	profit per Year				221,919,759		

b. Estimation by JICA

JICA Estimation							
Operation Cost estimated by JICA using KOICA Information							
A	Variable Cost						
1	Electricity	kwh	767,004	87.87	67,396,641		
2	Fuel	liter	18,180	1,650	29,997,000	revise unit rate	
3	Water	ton	120	1,105	132,600		
4	Maintenance and Repair cost	%	1	3,219,000,000	32,190,000		
	Sub total				129,716,241		
B	Labour Cost						
1	Labor cost	month	12	5,700,000	68,400,000		
2	Other Expense	%	5	68,400,000	3,420,000		
3	Insurance	%	0.3	3,219,000,000	9,657,000		
	Sub total				81,477,000		
C	Residue Transportation						
	80ton/day x 80% =64ton/day						
	64ton x 300 days = 19,200 ton/year						
	10 ton dump truck	ton	19,200	5,000	96,000,000		
	Total				307,193,241		
Income from selling valuables for one year (300days)						Using PP results	
	PET	kg	64,800	380	24,624,000	0.27	%
	Colored Plastic	kg	115,200	150	17,280,000	0.48	%
	Glass Bottle	kg	525,600	40.6	21,339,360	2.19	%
	Iron	kg	129,600	50	6,480,000	0.54	%
	HQ Paper	kg	208,800	80	16,704,000	0.87	%
	Cardboard	kg	1,087,200	17	18,482,400	4.53	%
	Bone	kg	252,000	20	5,040,000	1.05	%
	HDPE (plastic bag)	kg	24,000	200	4,800,000	0.10	%
	Metal	kg	26,400	630	16,632,000	0.11	%
	Sub Total				131,381,760		
	Annual Operation Cost				175,811,481		

Section H Project Design Matrix

H Project Design Matrix

H.1 PDM_4

Suggested PROJECT DESIGN MATRIX$_4$ **(PDM_4)**
Project Name: Strengthening the Capacity for Solid Waste Management in Ulaanbaatar City
Implementing Agency: EPWMD Cooperating organizations: CMPUA, WSFs and District Governments
Project Period: October 2009 to October 2012 (3 years)
Target Group: Staff of EPWMD, CMPUA, WSFs and District Officers
Project Area: Ulaanbaatar City

Date: **May**, 2011

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Deteriorated urban environment and sanitary conditions caused by uncontrolled solid waste will be improved in Ulaanbaatar City.	1. People's satisfaction level (more than average) for urban environment and sanitation throughout the City reaches to 50%. 2. Six large scale accumulated illegal disposal site out of 10 monitoring sites shall be eliminated.		
Project Purpose Capacity for SWM in Ulaanbaatar City is strengthened through human resource development.	1. People's satisfaction level (more than average) for the SWM service throughout the City reaches to 60%. 2. Waste collection rate in Ger area is increased to **90%.** (waste collection cover rate in population) 3. Waste collection rate in Apartment area keeps 100% in spite of population growth. 4. Collection rate of waste service fee from Ger area is increased **to 30%.**	1. Progress reports 2. Minutes of Meetings of JCC 3. Report from EPWMD, CMPUA, WSFs, District Governments and TUKs 4. Report on social satisfaction level survey throughout the City 5. Interview survey to each khoroo 6. Interview survey to each WSF 7. Interview Survey to Ger Khoroo residents.	1. The draft policy, draft regulation(s), draft guideline(s) on SWM is officially approved, or revised and then approved, by the Ulaanbaatar City authority. 2. Necessary budget for SWM activities is continuously allocated. 3. Continuing-existence of private sector-based recycling market.
Output 1 Development of human resource in EPWMD for policy making and planning for solid waste management	1. Proposals of draft policy, draft regulation(s) and draft guideline(s) on SWM prepared by EPWMD. 2. Draft updated Master Plan prepared by EPWMD. 3. Action Plan for the organizational development of EPWMD.	1. Capacity Assessment sheets 2. Text(s), Manual(s), etc. 3. Record of the training, Participants list 4. Draft policy on SWM, draft regulation(s) on SWM, draft guideline(s) on SWM 5. Draft updated Master Plan 6. Action Plan 7. Progress Reports	1. The basic policy, institutional setup and responsible organization on SWM in Ulaanbaatar City are not changed. 2. Assignment of counter personnel in implementing agency and cooperating organizations is stable, which ensures the continuity of human resource developed through

			the Project.
Output 2 Development of human resource in EPWMD and CMPUA for operation and maintenance of solid waste collection vehicles and heavy machineries.	1. Report on operation of SWM equipment (collection vehicles and heavy machineries) is submitted by CMPUA to EPWMD 4 times a year. 2. Report on maintenance of SWM equipment is submitted by CMPUA to EPWMD 4 times a year. 3. CMPUA and each district prepare and submit the waste collection plan to EPWMD once a year.	1. Capacity Assessment sheets 2. Text(s), Manual(s), etc. 3. Record of the training, Participants list 4. Report on operation of SWM equipment 5. Report on maintenance of SWM equipment 6. Report on waste collection plan 7. Record of the seminar(s) for TUKs 8. Progress Reports	
Output 3 Development of human resource of CMPUA for proper management of Narangiin Enger Landfill	1. Landfilling monitoring committee assesses landfilling operation as sanitary landfilling. 2. Report of waste composition survey is prepared by CMPUA. 3. Environmental monitoring including gas emission survey at landfill site is conducted regularly by CMPUA.	1. Capacity Assessment sheet 2. Text(s), Landfill Operation Manual(s), etc. 3. Assessment report by monitoring committee. 4. Record of the training, Participants list 5. Report on waste composition survey 6. Report on landfill gas emission survey 7. Landfill Environmental Monitoring Report 8. Progress Reports	
Output 4 Development of human resource in EPWMD and WSFs for administrative/financial management in SWM	1. Common financial management rule for all WSFs is established. 2. Financial condition of each WSFs is monitored regularly by EPWMD. 3. EPWMD strengthens understanding about administrative/financial management of SWM. 4. EPWMD can design necessary waste generation fee based on the appropriate waste collection tariff to the waste collection organizations. 5. EPWMD can prepare standard tender procedure and standard tender document for selection of waste collection organizations. 6. Control system of selected waste collection organizations will be developed.	1. Capacity Assessment sheet 2. Text(s), Financial Management Manual(s), etc. 3. Record of the training, Participants list 4. Reports on financial analysis of WSFs 5. Recommendation paper 6. Progress Reports 7. Guideline for calculation of waste generation fee based on appropriate waste collection tariff. 8. Standard tender procedure 9. Standard tender document 10. Guideline for monitoring waste collection organizations according to contract.	

Output 5 Development of human resource of EPWMD and District Officers for promoting public awareness and participation in SWM.	1. Personnel who are in charge of Public Awareness in EPWMD and District offices are able to conduct the public awareness activities by taking initiatives. 2. Public awareness campaign will be conducted in 4 khoroos through PP and another 4 khoroos by the C/P. 3. Awareness of residents on waste reparation and discharging manner is improved at the PP sites	1. Capacity Assessment sheet 2. Text(s), Public Awareness Campaign Manual(s), etc. 3. Record of the training, Participant list 4. Monitoring Report on the pilot project on public awareness campaign 5. Recommendation paper 6. Progress Reports 7. Interview survey to the residents at pilot project site.	
Output 6 Recommendation for the appropriate system of waste separation and recycling in Ulaanbaatar City	1. Waste separation facility is examined in NEDS and report on necessary extra cost, efficiency, sanitary conditions of separation operation is submitted. 2. Valuable collectors (former waste pickers) will cooperate for sorting operation at sorting yard according to the manual and guidelines. 3. Recommendation paper on waste separation and recycling system is officially submitted to UB City authority.	1. Record of the seminar, Participant list 2. Monitoring Report of the pilot project on waste separation and recycling in the landfill 3. Recommendation paper 4. Progress Reports	
Activities for Output1 1-1) JET (JICA Expert Team) assesses the baseline capacity of the staff in newly established EPWMD. 1-2) JET prepares a training program (seminar, workshop, site visit, etc.) and training materials (text, manual, etc.). 1-3) The training program is implemented by JET and EPWMD. 1-4) JET advises EPWMD how to formulate policy, regulation(s) and guideline(s) of SWM. 1-5) Seminar on **household** hazardous waste and e-waste management involved in urban waste stream is organized by JET and EPWMD. 1-6) EPWMD conducts waste amount survey at generation source under the assistance of JET.	**Input** **＜Input from JICA＞** 1. Short-term Experts (1) Leader / Solid Waste Management (2) Operation & Maintenance of Waste Collection Vehicles & Heavy Machineries (3) Landfill Management (4) Financial Management (5) Public Awareness (6) Waste Separation and Recycling (7) Coordinator, if necessary 2. Equipment for waste manual separation facility in landfill site 3. Landfill gas monitor 4. Oversea training 5. Local cost for JET activities 6. Interpreters	**Input** **＜Input from Mongolian side＞** 1. Assigning C/P personnel 2. Buildings and Facilities for Project activities including the land for the waste manual separation facility in landfill site. 3. Office space for JICA experts and meetings 4. Facilities and services such as electricity, gas, water, telephone, internet access and furniture 5. Operational and recurrent cost for the project activities of the Mongolian side	1. EPWMD, CMPUA and WSFs assign necessary personnel for the Project activities.

1-7) EPWMD reviews and updates the Master Plan under the assistance of JET. 1-8) EPWMD prepares an Action Plan for the organizational development of EPWMD under the advice of JET.			
Activities for Output2 2-1) JET assesses the baseline capacity on operation and maintenance of CMPUA. 2-2) JET prepares a training program and training materials. 2-3) The training program is implemented by JET, CMPUA and EPWMD. 2-4) JET organizes practical training/guidance for the technical staff of the maintenance workshop in CMPUA. 2-5) JET prepares recommendations for management system of maintenance workshop in CMPUA 2-6) CMPUA and EPWMD review and recommend the waste collection plans of Ulaanbaatar City under the cooperation of JET. 2-7) CMPUA and EPWMD organized seminar(s) for TUKs about operation and maintenance of vehicles under the advice of JET.			
Activities for Output3 3-1) JET assesses the baseline capacity on landfill management of CMPUA. 3-2) JET prepares a training program and training materials including Landfill Operation Manual. 3-3) The training program is implemented by JET and CMPUA. 3-4) JET organizes practical training/guidance for the CMPUA's technical staff for proper management of the Landfill. 3-5) Waste composition survey of landfill-incoming waste is conducted by CMPUA under the cooperation of JET and EPWMD. 3-6) Landfill gas emission survey is conducted by CMPUA under the cooperation of JET and EPWMD. 3-7) CMPUA summarize the environmental monitoring			

report of the Landfill under the cooperation of JET and EPWMD.		
Activities for Output4 4-1) JET assesses the baseline capacity on control of waste collection organizations of EPWMD and financial/administrative management of WSFs.. *4-2)* JET prepares a training program and training materials. 4-3) The training program on financial management is implemented by JET and WSFs. 4-4) Analysis of financial situation of WSFs is conducted by JET, EPWMD and WSFs. 4-5) Recommendations for appropriate financial management system including revenue plan are summarized by JET and EPWMD. 4-6) EPWMD and WSFs conduct recommendations under the cooperation of JET. 4-7) JET conducts consultations among senior managements of EPWMD and CMPUA on comprehensive SWM in UB City. 4-8) JET assists EPWMD to formulate guideline for calculation of waste generation fee based on appropriate waste collection tariff. 4-9) JET assists EPWMD to prepare standard tender procedures to select waste collection organizations. 4-10) JET assists EPWMD to prepare standard tender document for selecting waste collection organizations. 4-11) JET assists EPWMD to prepare guideline for monitoring waste collection organizations based on the contract. 4-12) JET assists EPWMD to prepare a weighbridge data management manual.		
Activities for Output5 5-1) JET assesses the baseline capacity of EPWMD and District Officers for promoting public awareness and participation. 5-2) JET prepares a training program and training		

materials. 5-3) The training program is implemented by JET and District Officers. 5-4) A pilot project on public awareness raising campaign and social satisfaction level survey is planned by EPWMD and District Officers under the assistance of JET. 5-5) The Pilot Project is implemented and monitored by EPWMD, District Officers and JET. 5-6) Recommendations for promoting public awareness and participation are summarized by EPWMD, District Officers and JET.			
Activities for Output6 6-1) Seminar and workshop on waste separation, recycling and 3R (Reduce, Reuse, Recycle) strategy is organized by JET, EPWMD and CMPUA. 6-2) A pilot project for trial implementation of waste separation and recycling is planned by JET, EPWMD and CMPUA, and a pilot facility for waste manual separation in landfill site is constructed in Narangiin Enger Landfill. 6-3) The Pilot Project is implemented by EPWMD, CMPUA and JET under the participation of waste pickers group. 6-4) The Pilot Project is monitored and evaluated by JET, EPWMD and CMPUA. 6-5) Recommendations for appropriate system of waste separation and recycling are summarized by JET, EPWMD and CMPUA on the basis of the results of the Pilot Project.			**Pre-conditions** 1. The EPWMD is functional as a coordinating agency among various organizations on SWM in Ulaanbaatar City. 2. WSFs are cooperative for disclosing the financial data to the Project. 3. Waste picker group in the landfill site is cooperative to the Pilot Project.

Remarks:

(1) The descriptions of “Objective Verifiable Indicators” and “Means of Verification” are preliminary in nature because these were defined prior to the commencement of the Project implementation. The description will be elaborated and/or incremented in the course of Project implementation based on the discussion between JET and Mongolian counterparts, which shall be approved by the JCC meeting.

(2) Revised parts are underlined.