A.3 Hazardous waste from households in UB city and e-waste

A.4 Survey on WEEE

A.4.1 Outline of the Survey

a. Background

WEEE is the abbreviation of Waste Electrical and Electronic Equipment (sometimes referred as electronic waste, e-waste and e-scrap) and the term describes loosely discarded, surplus, obsolete and broken electrical or electronic devices. The processing of WEEEs in developing countries causes serious health and pollution problems as these contain some heavy metals and contaminants such as lead, cadmium, beryllium and brominated flame retardants.

Even in developed countries recycling and disposal of WEEE involves significant risk to workers and communities and great care must be taken to avoid unsafe exposure in recycling operations and leaching of material such as heavy metals from landfills and incinerator ashes.

Under these circumstances, the JET investigated the current conditions of WEEEs being recycled and disposed in UBC from Jan to Feb 2010 in order for the MUB to develop its policy for WEEE.

The report of the survey conducted for the purpose is compiled as below.

b. Objectives

The main objectives of this survey are (1) to understand the current way of discharge, recycle and disposal of WEEEs in UBC and (2) to identify the amount and the flow of WEEEs.

c. Target WEEEs and the Scope of the Survey

Although 5 types of EEEs (*TV set, refrigerator, washing machine, PC and mobile phone*) were initially selected as target EEEs, the mobile phone was deselected through consultation with EPWMD staffs since its imported quantities had not been clear making the waste flow impossible to identify.

The core approaches of this survey are (1) to consider EEEs that have finished their lifetime period as “WEEE”, (2) to consider the imported amounts of the EEEs as total amounts of the WEEEs and (3) to calculate the amounts of WEEEs treated at each stage of waste flow based on the total amounts of the WEEEs.

Therefore, the term "WEEE", for this survey, does not include any other e-wastes (such as discharged non-functional spare parts) resulted from maintenances of EEEs, lifetime of which have not been completed.

d. Applied Methodology

d.1 Data Collection

In order to collect data, the JET conducted qualitative and quantitative surveys in cooperation with the EPWMD. The outline of each survey is as follows:

d.1.1 Qualitative Survey (Interviews)

The purpose of this survey was to identify the ways, in which how target WEEEs are collected, recycled and disposed in UBC, and the stages of the WEEE flow. The JET interviewed 5 business entities and 15 individuals who participate in WEEE recycling. The types of the interviewees were repair shops, refrigerator recycling, individual repairmen, waste pickers, collection workers and metal purchasers.

d.1.2 Quantitative Survey (Questionnaires)

Following the commencement of the survey, the JET found difficulty in collecting data that had been essential for identification of the WEEE flow due to cautiousness attitudes of the respondents against the survey. Therefore, the JET consulted with the EPWMD on methods of data collection and the EPWMD was decided to distribute questionnaires through district offices on behalf of the JET. As a result, district offices were requested by the EPWMD to collect necessary data from recyclers operating in their respective districts using the questionnaires prepared by the JET.

The main purpose of the questionnaire survey was to identify recyclable and non-recyclable parts by each target WEEEs, amounts of parts recycled by the respondents, shares of recyclables in the total amount of the treated WEEEs and recycling methods for each type of target WEEEs.

d.2 Principles for Data Processing

The main principles applied to the data analysis are the following:

1. Amounts of WEEEs are calculated by weights; namely, the WEEEs are basically measured in *kg* or *ton*;
2. The total amount of each type of WEEE equals to the imported amount of the relative type of EEEs that finished duration of its lifetime cycle in 2009;
3. The duration of lifetime cycle of each target EEEs are considered as same as those in Japan since identification of the lifetime cycle for each EEE in Mongolia has been difficult due to the impossibility in verification of production dates using serial

numbers of EEEs; and

4. The amounts of WEEEs to be treated at each stage of the WEEE flow that represent the whole condition in the city are calculated from the relative shares (percents) identified during the data analysis of questionnaire survey.

A.4.2 Current Condition of WEEE Recycling System in UBC

According to the interviews, the methods of WEEE recycling in UBC are almost similar for all types of target WEEEs.

WEEE recycling system in UBC can be described as follows.

a. Recyclables and Non-recyclables

According to the interview surveys, the most common recyclables and non-recyclables of each WEEE are identified as follows:

Table A-4: The Most Common Recyclables and Non-recyclables

	TV sets	Refrigerator	Washing machine	PC
Recyclables:	PCB	Compressor	Compressor	Main board items
	Choke coil	Iron cases	Iron cases	Some functional parts
	Wires	Wires	Wires	Power supply unit
				Processor case
				Wires
Non-recyclables:	CRT	Rubber items	Plastic items	CRT monitor
	Plastic cases	Glass		Optical drives
		Plastic		Floppy drive
				Plastics & mixed items

The majority of the most common recyclables are metal-containing parts. Generally, metal containing parts are recycled regardless of their functionality as non-functional ones can be sold as metal after segregation. Among the non-metal or mixed small parts, any of the functional ones can be used in maintenance as spare parts; however, whether to be used depends on the needs of maintenance. Although the rest of the non-metal or mixed parts are usually disposed, main boards of PCs are kept by repair shops for further possible uses.

Some of the parts mentioned above are reflected in the following photos:

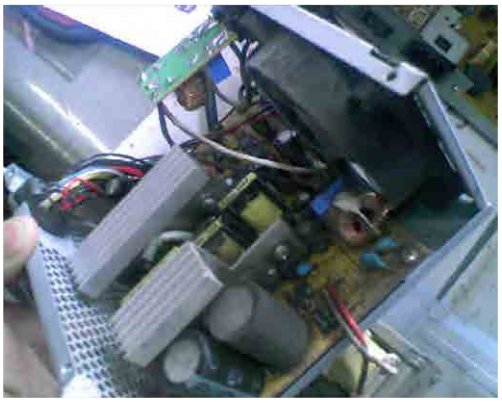
PCB (TV)

CRT with a Choke coil (TV)

Case (TV)

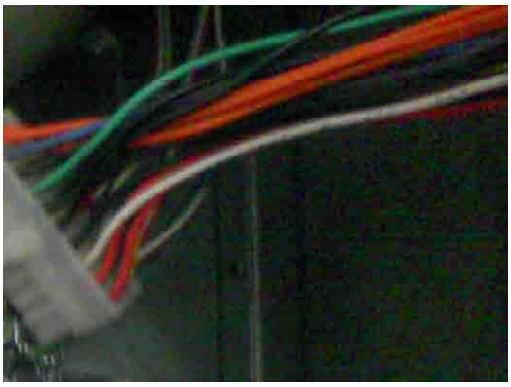
Compressor (Refrigerator)

Motors (Washing machine)



Power Supply Unit (=PSU; PC)

Main board (PC)



Wires

b. WEEE Recycling Processes

The majority of WEEEs generated in UBC are re-used since most of second hand EEEs purchased by recyclers are resold and repaired/resold back to residents.

Only those that cannot be repaired are dismantled and some of their parts are recycled. There are 2 main patterns of recycling: using some of functional parts as spare parts for maintenance and segregating metals from metal containing parts.

Although majority of parts used for maintenance are recycled by repair shops themselves (who dismantled the EEEs), smaller amount of them are sold to other repair shops.

All the metals (copper, iron, aluminum and alloys) segregated from WEEE parts, except iron cases of refrigerators, are exported to China. As iron cases of refrigerators are used as raw material for chimneys of ger stoves, most refrigerator cases are purchased by ger stove producers.

Segregation is conducted by all the recyclers. Although repair shops segregate some metals, they pay attention only on parts containing more metals such as choke coil of TV sets, compressors/motors or cases of refrigerators and washing machines. As for other parts discharged by repair shops, waste pickers and collection workers segregate metals. As metal purchasers offer low prices for non-segregated metals, most recyclers do segregate by themselves before selling metals to metal purchasers.

The rest have been discharged at the final disposal site and buried during landfill operations.

c. WEEE Recyclers

The WEEE recyclers in UBC are repair shops or individual repairmen, collection workers, waste pickers and metal purchasers.

c.1 Repair shops & individual repairmen

The repair shops and the repairmen play the main role in WEEE recycling since they purchase old and broken EEEs (WEEEs) from consumers, repair most of the purchased EEEs, resell them to residents and dismantle other EEEs that are impossible to repair. However, maintenance units of big electronics traders such as Nomin and MCS do not purchase second hand EEEs from consumers. Therefore, participation by these big organizations in WEEE recycling is limited to only usage of small amount of functional parts removed from broken EEEs as spare parts for their maintenance activities. Therefore, the repair shops playing the important roles are usually small and medium in size consisting of 1 to 3 persons; especially in TV and PC recycling, repair shops are usually operated by individual repairmen not by companies.

Some of bigger repair shops deal with several types of home appliances; however, the number of these shops seems to be relatively few.

A refrigerator recycler at Narantuul zakh who repairs and resells old refrigerators.

A TV repair shop located in the central UB.

c.2 Collection workers and waste pickers

The useless parts of dismantled WEEEs are discharged by repair shops to nearby temporary discharge points or directly to collection trucks if there are bell collections. Waste pickers working in the city and collection workers pick metal containing parts among the discharged items to segregate metals before transporting them to the landfill site. After the arrival to the landfill site, the remained metal-containing parts are further picked by waste pickers working at the landfill site. The residues are left at the site and buried.

c.3 Metal purchasers

All the metals segregated from WEEEs or their parts are purchased by metal purchasers operating in the city and at the final disposal sites. Purchasable metals are copper, aluminum, iron, alloy and mixed ones. All the metals purchased by metal purchasers are exported to China.

d. The WEEE Recycling Cycle and WEEE Flow

Based on the above, the whole cycle of WEEE recycling can be described as follows: (1) purchase of WEEEs, (2) Re-use of WEEEs (reselling and repairing/reselling), (3) Recycling as spare parts (both using and selling functional parts as spare parts) (4) Primary segregation (by repair shops), (5) Secondary segregation (by collection workers and waste pickers), (6) Export of metals and (7) Disposal and landfill.

Consequently, the WEEE flow chart identified for UBC is described as shown in the Figure A-2.

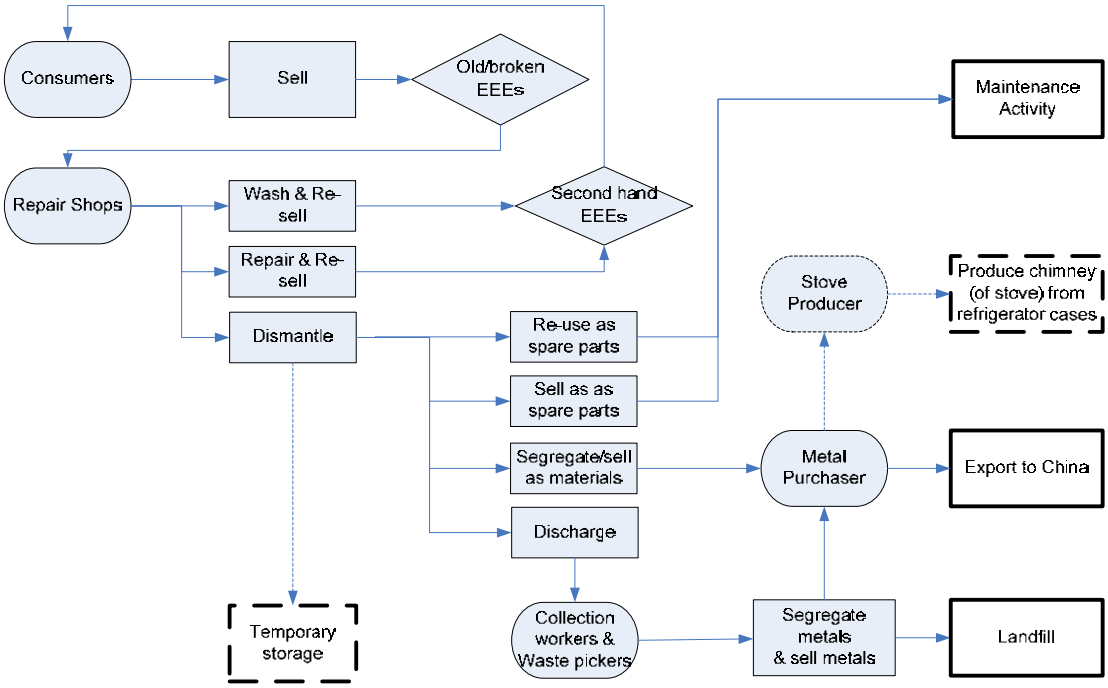


Figure A-2: The WEE Flow in UBC

A.4.3 The Annual Amount of WEEE by Types of EEEs

The annual imported amounts of the target EEEs and the durations of their lifetime cycles are essential for identification of the total amount of the WEEEs. Therefore, the relative data used for the calculation is identified through the following processes based on the principles mentioned in 1.4.2:JET applied the lifetime periods of target EEEs known in Japan to this analysis and identified the necessary years of imports. The result is presented in the table below:

Table A-5: Average Lifetime Period for Each Type of the Target EEEs

	Items	TV set	Refrigerator	Washing machine	PC**
1	Lifetime period of EEEs (years)*	12	12	11	7
2	The year of necessary data for identification of WEEE amounts	1997	1997	1998	2002

** Source (for EEEs except PC): Interview survey conducted by METI covering 4,700 households in 1997*

*** Source (for Desktop PC): Interview survey conducted by Kokusai Kogyo (Thailand) Co., Ltd in 2003*

As shown in the table, the amounts of EEEs imported in 1997 for TV sets and refrigerator, 1998 for washing machine and 2002 for PC will be considered as the annual amounts of WEEEs generated in UBC for the year 2009.

Therefore, the JET surveyed two data sources for the series of imported amounts of target EEEs: the database of the General Customs Office of Mongolia (GCO) and the UN Commodity Trade Statistics Database. The data obtained from the two sources are as shown in the table below:

Table A-6: Imported Amounts of EEEs Obtained from 2 Data Sources and the Figures

Years	Imported Amounts										
	TV set			Refrigerator			Washing machine			Desktop PC	
	UN*	Customs Office**	Adapted Figure	UN	Customs office	Adapted Figure***	UN	Customs	Adapted Figure	Customs office	Adapted Figure
1997	18,467		**18,467**	963		**4,032**	3,899				
1998	16,549			4,032			3,748		**3,748**		
1999	17,997			3,576			5,136				
2000	25,173			5,460			5,799				
2001	22,460	22,430		4,736	4,736		8,262	8,262		43,892	
2002	N.A.	33,971		N.A.	4,438		N.A.	11,888		60,589	**60,589**
2003	780,693	36,692		323,174	6,100		444,167	14,354		64,631	
2004	49,402	48,862		10,037	10,037		N.A.	23,439		75,558	
2005	41,140	41,074		5,198	5,198		N.A.	23,101		114,009	
2006	43,422	43,419		1,151	1,151		N.A.	31,493		224,695	
2007				32,375	32,476		N.A.	41,507		89,652	
2008				N.A.	35,182		N.A.	58,250		105,714	

Adapted as the Amounts of WEEEs

**Source: UN Commodity Trade Statistics Database, http://comtrade.un.org/db/default.aspx , accessed on 26 Feb 2010*

***Source: Statistical Analysis Department, General Customs Office, Jan 2010*

**** As the figure for 1997 indicated in UN database is seemed as odd, the imported amount in 1997 for refrigerator has been assumed as same as that in 1998.*

As the data before 2001 does not exist in the database of the GCO, the relative data was not obtained from the office. However, there were not much differences between the two sets of data obtained from the sources (except those of UN database for the year 2003 shaded in the table) when comparing the figures available in both databases (those of the years of 2001

to 2008). As for the UN data for 2003, they are considered as an input mistake; and therefore, have not been considered during the comparison.

As a result, the JET had concluded that the data obtained from the UN database can be used for further analysis and adapted the figures from this source (shown in the "Adapted Figures" columns of the table) for annual amounts of WEEEs. As for the refrigerator, the data in 1997 is obviously odd in comparison to those of other years; and therefore, the JET assumed that the number of refrigerators imported in 1997 did not differ from that in 1998.

A.4.4 Calculation Factors for Amounts of WEEEs Treated at Each Stages of the WEEE Flow

The JET conducted questionnaire surveys in cooperation with the EPWMD and the district offices in order to calculate the amounts WEEEs treated by respondents at each stage of WEEE flow and identify their shares in the total amount of the treated WEEEs. As the shares have to be used as calculation factors for estimation of overall Flow of WEEEs generated in UBC, the main attention has been paid to this analysis.

The results of the analysis are compiled below.

a. Samples of Analysis

18 questionnaires were distributed to each district office by EPWMD, in addition to those distributed by the JET; the district offices collected the data from recyclers located in their districts based on the questionnaires. Since repair shops/repairmen play the main role in the WEEE recycling, the survey targeted only repair shops.

The questionnaire contained the information related to treated amounts of WEEEs by the respondents (purchased, re-used and dismantled amounts), recycled and non-recycled parts and recycling methods (See also Annex-1: Questionnaire).

The following table shows the numbers of distributed, collected and analyzed questionnaires for the survey.

Table A-7: Questionnaires

Distributed Org.	Target areas	Number of Questionnaires		
		Distributed	Returned	Used for Analysis
JET	Narantuul	4	4	4
	Khar khorin	5	5	5
	Subtotal	**9**	**9**	**9**
EPWMD	BZD	18	18	11
	ChD	18	5	4
	SBD	18	18	11
	BGD	18	7	5

	KhUD	18	13	10
	SKhD	18	15	8
	Subtotal	**108**	**76**	**49**
	TOTAL	**117**	**85**	**58**

As presented in the table, 1-4 among the total returned questionnaires were excluded from the samples due to the lacks of data necessary for the analysis.

As some respondents deal with several types of EEEs, the total size of the samples analyzed are 84 cases by the 58 respondents. The samples by each target EEEs are 27 for TV set, 16 for refrigerator, 12 for washing machine, 11 for PC and 18 for mobile phone.

b. Data Analysis

b.1 Assumptions Used for Analysis

The major assumptions used for this analysis are the following:

1. Printed circuit boards (PCB) of TV sets are considered as it consists of 6 types of items and each item occupies 1/6 in total weight of that PCB.
2. Based on the interview survey, the number of Cathode ray tubes (CRT) recycled by a respondent who indicated CRTs as “recycled” has been considered as 20% of CRTs of all the TVs dismantled by him or her. Likely, the recycle rate for plastic cases of TVs has been considered as 10%.
3. All CRT monitors of treated PCs are considered as 14 inch’s monitors that weigh around 10 kg. In addition to this, the average weight of keyboards is considered as 0.5 kg.
4. Same parts of all EEEs dismantled by same respondent are treated in same manners. For example, when a respondent replied that s/he used capacitors of TV as spare parts, all the capacitors taken from all her/his dismantled TVs are considered as re-used as spare parts.
5. The average weights of target EEEs are considered as same as those in other countries, namely, Thailand; and therefore, the figures related to weights of EEEs and their parts are taken from the results of dismantling survey conducted in Thailand by Kokusai Kogyo (Thailand) Co., Ltd in 2004. The average unit weights of EEEs and their parts are shown in the table below:

Table A-8: Average Unit Weights Used in the Analysis (Unit: kg)

TV set		Refrigerator		Washing machine		PC	
Parts	Weight	Parts	Weight	Parts	Weight	Parts	Weight
PCB	1.65	Compressor	8.96	Iron scrap	23.12	Iron scrap	3.46
Plastic case	2.06	Case	10	Plastics	6.42	Power Supply Unit	0.80
CRT glass	10.16	Radiator	8.74	Glass	0.83	Plastics	0.59
Copper	0.26	Rubber hose	0.03	Aluminum	0.77	Mother board	1.16
Electric wire	0.51	Plastic	7.16	Copper	0.55	Hard disk*	0.46
Other scraps	2.81	Glass	0.16	Rubber gasket	0.51	Optical drive*	0.44

		Aluminum (fridge)	1.22	Electric wire	0.31	Monitor	10.00
		Electric wire	0.2	Concrete	11.92	Keyboard	0.50
		Rubber gasket	0.62	Particle board	1.05		
		Styrofoam	3.28				
Unit weight	**17.45**	**Unit weight**	**40.37**	**Unit weight**	**45.48**	**Unit weight**	**17.41**

Source: Kokusai Kogyo (Thailand) Co., Ltd, Report for Survey on Electrical and Electronic Waste (Complete Version), 2004

b.2 The Results of the Analysis

Based on the assumptions mentioned in the 4.2.1, the JET calculated the amounts of WEEEs treated by the respondents at each stage of WEEE flows and the shares of these amounts in the respective totals of WEEEs (See also the Annex 2: The Data Analysis of Questionnaire Survey). The results are presented in the table below:

#	Basic parameters			Measure unit	TV		Refrigerator		Washing machine		PC	
					Weight	Share in the total	Weight	Share in the total	Weight	Share in the total	Weight	Share in the total
1	Average unit weight of EEEs			kg	17.45		40.37		45.48		17.41	
2	Total amount of WEEEs			unit	181		111		40		28	
				kg	3158.45	100.0%	4481.07	100.0%	1819.20	100.0%	487.48	100.0%
3	Re-use Amount:											
	1	Resell amount		unit	40		39		2		0	
				kg	698.00	22.1%	1574.43	35.1%	90.96	5.0%	0.00	0.0%
	2	Repair & resell amount		unit	81		50		27		8	
				kg	1413.45	44.8%	2018.50	45.0%	1227.96	67.5%	139.28	28.6%
	Sub total			unit	**121**		**89**		**29**		**8**	
				kg	**2111.45**	66.9%	**3592.93**	80.2%	**1318.92**	72.5%	**139.28**	28.6%
4	Dismantling Amount			unit	**60**		**22**		**11**		**20**	
				kg	1047.00	33.1%	888.14	19.8%	500.28	27.5%	348.20	71.4%
	1	Recycle Amount by repair										
		1	Re-use as spare parts	kg	140.22	4.4%	92.1	2.1%	125.81	6.9%	28.39	5.8%
		2	Sell as spare parts	kg	12.91	0.4%	34.82	0.8%	0.00	0.0%	8.11	1.7%
		3	Segregate & sell as materials	kg	11.24	0.4%	375.2	8.4%	151.08	8.3%	35.93	7.4%
		Sub total		kg	**164.37**	5.2%	**502.12**	11.2%	**276.89**	15.2%	**72.43**	14.9%
	2	Temporarily stored spare		kg	**0.00**	0.0%	**0.00**	0.0%	**0.00**	0.0%	**5.80**	1.2%
	3	Discharge Amount										
		1	Discharged recyclables	kg	33.12	1.0%	30.08	0.7%	25.06	1.4%	72.49	14.9%
		2	Landfill amount	kg	849.52	26.9%	355.94	7.9%	198.33	10.9%	197.49	40.5%
		Sub total		kg	**882.64**	27.9%	**386.02**	8.6%	**223.39**	12.3%	**269.98**	55.4%

Table A-9: The Results of the Data Analysis

c. Calculation Factors for Estimation of the Entire WEEE Flows

Based on the results of the analysis, the calculation factors are picked and compiled into the Table below These factors will be further used for estimation of the entire WEEE Flows of UBC.

Table A-10: Calculation Factors for WEEE Flows (Unit: %)

#	WEEEs at Recycling Stage	TV	Refrige-rator	Washing machine	PC
1	**Total amount of WEEEs**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
2	*Re-used Amount:*				
	Resell amount	22.1%	35.1%	5.0%	0.0%
	Repair & resell amount	44.8%	45.0%	67.5%	28.6%
	Total Re-used amount	**66.9%**	**80.2%**	**72.5%**	**28.6%**
3	**Amount of Dismantling**	**33.1%**	**19.8%**	**27.5%**	**71.4%**
4	Recycled Amount by repair shops:				
	Re-use as spare parts	4.4%	2.1%	6.9%	5.8%
	Sell as spare parts	0.4%	0.8%	0.0%	1.7%
	Segregated metals	0.4%	8.4%	8.3%	7.4%
	Total Recycled by Repair Shops	**5.2%**	**11.2%**	**15.2%**	**14.9%**
5	**Temporarily Stored Parts**	**0.0%**	**0.0%**	**0.0%**	**1.2%**
6	**Amount Discharged by Repair Shops**	**27.9%**	**8.6%**	**12.3%**	**55.4%**
7	**Amount Segregated by WP and CW***	**1.0%**	**0.7%**	**1.4%**	**14.9%**
8	**Landfill amount**	**26.9%**	**7.9%**	**10.9%**	**40.5%**

**WP-waste pickers; CW-collection workers. Metal containing parts discharged by repair shops. As WPs and CWs pick them up and segregate metals, this category of WEEE has been considered as those "segregated by WP and CW".*

A.4.5 Identification of WEEE Flows in Mongolia

a. Key Indicators of WEEE Flows in Mongolia

The annual amounts of WEEEs generated, re-used, recycled and disposed in MONGOLIA are estimated based on the calculation factors identified during analysis presented in 4.3. The Table 1-8 shows the results of the estimation.

Table A-11: Annual Amounts of WEEE

#	Stages of WEEE Recycling Cycle	Measure unit	TV		PC		Refrigerator		Washing machine		Total WEEE	
			Weight	Share in the total	Weight	Share in the total	Weight	Share in the total	Weight	Share in the total	Weight	Share in the total
1	Average unit weight of EEEs	ton	0.01745		0.01741		0.04037		0.04548			
2	Total amount of WEEEs	unit	18,467		60,589		4,032		3,748			
		ton	322.25	100.0%	1,054.85	100.0%	162.77	100.0%	170.46	100.0%	1,710.33	100.0%
3	*Re-used amount:*											
	Resell amount	unit	4,081		0		1,417		187			
		ton	71.22	22.1%	0.00	0.0%	57.19	35.1%	8.52	5.0%	136.93	8.0%
	Repair & resell amount	unit	8,264		17,311		1,816		2,530			
		ton	144.21	44.8%	301.39	28.6%	73.32	45.0%	115.06	67.5%	633.98	37.1%
	Total re-used amount	unit	12,345		17,311		3,233		2,717			
		ton	215.43	66.9%	301.39	28.6%	130.51	80.2%	123.58	72.5%	770.91	45.1%
4	Dismantled amount	unit	6,122		43,278		799		1,031			
		ton	106.82	33.1%	753.47	71.4%	32.26	19.8%	46.88	27.5%	939.43	54.9%
5	*Recycled amount by repair shops:*											
	Re-used as spare parts	ton	14.31	4.4%	61.43	5.8%	3.35	2.1%	11.79	6.9%	90.87	5.3%
	Sold as spare parts	ton	1.32	0.4%	17.55	1.7%	1.26	0.8%	0.00	0.0%	20.13	1.2%
	Segregated/sold as materia	ton	1.15	0.4%	77.75	7.4%	13.63	8.4%	14.16	8.3%	106.68	6.2%
	Total recycled by repair shops	ton	16.77	5.2%	156.73	14.9%	18.24	11.2%	25.94	15.2%	217.68	12.7%
6	Temporarily stored spare parts	ton	0.00	0.0%	12.55	1.2%	0.00	0.0%	0.00	0.0%	12.55	0.7%
7	Amount discharged by repair shops	ton	90.05	27.9%	584.21	55.4%	14.02	8.6%	20.93	12.3%	709.22	41.5%
8	Amount segregated by WP and CW	ton	3.38	1.0%	156.86	14.9%	1.09	0.7%	2.35	1.4%	163.68	9.6%
9	Landfill amount	ton	86.67	26.9%	427.35	40.5%	12.93	7.9%	18.58	10.9%	545.53	31.9%

b. WEEE Flow in MONGOLIA

The entire flows of WEEE generated in MONGOLIA are shown in the Figure 1-2 while the flows for each type of the target WEEEs are presented in the Figures 1-3 to 1-6:

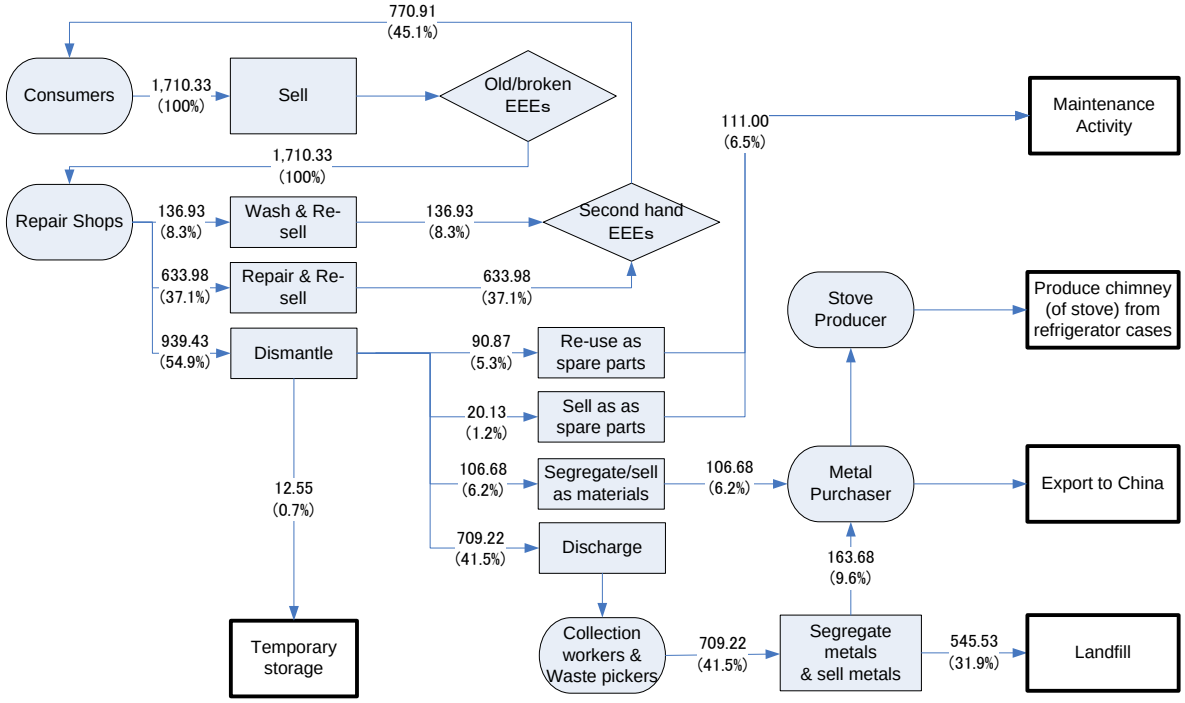


Figure A-3: Overall WEEE Flow in MONGOLIA (Unit: tons)

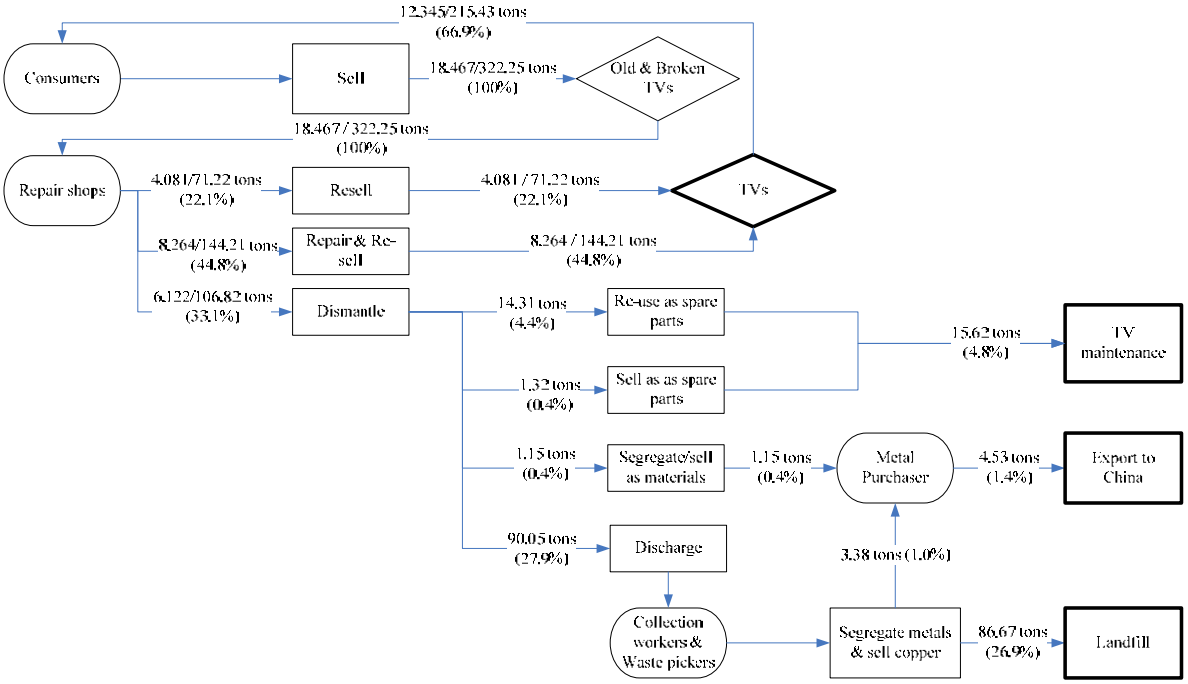


Figure A-4: TV Flows in MONGOLIA

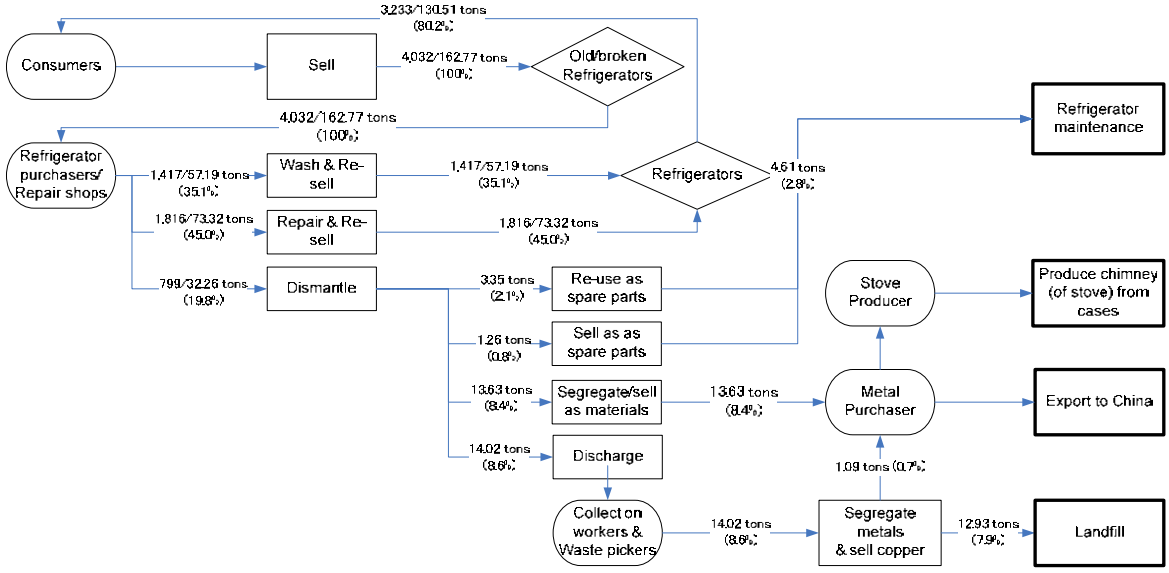


Figure A-5: Refrigerator Flow in MONGOLIA

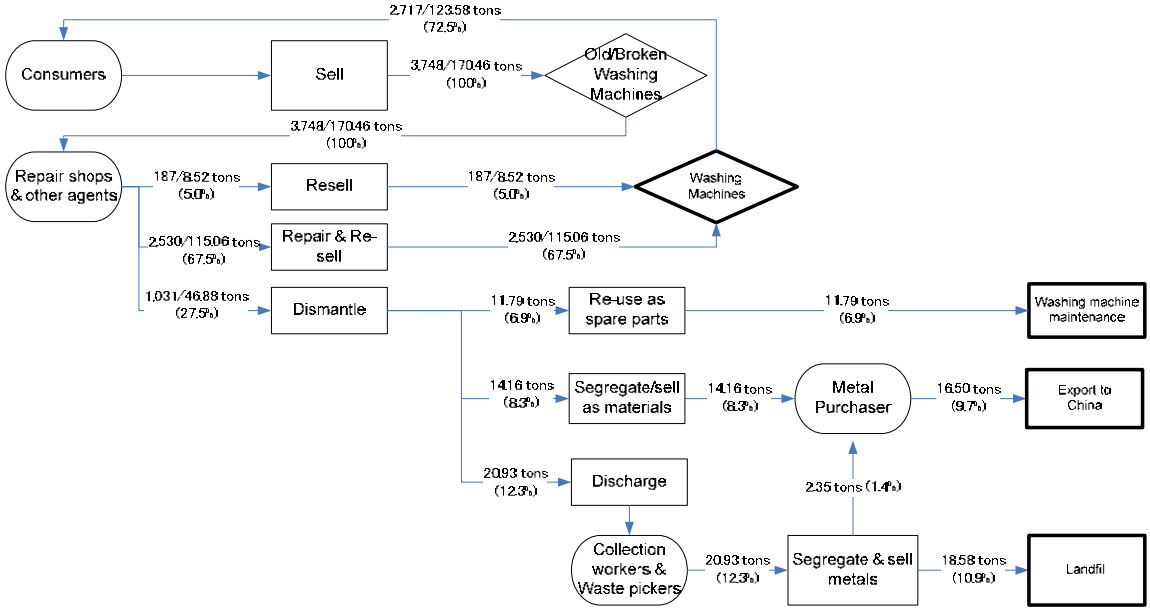


Figure A-6: Washing Machine Flow in Mongolia

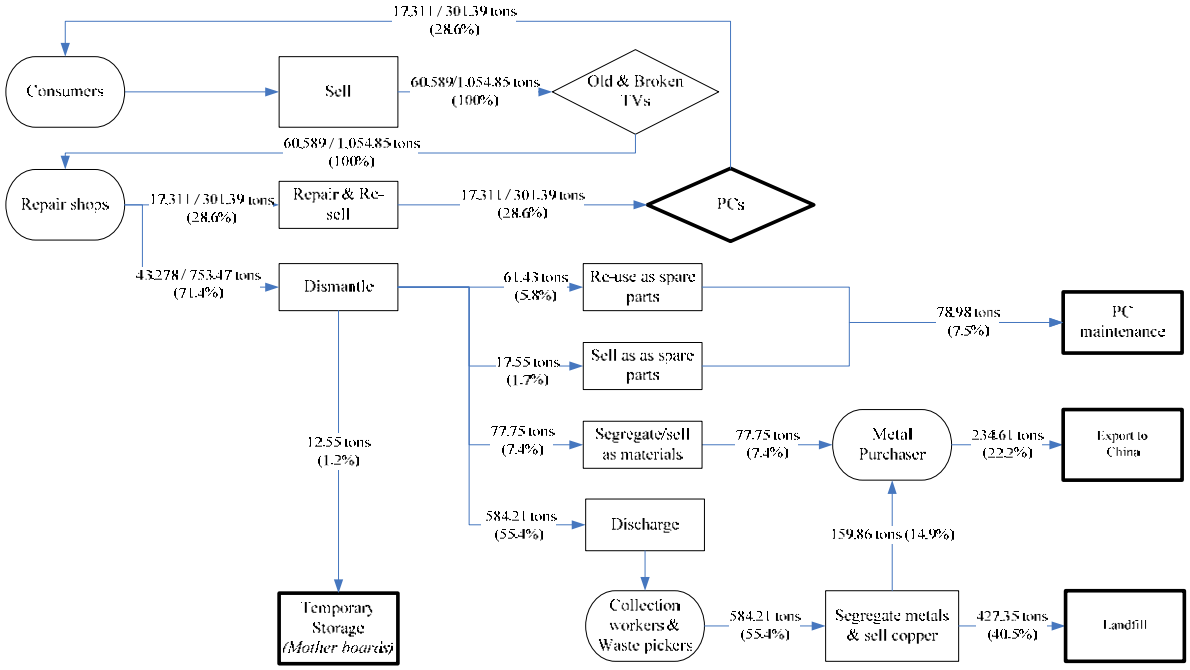


Figure A-7: PC Flows is Mongolia

A.4.6 Findings and Recommendations

a. Major findings

- The main indicators of the WEEE flows in MONGOLIA are summarized in the Table 6-1. According to the table, 45.1% in the total WEEEs is re-used, 23.0% is recycled (including stored spare parts) and 31.9% is disposed. The main descriptions of re-used, recycled and disposed amounts are the following:

- Re-use rate of each type of WEEEs is usually high (ranging from 66.9% to 80.2%) except PC. As for PC, the indicator is only 28.6% since CRT monitors, which occupy the major part in the weights of TV sets, are usually impossible to re-use.

- The most part of the total recycle rate calculated as 23% has been formed by the recycled amount of PC parts. Taking the PC out of account, the overall recycle rate falls to a value less than 10.0% of the total amount of WEEEs. More than half of the recycled parts are sold metals and only the minority (6.5% in the total amount) is used for maintenance as spare parts.

- As mentioned above, the total disposed amount (landfill amount) occupies 31.9% in the total (545.53 tons). As the amount is estimated by weights of the disposed parts, the majority of the total disposed waste has been resulted from disposed CRTs of PCs and TV sets. The main reasons for the conclusion are (1) all the CRTs of PC cannot be sold and around 80% of those of TV sets are disposed; and (2) a CRT weights more than 10 kg occupying the majority in the weights of TV sets and PCs, according to survey results.

Therefore, the sum of disposed amounts of TVs and PCs occupy 94% in the total landfill amount ([86.67+427.35]/545.53).

Table A-12: Summary of WEEE Flow Indicators for Mongolia

#	Stages of WEEE Recycling Cycle	Measure unit	TV		PC		Refrigerator		Washing machine		Total WEEE	
			Weight	Share in the total	Weight	Share in the total	Weight	Share in the total	Weight	Share in the total	Weight	Share in the total
1	Re-Used Amount	ton	215.43	66.9%	301.39	28.6%	130.51	80.2%	123.58	72.5%	770.91	45.1%
2	*Recycled amount by repair shops:*											
	Used for Maintenance	ton	15.62	4.8%	78.98	7.5%	4.61	2.8%	11.79	6.9%	111.00	6.5%
	Segregated/sold as materials	ton	4.53	1.4%	234.61	22.2%	14.72	9.0%	16.50	9.7%	270.36	15.8%
	Total recycled parts	ton	20.15	6.3%	313.59	29.7%	19.33	11.9%	28.29	16.6%	381.37	22.3%
3	Temporarily stored spare parts	ton	0.00	0.0%	12.55	1.2%	0.00	0.0%	0.00	0.0%	12.55	0.7%
4	Landfill amount	ton	86.67	26.9%	427.35	40.5%	12.93	7.9%	18.58	10.9%	545.53	31.9%
	Total Amount	ton	322.25	100.0%	1,054.85	100.0%	162.77	100.0%	170.46	100.0%	1,710.33	100.0%

b. Problems Faced by Recyclers

Among the total respondents of the questionnaire survey, 24 respondents answered the questions related to the difficulties occurring in their businesses. According to the analysis, the most common problems are (1) difficulties in obtaining short-term loans or credit with discounted interest rates (accounts for 37.5% in the total answers), (2) non-existence of buyers and recyclers for most parts removed from the dismantled EEEs (33.3%) and (3) decrease in sales (12.5%).

In other words, the biggest problem is that related to insufficiency of financial assets. Considering the framework of this study, the problem can be interpreted into the impossibility to sell many of the dismantled parts. Actually, the survey results indicate that almost all the materials except metals have just been disposed in UBC.

c. Recommendations

Based on the above-mentioned findings, the JET recommends the MUB to focus on the following directions when formulating policies on WEEEs. These are:

1. As CRTs contain heavy metals such as mercury that cause serious health problems to human beings, the major attention should be paid to their disposal. A separate disposal site where hazardous wastes are disposed in safe manners is required to be constructed in the future in order to prevent the negative impacts on surrounding environment. Until such hazardous waste disposal site is ready, these hazardous wastes should be stored in dry places away from the sun light.

2. There are no manufacturers of the target EEEs in Mongolia; as the result, all of these EEEs are imported from abroad. Therefore, encouraging imports of EEEs that do not contain hazardous substances is needed; however, this may lead to higher prices for

EEEs to be imported in the future in comparison with those for the existing EEEs at the market. For this reason, regulation should be conducted step by step at the same time with building consensus among the public.

3. The re-use and the recycle of WEEEs are conducted mainly by individual recyclers and the main problem that has been faced by them is the difficulty in obtaining financial assets such as loans or credits with discounted interest rates. Based on the condition, it is necessary to promote and develop these individuals as formal recyclers by supporting their status such as accommodating low interest rate loans after achieving a complete control on their activities by registering the recyclers, identifying the amounts and the flows of parts dismantled by them and preventing possible illegal dumping.

A.4.7 Seminar on Hazardous Waste

On 3.Nov.2010, a seminar concerning hazardous waste issue has been conducted to invite MOE, MOH, and each directors of PSD of district government. On this seminar, MOH has presented about current situation of medical hazardous waste and its future planning. MOE has followed it by these of industrial hazardous waste. And then JET has explained about hazardous waste which is generated from households in Japan and Ulaanbaatar City. Finally EPWMD ended the seminar to present current situation and planning about WEEE based on research which we have conducted on 1st year of our project. Materials and details of this seminar are shown below.

a. Agenda

a.1 Background and Objectives

a.1.1 Background

Environmental Pollution and Waste Management Department of Mayor's office of Municipality of Ulaanbaatar is responsible for all kind of environmental pollution and waste management in Ulaanbaatar City.

JICA is implementing the project called "Strengthening the Capacity for SWM in Ulaanbaatar City Mongolia" from September 2009 till August 2012. One of the expected outcomes from the project is to strengthen the capacity of EMPWMD for policy making and planning for solid waste management.

Under such circumstances, Municipality of Ulaanbaatar will organize seminar on hazardous waste in Ulaanbaatar City to discuss current situation and future planning among relevant authorities under assistance of JICA Project Team.

Although hazardous waste is not included as a target waste in JICA technical cooperation project, some of Japanese experience might be contributed to establish an environmental friendly city through environmentally sound SWM system which is the fundamental goal of the Master Plan for SWM in MUB.

a.1.2 Objective

The objectives of the seminar are:

- To share the information among relevant authorities about current situation and future planning on hazardous waste management in UBC
- To introduce Japanese experience on hazardous waste management especially on household waste
- Discussion among Authorities concerned.

a.2 Outline of the Seminar

a.2.1 Date and Venue

Date: November 3rd (Wed), 2010

Place: Ulaanbaatar Hotel 6th Floor, Hall "Urguu"

a.2.2 Participants

Upon consideration of the objective of the seminar, the participants will be invited from the following organizations:

EPWMD

Ministry of Finance

Ministry of Nature Environment and Tourism

Ministry of Health

Ministry of Food, Agriculture and Light Industry

Ministry of Mineral Resources and Energy

National Emergency Management Agency

City Emergency Management Agency

Administration of Land Affairs, Construction, Geodesy and Cartography

City Development Policy Department of Governor's Office

Capital City's Inspection Agency

Representatives of district PSD

a.2.3 Seminar Program

The seminar program is shown in the table below.

Chairperson: Director of EPWMD/Project manager

Topic	Expositor	Time
Opening Address by Mongolian Side	MUB	9:00 - 9:10

1 Current Situation and Future Planning for medical waste management in Mongolia	MOH	9:10 - 9:40
2. Current Situation and Future Planning for hazardous waste management in Mongolia	MONET	9:40 -10:10
Tea Break		10:10 - 10:30
3. Household Hazardous Waste Management	JICA Expert Team	10:30 – 11:10
4. Current Situation and Future Planning for e-Waste in UBC	EPMWD/MUB	11:10 – 11:30
5. Question and Comment	Participants	11:30 – 12:10
6. Closing Speech	Director of EPWMD	12:10 – 12:20

b. List of Attendants

#	Organization/Position	Attendants
1	PSD of SKhD, director	Mr. Baasansuren. O
2	PSD of SBD, director	Mr. Batdelger. B
3	PSD of ChD, director	Ms. Bulgan. D
4	PSD of BGD, director	Amarbayasgalan
5	PSD of BZD, director	Ganchudur
6	PSD of KhD, director	Mr. Begz
7	Agency of Land, construction, geodesy and cartography	Ms. Khangaisaikhan. N
8	Municipal Specialized Inspection Agency	Ms. Badamkhand
9	General Emergency Agency	
10	Governor's Office	Mr. Itgelt
11	Ministry of Health	Ms. Tsetsegsaikhan
12	Ministry of Nature, Environment and Tourism	Ms. Jargalsaikhan
13	Municipal Emergency Department	Ms. Ganchimeg
14	Element Co., Ltd, director	Mr. Bayarsaikhan
15	South gobi Co., Ltd, specialist of environment	Ms. Enkhbayasgalan

c. Presentation Materials

c.1 PROGRAM 1: Current Situation and Future Planning for medical waste management in Mongolia by MOH

HEALTHCARE WASTE: WHO'S AT RISK?

- People within a Healthcare Facility
- Nurses, physicians and hospital maintenance staff
- Patients
- Visitors
- Workers in support services e.g. laundries, waste handling & transportation

HEALTHCARE WASTE: WHO'S AT RISK? II

- People outside Healthcare Facilities
- Local population
- Waste carrier
- Workers in waste disposal facilities, e.g. landfills or incinerators
- Waste pickers

Health Care Waste Management

- The safe collection, transportation and treatment of all different kind of hazardous Health Care Waste (HCW)
- Tracing and control of these waste streams
- Environmentally correct management & treatment of hazardous HCW:
  - Infectious waste (about 60-70%)
  - Chemical waste (about 20-25%)
  - Pathological waste (about 5-10%)
  - Other hazardous waste (< 5%)
- Final disposal of the treated waste, including generated by-products
- Consideration of environmental aspects
- Consideration of economical aspects

1

Legal aspects of the Health care waste management

Relevant Laws on Health Care Waste Management

1. The Law on Household and Industrial Waste, 2003
2. Environmental protection law, 1995
3. The Law on the import, export and crossborder transport of hazardous wastes, 2000
4. Law on chemicals,2006
5. Environment Impact Assessment Law, 1998
6. Hygiene Law,
7. Law on protection and security of radio activity , 2009
8. Law on Air , 2010
9. Law on Air payment, 2010

Relevant Guideline, policies

National Programme for Waste reducing, 1999 (under revision)

•The document defines the policies, activities, ways to reduce the amount of waste based on the Basel convention principles, law on environment protection

National Programme on "Environmental Health", 2005

•The document defines the policies, activities, ways to establish safe, healthy environment for people

Relevant Guideline, policies

Government Resolution 2001, # 61
The state policy on Public health

- Health Sector Master Plan
Strategy 8:
Improve the health care solid waste and disposal of the expired drugs 2006-2010

Measures for strengthening waste management – Government Resolution N256

Requirements for the Removal and Disposal of Hazardous Waste – Government Decree N135

Guidelines

Guidance on classification, collection, storage, transportation and disposal of medical wastes MoH, MNET Joint Minister's Order [illegible]

Regulation on storage, transportation, usage of the toxic and hazardous chemicals
MNET, MOH, NEMA Joint Order, 2009, # [illegible]

Regulation on import, cross border transport, manufacturing, selling of the toxic and hazardous waste
MNET, MOFA Joint Ministers Order, 2008, # [illegible]

Regulation on the Risk assessment of the toxic, hazardous chemicals
MNET, MOH, NEMA Joint Order, 2009, # [illegible]

The list of the permitted pesticides, chemicals, insecticides and desinfectants and Regulation for the experiment, usage of the pesticides, chemicals, insecticides and desinfectants MNET, MoFALI, MOH Joint Order - annual

Minister of Health's Orders

Health care waste management strategy, plan of action for 2009 – 2013 (environmentally friendly, non-burning technology)

Minister of Health's Order, September 2009, # 293

Calculation methodology for wastes generated from hospitals (based on number of beds)

Minister of Health's Order, 2010, # 73

2

Activities to improve the HCWM

Research, survey

-Baseline survey to assess the structure and amount of HCW – 2005

- Assessment of the soum level hospitals current situation by questionnaire – 2006

- Assessment of the HCWM situation at the national and provincial level - 2006 – 2007

Research, survey

2009 – 2010

-Assessment of the needle stick injury and prevalence of Hepatitis B,C among medical workers

- Baseline survey of the mercury containing devices at the health sector

Meeting, seminars

"Improvement of HCWM" WHO Regional International Meeting, Ulaanbaatar, May, 2008

All level trainings, 2006-2010

"Improvement of HCWM" seminar - Darkhan-Uul, Khovd aimag, 2008-2010 on

"Improvement of HCWM" seminar – Orkhon, Tuv aimag, 2010 on

Indira Ghandi National Open University Distance Training on HCWM for 6 months

HCWM 3 day training, WHO Consultant, October, 2010

HCW Centralized Treatment Facility

1. UB city CTF

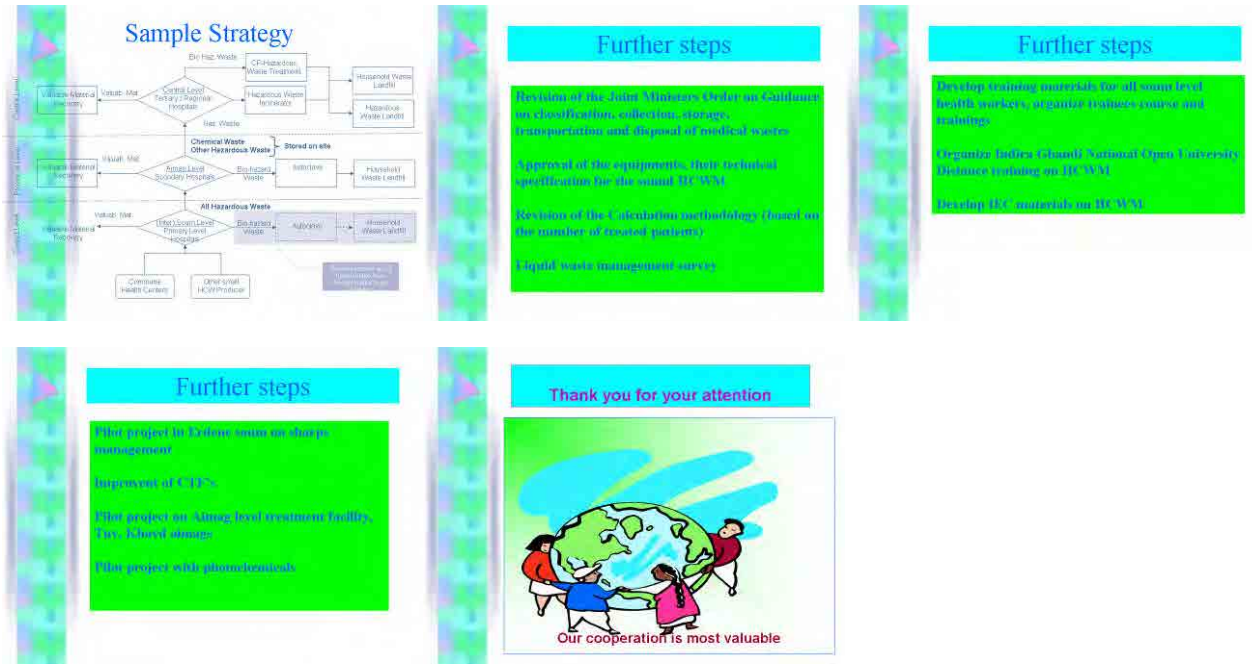
- Narangiin Enger new Disposal Landfill
- Agreement for cooperation and leasing of the equipment with Element Co., Ltd

2. Darkhan-Uul, Orkhon aimag HCW CTF

3. Tuv aimag Erdene soum pilot project on HCWM at soum level

3

Further activities to improve the HCWM



c.2 PROGRAM 2: Current Situation and Future Planning for hazardous waste management in Mongolia by MONET

Results of Preliminary Inventory of Hazardous Waste

Waste treatment method	Amount of hazardous waste
1. Incineration	7,994 ton/year
2. Reuse	1,354 ton/year
3. Disposal	998 ton/year
4. Treatment	455 ton/year
Total hazardous waste	10,801 ton/year

Measures

Drafting of methodology to establish human health and environment friendly disposal site and sample design drawings (Geo Ecology Institute, Academy of Sciences)

- Arkhangai
- Dornod
- Zavkhan
- Uvurkhangai
- Tuv
- Uvs
- Khovd
- Khuvsgul
- Darkhan-Uul

2010
- +4

Measures

- Solid Waste Master Plan (WB, NEMO-2 Project)
  - Khovd
  - Zavkhan
- 2010:
  - Other aimags

Feasibility Study and Basic Design of Hazardous Waste Disposal Facility

Annual capacity of hazardous waste treatment facility
- Incineration section
  - Incinerate 10,000 ton annually, and manufacture 200-250 kWt electricity power
- Physical and chemical treatment section
  - Physical and chemical treatment of 1,000 ton of waste
- Solidification and reinforcement section
  - 1,480 ton
- Landfill
  - Annual capacity is 3,930 ton. Lifetime is 10-12 years with 40,000m3 capacity
- Medical waste treatment section (disinfection)
  - 1,000 ton
- Waste recycling
  - 1,350 ton
- Storage
  - 8,000 ton
- Laboratory

Proposed locations

- Narangiin Enger
- Morin Davaa
- Buurlin Davaa

Landfill of waste contaminated with chemical pollutants

197,687 ton of sludge accumulated in 230 sites of 370 soums of 9 aimags has been detoxified (stabilization) and landfilled, and 128,444m2 area is cleaned

Elimination of poly chloride biphenyl containing waste

- Program on POPs
  - Stop the usage of equipment containing poly chloride biphenyl, and eliminate it by environmentally sound manner by 2020
- 2008-2012 Mongolia Government Action Plan
  - "Strengthening the capacity of reduction and monitoring of equipment waste containing poly chloride biphenyl" within the framework of the objective "to ensure environmental balance"
- "Capacity Building for Environmentally Sound PCBs Management and Disposal", UNIDO, 2009-2012
  - State Inventory of PCBs containing equipment
  - Laboratory
  - Cleaning technology

Current issues

1. Legal regulation on hazardous waste is insufficient
   - Laws and regulations are not sufficient
   - Not sufficient and not harmonized with each other
   - Insufficient implementation of laws and regulations (conditions for implementation of laws and regulations have not established yet)
2. Appropriate system for hazardous waste management is not established
   - No collection and separation system of hazardous waste
   - No special facilities for elimination, storage and disposal of hazardous waste
3. Hazardous waste is accumulated in large amount and stored in not appropriate facilities
   - Expired chemical substances, pesticides and their packages (20.2 ton of arsenic peroxide in former glass factory in Nalaikh District)
   - Waste discharged from factories that use chemicals (waste containing chromium generated from leather factories)
   - Sludge generated from industries and waste water treatment facilities
4. Environment degradation due to unregulated disposal of hazardous waste
   - Petroleum products waste, used oil
   - Batteries
   - Electronic parts, printers and their cartridges
   - Ash and filter oil
   - Construction material, paint, lacquer, asbestos
   - Packages of chemical substance and etc.
5. Waste incineration facilities do not meet requirements (medical waste incineration stove)

Future measures

- Improve legal environment on hazardous waste
- Improve waste management
- Establish hazardous waste elimination, storage and disposal facility

Thank you for your attention

c.3 PROGRAM 3: Household Hazardous Waste Management by JET

Household Hazardous Waste Management

November 3, 2010
JICA Expert Team for Strengthen the Capacity for SWM in Ulaanbaatar City Mongolia
Susumu SHIMURA

Outline of the Lecture

A) Household Hazardous Waste (HHW)
B) HHWM in Japan
C) HHWM in Ulaanbaatar City

A) Household Hazardous Waste (HHW)

1. What is Hazardous Waste (HW)?
2. What is Household Hazardous Waste (HHW)?

1. What is Hazardous Waste (HW)? (1)

- Law of Mongolia on Household and Industrial Waste defines hazardous waste (HW) as follows:

"*hazardous waste*" shall mean waste containing explosive, toxic, flammable, infectious, or actively reactive substances harmful to humans, livestock, animals or plants, and having potentially adverse impacts on progeny of humans, livestock, animals or plants, and disrupting environmental balance;

1. What is HW? (2)

- There is no specific categorization for HW by laws and regulation.
- HW may be categorized by the generation sources as follows:

1. Industrial (Factory) HW
2. Medical HW
3. Household (Municipal) HW
4. Construction HW
5. Agricultural HW

1. What is Household Hazardous Waste (HHW)?(1)

- EPWMD of MUB has drafted "Regulation for Waste Separation" which defines HHW as follows:
  - Household hazardous waste is waste that poses substantial or potential threat to public health or the environment which is generated from residential households. Household hazardous waste includes the followings => See next screen

1. What is Household Hazardous Waste (HHW)?(2)

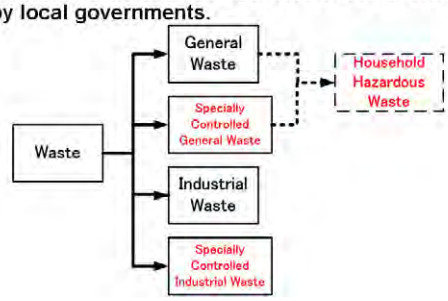
1. Paint and solvent
2. Automotive wastes (Used motor oil, antifreeze, tyre)
3. Pesticides
4. Mercury containing wastes (thermometers, switches, fluorescent lightings)
5. Electronics (PC, TV, cell phones) => WEEE
6. Aerosols (propane cylinders)
7. Caustics (cleaning agent)
8. Refrigerant containing appliances
9. Some special batteries (lithium, nickel cadmium, button cell batteries)
10. Ammunition
11. Radioactive waste (smoke detector)

B) HHWM in Japan

1. **Waste Categorization in Japan**
2. **HHWM in Japan**
3. **HHWM in Ome City**
4. **HHWM in USA**

1. Waste Categorization in Japan

- There is no specific categorization for HHW by law in Japan.
- HHW is included both categories of general waste and specially controlled general waste and managed by local governments.



2. HHWM in Japan

- Since there is no specific law on HHW except specially controlled general waste, *each local government (LG) manages it* by their own regulation.
- Generally some of HHW are managed by LG and some are subject to the management of dischargers.
- The reasons for the above-management may be:

1. Discharge amount of HHW is very little. => 0.16% of MSW in Ome City
2. There are so many kinds of HHW.
3. Proper disposal of them differs each other.
4. Proper disposal of HHW needs considerable cost.

3. HHWM in Ome City (1)

- Population: 140,000, Area: 103.3 km^2
- General Waste Collection Amount: A = 44,106 ton/year
- HHW Collection Amount: B = 71 ton/year
- A/B x 100 = 0.16 %
- HHW to be collected by the City: Dry-cell battery, fluorescent lamp, containers for flammables, etc.
- HHW to be managed by the Discharger: WEEE, Tyre, Car battery, Solvents, Waste oil, Chemicals, Paint, etc.

3. HHWM in Ome City (2): Location of Two Landfills in Tokyo

3. HHWM in Ome City (3): Offshore Landfill for 23 Wards of Tokyo (1): Bird's Eye View

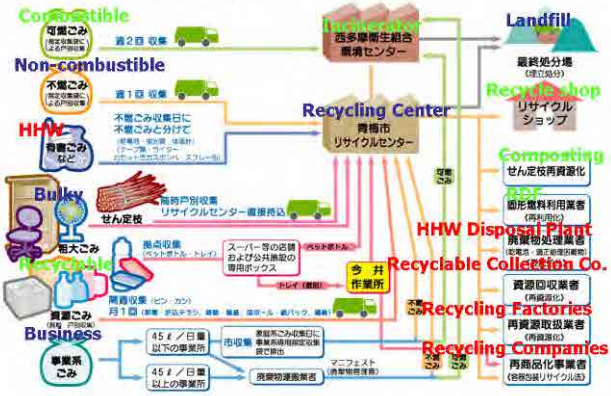
3. HHWM in Ome City (4): Offshore Landfill for 23 Wards of Tokyo (2)

平成13年の写真
新海面ブロックの建設工事が始まっている。(囲みの部分)
臨海トンネルと第2航路海底トンネルがつなぐ。平成14年4月開通(囲みの部分)

3. HHWM in Ome City (5): Inland Landfill for 26 Municipalities of Tokyo (1)

3. HHWM in Ome City (6): Inland Landfill for 26 Municipalities of Tokyo (2)

3. HHWM in Ome City (7): MSWM



3. HHWM in Ome City (8)

Fluorescent lamp containing mercury crushed and sent to previous mercury mining factory in Hokkaido

Dry-cell battery sent to Hokkaido

3. HHWM in Ome City (9)

Container for Aerosols sent to metal or plastic recycling after gas release

HHW for Shipping

3. HHWM in Ome City (10)

Day for HHW

Instruction for HHW

Waste Calendar for Higashi-Ome Area in Ome City

3. HHWM in USA (1)

- Environmental Protection Agency (EPA) of USA defines HHW in its web-site as follows:
  "Leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients are considered to be "HHW." Products, such as paints, cleaners, oils, batteries, and pesticides, that contain potentially hazardous ingredients require special care when you dispose of them. "
- EPA issues several publications on HHW to promote 3R and proper disposal of it.
- HHWM: A Manual for One-day Community Collection Programs provides a useful information for HHWM by local governments.

3. HHWM in USA (2)

- According to the Manual, the average US household generates more than 20 pounds (9 kg) of HHW per year.
- The local government (LG) provides collection sites for HHW.
- The discharger (residents) of HHW shall be requested to store it in its compound and bring it to a collection site. Then discharges it according to the category of HHW.
- Manufactures and distributors of household products, which becomes HHW, shall collect and recycle or treat it.

C) HHWM in Ulaanbaatar City (UBC)

1. **Hazardous Waste Management Study**
2. **HHWM in UBC**
3. **Recommendations**

1. Hazardous Waste Management (HWM) Study

- "The Feasibility Study of the Hazardous Waste Management Facility in Mongolia" (HWM Study) was completed in June 2009.
- The HWM Study reported the following HW generation in UBC:

1. Total HW: 10,801 ton/year
2. Hazardous medical waste: 284.7 ton/year
3. HHW: 58.4 ton/year (Note: 0.02 % of all MSW generation amount of 292,000 ton/year in 2010. 0.02 % is in the "Waste Characterization Study, UB Mongolia 2002 by WHO/MOH/city Inspectorate"

2. HHWM in UBC (1)

- HHWM has been not been established in UBC.
- EPWMD of MUB has drafted "Regulation for Waste Separation" which defines HHW.
- Most of HHW, which are not reused or recycled, are collected and disposed of at municipal landfill.
- Generation of HHW other than WEEE may be 0.16 ton/day (58.4 ton/year) by WHO rate of 0.02% to 1.28 ton/day (467.2 ton/year) by Ome City rate of 0.16%.

2. HHWM in UBC (2)

- Generation of WEEE in the country is 1,710 ton/year.
- It of UBC may be more than half of the 1,710 ton/year, i.e. 860 ton/year.

3. Recommendations (1)

- Proper hazardous waste management (HWM) is the highest prioritized issue.
- However, in terms of risks both quality and quantity of HHW is much less than other kind of HW such as industrial and medical HW.
- The priority of establishment of proper HWM shall be given to industrial and medical HW at this moment.
- The following aspects shall be considered for planning of proper management of HHW:

1. There are so many kinds of HHW.
2. Proper disposal of them differs each other.
3. Proper disposal of HHW needs considerable cost.

3. Recommendations (2)

- The priority of establishment of proper HHWM shall be given to higher risk ones, such as mercury containing waste, pesticides, etc.
- MUB may provide collection and storing sites for HHW. So that people will bring their HHW there.
- If proper treatment and recycling of those HHWM may not be possible, it should be stored until HW disposal facility will be operated.

Thank you very much for your attention!!!
Clean your City!!

c.4 PROGRAM 4: Current Situation and Future Planning for e-Waste in UBC by EPMWD/MUB

Program 4: Current Situation and Future Planning of WEEE management in Mongolia

EPWMD of MUB
Ms. Chantsalnurmaa

Agenda

1. Outline of the Survey
2. Current Condition of WEEE management system in UBC
3. Estimation of WEEE amounts in Mongolia
4. WEEE flow in Mongolia
5. Findings from the Survey
6. Future Planning for WEEE management in Mongolia

What is WEEE

- Waste Electrical and Electronic Equipment

1. Outline of the Survey

1. Objectives
- To understand the current way of discharge, recycle and disposal of WEEEs in UBC; and
- To identify the amount and the flow of WEEEs.

2. Scope of the Survey
- Target: TV, refrigerator, PC and washing machine.
- WEEE: EEEs which lifetime is over.

3. Duration
- 2 months (from 18 Jan 2010 to 18 Mar 2010)

4

Applied Methodology (1)

- Data collection:
  1. Qualitative Survey (Interview) =>
     Identification of current WEEE recycling system (the ways of discharge, collection and disposal; stages of WEEE flow)=20 respondents
  2. Quantitative Survey (Questionnaire) =>
     Identification of recyclables, amounts of treated WEEEs by recycling methods=58 cases
- Principles of data processing:
  1. Unit of WEEE amount: weight=kg or ton
  2. Total amount of WEEE=Imported EEE which lifetime was over in 2009
  3. Duration of lifetime: Assume same as those in Japan

5

Applied Methodology (2)

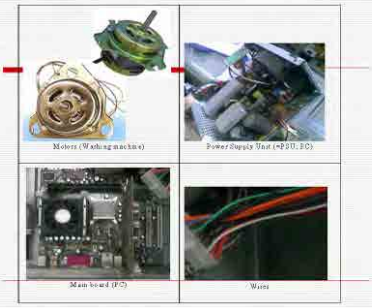
- Procedure to identify WEEE flow:
  1. Identification of WEEE Management System (process, way of recycling etc.) =>Description of WEEE Recycling Stages or Processes
  2. Identification of calculation factors to be used for estimation of amounts treated at each process of WEEE management
  3. Determination of annual WEEE amount in UBC
  4. Estimation of WEEE amounts treated at each processes of WEEE management=>(3)x(2)
  5. Identification of the WEEE flow.

6

2. Current Condition of WEEE Management System (1)

1. Recyclables and Non-Recyclables

	TV sets	Refrigerator	Washing machine	PC
Recyclables	PCB	Compressor	Motor	Main board items
	Choke coil	Iron cases	Iron cases	Some functional parts
	Wires	Wires	Wires	Power supply unit
				Processor case
				Wires
Non-recyclables	CRT	Rubber items	Plastic items	CRT monitor
	Plastic cases	Glass		Optical drives
		Plastic		Floppy drive
				Plastics & mixed items



WEEE Treating Processes

	Primary Process	Secondary Process	Tertiary Process	Quaternary Process	Final Process
Re-use	Resell	→	→	→	Use as EEEs
	Repair & Sell	→	→	→	
Recycle	Dismantle	Use as spare parts	→	→	Use for maintenance
		Sell as spare parts	Use as spare parts	→	
		First segregation	Sell metals	→	Export to China
		Discharge	Second segregation	Sell metals	
			Discharge	→	Landfill

10

WEEE Recyclers

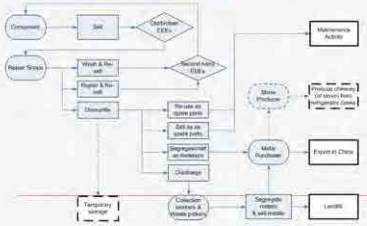
- Repair shops & Repairmen
- Collection workers & Waste pickers
- Metal purchasers

A refrigerator recycler at Narantuul zakh who repairs and resells old refrigerators.

A TV repair shop located in the central UB.

11

WEEE Flow in Mongolia



12

3. Estimation of WEEE flow in Mongolia

1. Samples of Analysis

- No. of Cases: TV-27; Refrig.-16; PC-11 & WM-12

Type of Survey	Target areas	Number of Questionnaires Distributed	Returned	Used for Analysis
Interview	Narantuul	4	4	4
	Khar khorin	5	5	5
	Subtotal	**9**	**9**	**9**
Questionnaire	BZD	18	18	11
	ChD	18	5	4
	SBD	18	18	11
	BGD	18	7	5
	KhUD	18	13	10
	SKhD	18	15	8
	Subtotal	**108**	**76**	**49**
	TOTAL	**117**	**85**	**58**

13

Assumptions for estimating WEEE amount

- An item on PCB (TV) occupies 1/6 in its weight based on questionnaire contents.
- Recycle rate of CRT equals to 20% based on interviews.
- The size of CRT monitors (PC) is 14 inches=>10 kg; Keyboard=0.5 kg (based on an experiment)
- Same parts of all EEEs dismantled by the same respondent are treated in same manners.
- Ave.weight of EEEs are assumed as same as those in previous survey in other countries.

14

Weight of each parts of EEEs per Unit

Unit: Kg

TV set		Refrigerator		Washing machine		PC	
Parts	Weight	Parts	Weight	Parts	Weight	Parts	Weight
PCB	1.65	Compressor	8.96	Iron scrap	23.12	Iron scrap	3.46
Plastic case	2.06	Case	10	Plastics	9.42	Power Supply Unit	0.8
CRT glass	10.16	Radiator	8.74	Glass	0.83	Plastics	0.59
Copper	0.76	Rubber hose	0.03	Aluminum	0.77	Mother board	1.16
Electric wire	0.51	Plastic	7.16	Copper	0.55	Hard disk*	0.46
Other scraps	2.81	Glass	0.16	Rubber gasket	0.53	Optical drive*	0.44
		Aluminum (fridge)	1.22	Electric wire	0.31	Monitor	10
		Electric wire	0.2	Concrete	11.92	Keyboard	0.5
		Rubber gasket	0.62	Particle board	1.05		
		Styrofoam	3.28				
Unit weight	17.45	Unit weight	40.37	Unit weight	45.48	Unit weight	17.41

Source: Kokusai Kogyo (Thailand) Co., Ltd, Report for Survey on Electrical and Electronic Waste (Complete Version), 2004

15

Reuse, Recycle and Disposed Amount in each WEEE

#			Basic parameters	Measure unit	TV Weight	TV Share in the total	Refrigerator Weight	Refrigerator Share in the total	Washing machine Weight	Washing machine Share in the total	PC Weight	PC Share in the total
1			Average unit weight of EEEs	kg	17.45		40.37		45.48		17.41	
2			Total amount of WEEEs	unit	181		111		40		28	
				kg	3158.45	100.0%	4481.07	100.0%	1819.20	100.0%	487.48	100.0%
3			Re-use Amount									
	1		Resell amount	unit	40		39		2		0	
				kg	698.00	22.1%	1574.43	35.1%	90.96	5.0%	0.00	0.0%
	2		Repair & resell amount	unit	81		50		27		8	
				kg	1413.45	44.8%	2018.50	45.0%	1227.96	67.5%	139.28	28.6%
			Sub total	unit	121		89		29		8	
				kg	2111.45	66.9%	3592.93	80.2%	1318.92	72.5%	139.28	28.6%
4			Dismantling Amount	unit	60		22		11		20	
				kg	1047.00	33.1%	888.14	19.8%	500.28	27.5%	348.20	71.4%
	1		Recycle Amount by repair									
		1	Re-use as spare parts	kg	140.22	4.4%	92.1	2.1%	125.81	6.9%	28.39	5.8%
		2	Sell as spare parts	kg	12.91	0.4%	34.82	0.8%	0.00	0.0%	8.11	1.7%
		3	Segregate & sell as materials	kg	11.24	0.4%	375.2	8.4%	151.08	8.3%	35.93	7.4%
			Sub total	kg	164.37	5.2%	502.12	11.2%	276.89	15.2%	72.43	14.9%
	2		Temporarily stored spare	kg	0.00	0.0%	0.00	0.0%	0.00	0.0%	5.80	1.2%
	3		Discharge Amount									
		1	Discharged recyclables	kg	33.12	1.0%	30.08	0.7%	25.06	1.4%	72.49	14.9%
		2	Landfill amount	kg	849.52	26.9%	355.94	7.9%	198.33	10.9%	197.49	40.5%
			Sub total	kg	882.64	27.9%	386.02	8.6%	223.39	12.3%	269.98	55.4%

16

Reuse, Recycle and Disposed Percentage in each WEEE

#	WEEEs at Recycling Stage	TV	Refrigerator	Washing machine	PC
1	**Total amount of WEEEs**	100.0%	100.0%	100.0%	100.0%
2	*Re-used Amount:*				
	Resell amount	22.1%	35.1%	5.0%	0.0%
	Repair & resell amount	44.8%	45.0%	67.5%	28.6%
	Total Re-used amount	66.9%	80.2%	72.5%	28.6%
3	**Amount of Dismantling**	33.1%	19.8%	27.5%	71.4%
4	Recycled Amount by repair shops:				
	Re-use as spare parts	4.4%	2.1%	6.9%	5.8%
	Sell as spare parts	0.4%	0.8%	0.0%	1.7%
	Segregated metals	0.4%	8.4%	8.3%	7.4%
	Total Recycled by Repair Shops	5.2%	11.2%	15.2%	14.9%
5	**Temporarily Stored Parts**	0.0%	0.0%	0.0%	1.2%
6	**Amount Discharged by Repair Shops**	27.9%	8.6%	12.3%	55.4%
7	**Amount Segregated by WP and CW***	1.0%	0.7%	1.4%	14.9%
8	**Landfill amount**	26.9%	7.9%	10.9%	40.5%

17

Duration of Lifetime for each EEE

	Items	TV set	Refrigerator	Washing machine	PC**
1	Lifetime period of EEEs (years)*	12	12	11	7
2	The year of necessary data for identification of WEEE amounts	1997	1997	1998	2002

*Source (for EEEs except PC): Interview survey conducted by METI covering 4,700 households in 1997

** Source (for Desktop PC): Interview survey conducted by Kokusai Kogyo (Thailand) Co., Ltd in 2003

Imported Amount of each EEE for estimation of WEEE amount in 2009

Years	TV set UN*	TV set Custom Office**	TV set Adapted Figure	Refrigerator UN	Refrigerator Customs office	Refrigerator Adapted Figure***	Washing machine UN	Washing machine Customs	Washing machine Adapted Figure	Desktop PC Customs office	Desktop PC Adapted Figure
1997	18,467		18,467	963		4,032	3,899				
1998	16,549			4,032			3,748		3,748		
1999	17,997			3,576			5,136				
2000	25,173			5,460			5,799				
2001	22,460	22,430		4,736	4,736		8,262	8,262		43,892	
2002	N.A.	33,971		N.A.	4,438		N.A.	11,888		60,589	60,589
2003	[illegible]	56,692		[illegible]	6,300		[illegible]	14,354		64,651	
2004	49,402	48,862		10,037	10,037		N.A.	23,439		75,558	
2005	41,140	41,074		5,198	5,198		N.A.	25,101		114,009	
2006	43,422	43,419		1,351	1,351		N.A.	31,495		224,695	
2007				32,375	32,476		N.A.	41,507		89,652	
2008				N.A.	35,182		N.A.	58,250		105,714	

*Source: UN Comtrade Trade Statistics Database, [illegible], accessed on 26 Feb 2010

**Source: Statistical Analysis Department, General Customs Office, Jan 2010

*** [illegible]

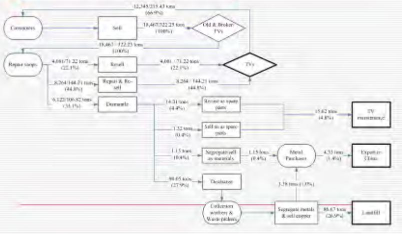
19

Estimated Reuse, Recycle and Disposed WEEE amount in 2009

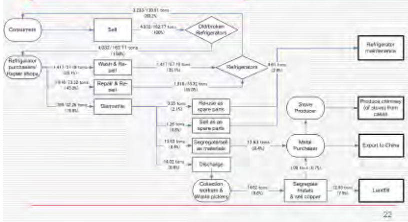
#	Stages of WEEE Recycling Cycle	Measure unit	TV Weight	TV Share in the total	PC Weight	PC Share in the total	Refrigerator Weight	Refrigerator Share in the total	Washing machine Weight	Washing machine Share in the total	Total WEEE Weight	Total WEEE Share in the total
1	Average unit weight of EEEs	ton	[illegible]		[illegible]		[illegible]		[illegible]			
2	Total amount of WEEEs	unit	[illegible]		[illegible]		[illegible]		[illegible]			
		ton	322.25	100.0%	1,054.85	100.0%	162.77	100.0%	170.46	100.0%	1,710.33	100.0%
3	*Re-used amount:*											
	Resell amount	unit	4,083		0		1,417		187			
		ton	71.22	22.1%	0.00	0.0%	57.19	35.1%	8.52	5.0%	136.93	8.0%
	Repair & resell amount	unit	[illegible]		17,311		1,816		2,530			
		ton	144.21	44.8%	301.39	28.6%	73.32	45.0%	115.06	67.5%	[illegible]	37.1%
	Total re-used amount	unit	12,345		17,311		3,233		2,717			
		ton	215.43	66.9%	301.39	28.6%	130.51	80.2%	123.58	72.5%	770.91	45.1%
4	Dismantled amount	unit	6,122		43,278		799		1,031			
		ton	106.82	33.1%	753.47	71.4%	32.26	19.8%	46.88	27.5%	939.43	54.9%
5	*Recycled amount by repair shops:*											
	Re-used as spare parts	ton	14.31	4.4%	61.41	5.8%	3.35	2.1%	11.79	6.9%	90.87	5.3%
	Sold as spare parts	ton	1.12	0.4%	17.55	1.7%	1.36	0.8%	0.00	0.0%	20.11	1.2%
	Segregated/sold as material	ton	1.15	0.4%	77.75	7.4%	13.68	8.4%	14.16	8.3%	106.68	6.2%
	Total recycled by repair shops	ton	16.77	5.2%	156.73	14.9%	18.34	11.2%	25.94	15.2%	217.68	12.7%
6	Temporarily stored spare parts	ton	0.00	0.0%	12.55	1.2%	0.00	0.0%	0.00	0.0%	12.55	0.7%
7	Amount discharged by repair shops	ton	90.05	27.9%	584.21	55.4%	14.02	8.6%	20.95	12.3%	709.22	41.5%
8	Amount segregated by WP and CW	ton	3.38	1.0%	156.86	14.9%	1.09	0.7%	2.35	1.4%	163.68	9.6%
9	Landfill amount	ton	86.67	26.9%	427.35	40.5%	12.88	7.9%	18.58	10.9%	545.53	31.9%

20

WEEE Flows for TV

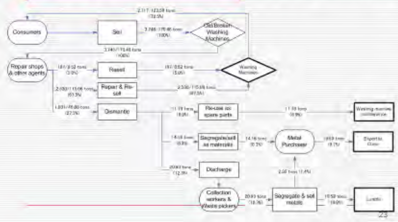


WEEE Flows for Refrigerator



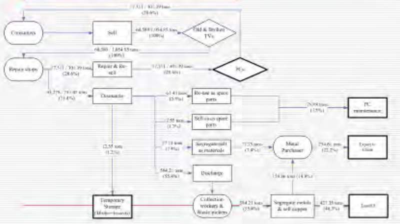
22

WEEE Flow for Washing Machines

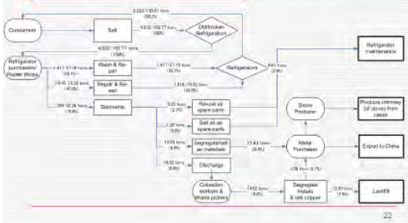


23

WEEE Flows for PC

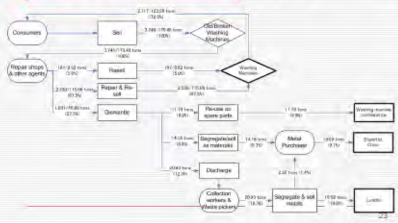


WEEE Flows for Refrigerator



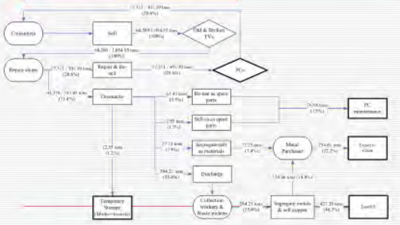
22

WEEE Flow for Washing Machines



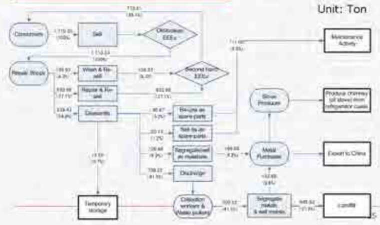
23

WEEE Flows for PC



Total WEEE Flows in Mongolia:

Unit: Ton



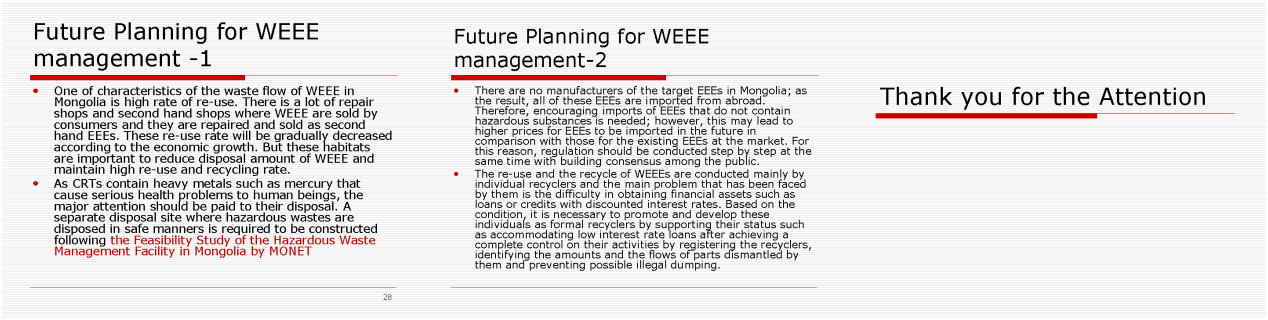
Findings from the Survey -1

- 45.1% in the total WEEE is re-used, 23.0% is recycled (including stored spare parts) and 31.9% is disposed.
- Re-use rate of each type of WEEE is usually high (ranging from 66.9% to 80.2%) except PC. As for PC, the indicator is only 28.6% since CRT monitors, which occupy the major part in the weights of PC, are usually impossible to re-use.

26

Findings from the Survey -2

- The most part of the total recycle rate calculated as 23% has been formed by the recycled amount of PC parts. Taking the PC out of account, the overall recycle rate falls to a value less than 10.0% of the total amount of WEEE. More than half of the recycled parts are sold metals and only the minority (6.5% in the total amount) is used for maintenance as spare parts.
- As mentioned above, the total disposed amount (landfill amount) occupies 31.9% in the total (545.53 tons). As the amount is estimated by weights of the disposed parts, the majority of the total disposed waste has been resulted from disposed CRTs of PCs and TV sets.



d. Content of Discussion

d.1 About Element Company:

Question (By attendant of SKhD PSD):

Whether Element Company possesses a special permission for operating the medical waste treatment facility or not? What kind of management is utilized to separate, collect, transport, incinerate and landfill the medical waste. Does the medical waste is separated at the generation sources or at Element Company?

Is it possible to treat other household hazardous waste such as aerosol, fluorescent lamps and others at the Element Company's waste treatment facilities?

Answer-1 (By Mr. Bayarsaikhan, Director of Element):

The company has started its operations in December 25, 2009. The main operations are to incinerate and disinfect the medical waste. It is considered as a pilot facility run by the Ministry of Health and Ministry of Environment. Since it is first-kind of operation in Mongolia, certainly, there are some errors during the implementation. Thus, we have received the WHO expert recently who had visited our facilities and will write his report and recommendations about the medical waste treatment operations conducted by our company. He noted that, at least, it is good that Mongolia has started such kind of operations that would contribute to the better monitoring system.

As for the separation, the medical institutions are separating anatomic or biological waste only. Others such as sharps, syringes and etc are not separated although, the medical institutions have been enrolled in various capacity development activities such as seminars (7-8) starting from this year.

The requirement of MOH, MONET and CSIA are to reduce the incineration of waste and do more disinfection by autoclave and landfill. In this framework, we are improving our equipment. We have ordered a new autoclave which will arrive about one month time, and we have made 11 mln MNT investment to renovate our incineration stove. So, that the technology would improve.

The company has not got any special permission. It has been operating based on the contract signed between the company and the MOH. The wastes the company transports to the facility are not separated.

Answer-2 (By Mr. Jargalsaikhan, MONET):

The MONET has not involved in selection of Element Company; the company has no EIA conducted, and therefore, we did not grant any special permission to the company.

Answer-3 (By Mr. Tsetsegsaikhan, MOH):

The selection of the operator for the facility was conducted by the MOH. The MOH has equipment rental agreement only with the Element Company. As there are no regulations on licensing contractors who operate such kind of facility (medical waste treatment facility), it has been difficult for us to grant a license to Element. In the future, the legal environment including the licensing should be improved. Currently, Element has been operating under a contract signed between the MOH and the company.

d.2 Hazardous waste to be generated from Tattoo activity:

Comment/Recommendation-1 (By Mr. Batdelger, SBD PSD):

Nowadays, many people have tattoo on their body. Although the waste to be generated from tattoo service is very hazardous, no survey or study has covered this activity and the amount of these wastes has not been identified. I suggest that tattoo service shops should be registered and hazardous wastes from this service should be identified. However, the expression “registration of tattoo services” does not mean licensing.

On the other hand, the WEEE survey presented here should have covered public organizations. Because public organizations are usually the biggest PC users and they have storing a large amount of PC wastes waiting permissions from their supervising organizations on disposal of the PCs.

Comment/Recommendation-2 (By Mr. Ariguun, EPWMD):

Before considering the waste from tattoo, we should identify each household hazardous waste and their impact or risks. Based on the recommendation by the JET to concentrate on the highest-risk wastes, we should decide which waste we pay attention to in order not to spent inefficient costs.

d.3 Recommendations to MONET by ChD PSD:

As for the management of hazardous waste, I want the MONET to take policy measures in advance and not afterwards. We have seen presentations about the polluted environment of Mongolia by mining companies which is going to take impact for quite a long period of time

in the future. Instead, the MONET should take measures that would prevent such kind of environmental pollutions. Also, the MONET raised the issue if funding for the hazardous waste disposal facilities. They say that Mongolia now has no problem with the money and investment (referring to the evening news on TV) from now on. They say Mongolia has embarked into the age of so-called Dutch Disease. So, those funds need to be utilized for such purposes and the Ministry has to ensure the usage of funds to finance above mentioned activities.

(Recorded by Gantumur. B)

A.5 Training Material: Waste Flow

Waste flow making guide

March, 2010

Japanese Expert Team

1

Generation Per Unit (GPU) for Household waste in 2006

Unit g/person/day	Winter	Summer
Apartment area	264	235
Ger area	956 =168 *1 + 788 *2	208

*1 Waste amount without ash from stove
*2 Amount of Waste of ash

2

The number of generation source (NGS) for House hold waste in 2006

- NGS for Household waste is Population.

	Apartment area	Ger area	Total
Population*	481037	409772	890809

* Except for Bagakhangai, Baganuur

3

Generation amount for Household waste in 2006

- GPU × NGS = Generation amount

Unit Tons/day	Winter	Summer
Apartment area	127.0	113.0
	264 × 481037	235 × 481037
Ger area	391.8	85.2
	956 × 409772	208 × 409772

4

Generation Per Unit (GPU) for Household waste in this year

Unit g/person/day	Winter	Summer
Apartment area	288 $= X_{\text{in 2006}} \times 1.03 \times 1.03 \times 1.03$	256 $= X_{\text{in 2006}} \times 1.03^3$
Ger area	971 $= X_{\text{in 2006}} \times 1.03^3$ +788	227 $= X_{\text{in 2006}} \times 1.03^3$

5

The number of generation source (NGS) for Household waste in this year

- NGS for Household waste is Population.

	Apartment area	Ger area	Total
Population*	406622	670607	1077229 (120.9% of population in 2006)

* Except for Bagakhangai, Baganuur

6

Generation amount for Household waste in this year

- GPU × NGS = Generation amount

Unit Tons/day	Winter	Summer
Apartment area	117.1	104.1
	288 × 406622	256 × 406622
Ger area	651.1	152.2
	971 × 670607	227 × 670607

7

Generation Per Unit (GPU) for Business waste in 2006

	Winter	Sumemer	Unit
Commercial Waste (Restaurant)	258	278	g /chair/day
Commercial Waste (Other Shop)	1,236	1,689	g /shop/day
Office Waste	134	185	g /employee/day
Market Waste	876	1,772	g /stall/day
School Waste	3.1	1.5	g /student/day
Hotel Waste	134	113	g /room/day
Business Total	-	-	-
Public Area Cleaning Waste	3.0	5.1	g /m2/day

The number of generation source (NGS) for Business waste in 2006

	NGS (Number of Generation Source)
Commercial Waste (Restaurant)	44,112 chairs
Commercial Waste (Other Shop)	3174 shops
Office Waste	111,172 employees
Market Waste	4593 stalls
School Waste	278,977 students
Hotel Waste	12,139 rooms
Business Total	-
Public Area Cleaning Waste	8,430,451 m2

Generation amount for Business waste in 2006

Unit : tons / day	Winter	Summer
Commercial Waste (Restaurant)	11.4	12.3
Commercial Waste (Other Shop)	3.9	5.4
Office Waste	14.9	20.6
Market Waste	4.0	8.1
School Waste	0.9	0.4
Hotel Waste	1.6	1.4
Business Total	36.7	48.2
Public Area Cleaning Waste	10.3	17.5

Generation Per Unit (GPU) for Business waste in this year

	Winter	Summer	Unit	Calculation
Commercial Waste (Restaurant)	282	304	g /chair/day	X 2016 ×1.03[3]
Commercial Waste (Other Shop)	1,350	1,846	g /shop/day	X 2016 ×1.03[3]
Office Waste	146	203	g /employee/day	X 2016 ×1.03[3]
Market Waste	957	1,936	g /stall/day	X 2016 ×1.03[3]
School Waste	3.4	1.5	g /student/day	X 2016 ×1.03[3]
Hotel Waste	146	123	g /room/day	X 2016 ×1.03[3]
Business Total			-	
Public Area Cleaning Waste	3.0	5.1	g /m2/day	X 2016 ×1.03[3]

11

The number of generation source (NGS) for Business waste in this year

	NGS (Number of Generation Source)	Calculation
Commercial Waste (Restaurant)	51,798 chairs	X 2016 × 1.055[3]
Commercial Waste (Other Shop)	3,727 shops	X 2016 × 1.055[3]
Office Waste	130,543 employees	X 2016 × 1.055[3]
Market Waste	5,394 stalls	X 2016 × 1.055[3]
School Waste	337,170 students	X 2016 × 120.9%
Hotel Waste	14,254 rooms	X 2016 × 1.055[3]
Business Total	-	
Public Area Cleaning Waste	4,146030 m2	X 2016 × 120.9%

12

Generation amount for Business waste in this year

Unit : tons / day	Winter	Summer
Commercial Waste (Restaurant)	14.6	15.7
Commercial Waste (Other Shop)	5.0	6.9
Office Waste	19.1	26.5
Market Waste	5.2	10.4
School Waste	1.1	0.5
Hotel Waste	2.1	1.8
Business Total	47.1	61.8
Public Area Cleaning Waste	12.4	21.1

13

Generation amount for Industrial waste in 2006

- Medical Waste : 16.8 tons / day
- Factory Waste : 67.9 tons / day
- Construction Waste :
  60.6 tons / day in winter
  123.0 tons / day in Summer

* Please refer to attachment for detail.

14

Generation amount for Industrial waste in this year

- Medical Waste : 20.4 tons / day
  By Population Rate (120.9%)
- Factory Waste : 79.6 tons / day
  $=X_{2006} \times 1.055^3$
- Construction Waste :
  93.9 tons / day in winter
  375.5 tons / day in Summer

* Please refer to attachment for detail.

15

Recycled waste amount in 2006

Unit : tons / day	Winter	Summer
Recycling Activity from MSW	5.3 (1.0 % of Generation from MSW)	5.6 (2.2 % of Generation from MSW)
Recycling Activity from Landfill site	11.2 (2.0 % of Generation from MSW)	11.7 (4.4 % of Generation from MSW)

A.6 Training Material: Time and Motion Survey

How to conduct time & motion survey

March, 2010
Japanese Expert Team

1

Objectives

- To know the current situation of waste collection system in order to improve it.

  From How organization, How much of waste, How, When Do they collect ?
  And how about its frequency ?
- To know the amount of recyclables collect by collection worker.

2

Outline of survey

1.	**Method**	To record the all activities to trace the waste collection vehicle
2.	**Duration**	1 week
3.	**Target**	A waste collection vehicle running at Target area
4.	**Target area**	A khoroo needed to achieve the purpose of survey
5.	**Recorded items**	Specification of vehicle, Contents of work, time, amount of waste collected, collection point, collection rout, etc.

3

1. Recording

4

1.recording

Materials should be prepared

- Basic information sheet
- Recording of activities sheet
- Recording recyclables dealt sheet
- The map of target area
- Others needed

5

1.recording

Basic information sheet

- It is used to calculate the volume of waste

Date	17th April 2010
District	Sukhbaatar
Khoroo	5
Type of Collection Truck	Compactor truck
Registration Number	UNB 2354
Year Made	1997
Volume	7.0 m3
Capacity	3 tons
Volume of compaction hopper	0.4 m3
Crew	Driver: Galbadrakh, Collection worker: Tulgaa, Bayaraa
Name of Company	Emergency Unit
Trip Number	5
Wastes weighed on weigh bridge of NEDS	3,040 kg

1.recording

Basic recording sheet (1)

- Items should be recorded

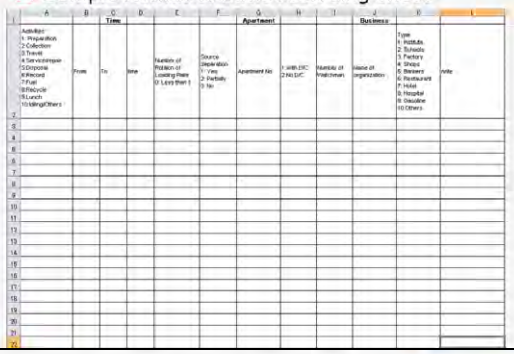
Activities: 1: Preparation 2:Collection 3:Travel 4:Service/repair 5:Disposal 6:Record 7:Fuel 8:Recycle 9:Lunch 10:idiling/Others	Time	Number of rotation of loading Plate 0: Less than 1	Apartment No.	D/C 1:Yes 2:No	Number of Watchman	Name of organization	Type 0: apartment 1: Institute 2: Schools 3: Factory 4: Shops 5: Barbers 6: Restaurant 7: Hotel 8: Hospital 9: Gasoline 10:Others	Number on map

7

1.recording

Basic recording sheet (2)

- Sample format of basic recording sheet



1.recording

Basic recording sheet (3)

- Sample of sheet filled by hand-writing

9

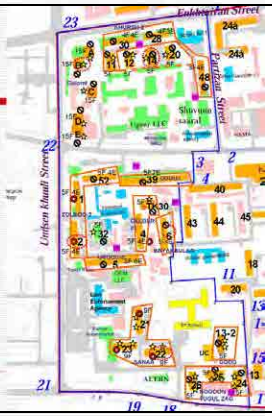
1.recording

Recording recyclables dealt sheet

Date	17th march 2010	
Trip no	3rd trip, Total weight 3,064 kg	
	price	weight
Glass	1000 tg	* Have to calculate
Plastic	590 tg	1.80 kg
Colored plastic	230 tg	1.80 kg
bone	640 tg	21.30 kg
can	0 tg	0.00 kg
paper	1890 tg	27.00 kg
iron	0 tg	0.00 kg
brass	1440 tg	0.38 kg
alloy	530 tg	1.06 kg
Total	**6320 tg**	**53.34 kg**

The map of target khoroo

- It is used to be point the collection point on its and to specify the collection route on target area.



1.recording

Others needed

- Camera
  It is used to record the situation graphically in order to get the amount of waste and to show other people its situation.
- Measure
  It is used to measure the volume of wastes on container and D/C for collection by dump truck and the volume of body of collection vehicles.

12

2. Analyzing

13

2.Analyzing

Products of survey

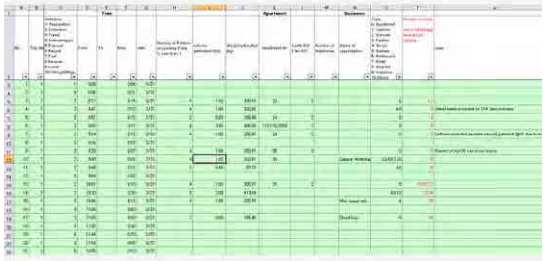
- Time and motion sheet
- The map of collection route
- The income list of recyclables

14

2.Analyzing

Time and motion sheet (1)

- To input the data recorded to excel format



2.Analyzing

Time and motion sheet (2)

- Calculation method of waste amount on each collection point (1)

Formula

A / B × C = D

A	Number of rotation at the collection point
B	Total Number of rotation on this trip
C	Wastes weighed on weigh bridge of NEDS
D	Wastes amount on the collection point we would like to know

16

2.Analyzing

Time and motion sheet (3)

- Calculation method of waste amount on each collection point (2)

Example

No.	Trip No.	Activity	From	time	date	Number of Rotation of Loading Plate	Weight estimated (kg)	Apartment No
5	1	Collection	8:51	00:12	3/31	2	165.45	24
Total	1					44	3,640	

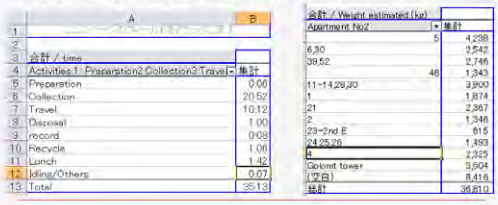
2 / 44 × 3,640 kg = 165.45 kg

17

2.Analyzing

Time and motion sheet (4)

- Making tables by collection time, waste amount from apartment and business entities or anything we want by using pivot table, excel function



18

2.Analyzing

Time and motion sheet (5)

- For example, it is possible to make table like this using the result of analysis

	Collection Point	daily (kg/day)	Rate	population	per unit (kg/day/person)
D/C	1	287	12%	790	0.36
	2	427	17%	834	0.51
	Sub Total	714	29%	1,624	0.44
Non D/C	23	181	7%	635	0.28
	24	206	8%	654	0.31
	30	193	8%	524	0.37
	31	208	8%	525	0.40
	33	82	3%	258	0.32
	38a	182	7%	330	0.55
	41,59	87	4%	411	0.21
	Sub Total	1,734	71%	5,837	0.30
	Total	2,448	100%	7,461	0.33

2.Analyzing

Time and motion sheet (6)

- For example, it is possible to make table like this using the result of analysis

		3/31 (wed)	4/1 (thu)	4/2 (fri)	4/3 (sat)	4/4 (sun)	4/5 (mon)	4/6 (tue)
D/C	1				10:11			
	2							10:30
	33				8:55			
Non D/C	23	8:27		9:25			9:34	
	24	9:02		9:55			10:19	
	115,116,29,58	9:03		10:08			10:39	
	30	9:36	Holiday	10:24		Holiday	11:02	
	31	10:01		10:47			14:14	13:51
	37a	13:49		13:45			14:44	
	37b,38b,40,57	14:05		13:59			15:08	
	41,41a,59	14:52		14:29			15:35	
	D8	15:12		14:50			15:51	
	38a	15:45		15:28			15:58	

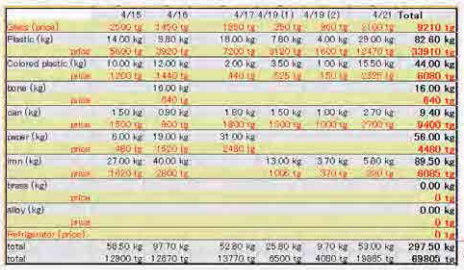
The map of collection route

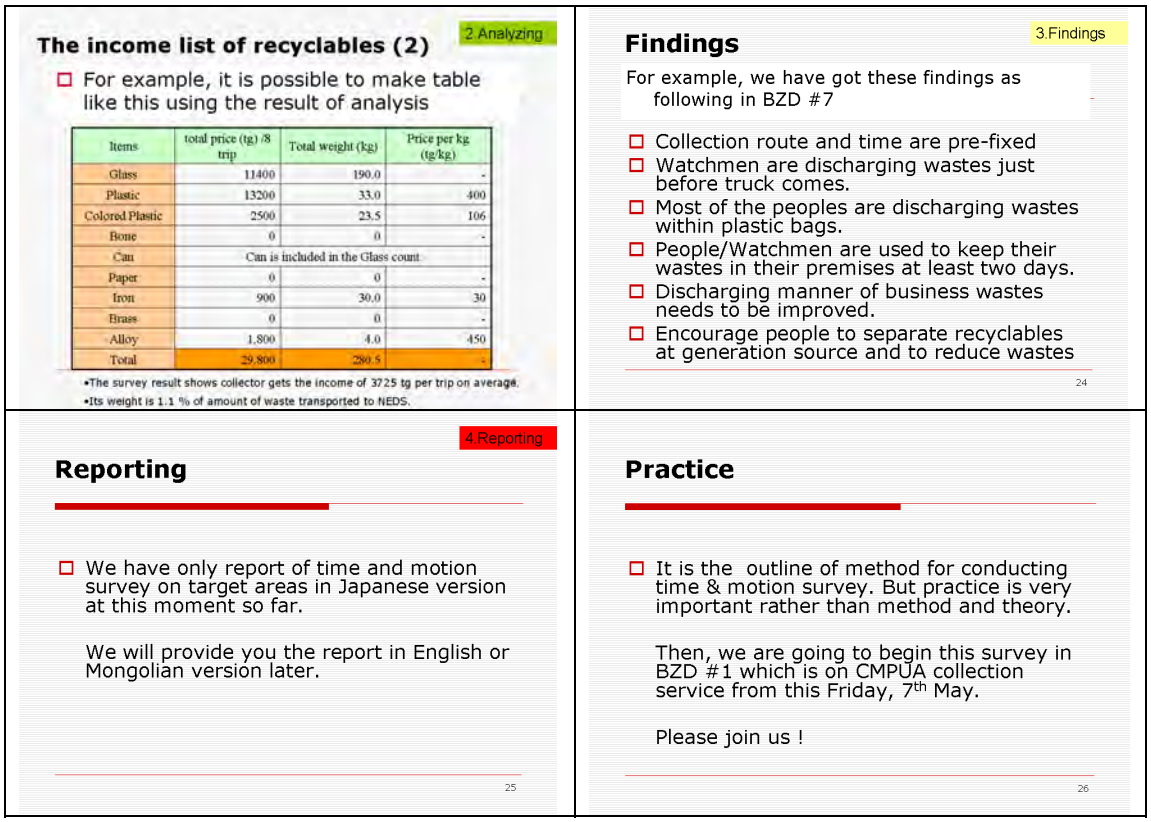
- It is possible to overwrite collection point and some explanation to the original map which each khoroo has.
- This map, windows meta file allow to us modifying it on power point.

2.Analyzing

The income list of recyclables (1)

- To input the data recorded to excel format





2.Analyzing

The income list of recyclables (2)

- For example, it is possible to make table like this using the result of analysis

Items	total price (tg) /8 trip	Total weight (kg)	Price per kg (tg/kg)
Glass	11400	190.0	-
Plastic	13200	33.0	400
Colored Plastic	2500	23.5	106
Bone	0	0	-
Can	Can is included in the Glass count		
Paper	0	0	-
Iron	900	30.0	30
Brass	0	0	-
Alloy	1,800	4.0	450
Total	29,800	280.5	-

•The survey result shows collector gets the income of 3725 tg per trip on average.
•Its weight is 1.1 % of amount of waste transported to NEDS.

3.Findings

Findings

For example, we have got these findings as following in BZD #7

- Collection route and time are pre-fixed
- Watchmen are discharging wastes just before truck comes.
- Most of the peoples are discharging wastes within plastic bags.
- People/Watchmen are used to keep their wastes in their premises at least two days.
- Discharging manner of business wastes needs to be improved.
- Encourage people to separate recyclables at generation source and to reduce wastes

24

4.Reporting

Reporting

- We have only report of time and motion survey on target areas in Japanese version at this moment so far.

  We will provide you the report in English or Mongolian version later.

25

Practice

- It is the outline of method for conducting time & motion survey. But practice is very important rather than method and theory.

  Then, we are going to begin this survey in BZD #1 which is on CMPUA collection service from this Friday, 7th May.

  Please join us !

26

A.7 Law and Regulation concerning about waste management in Mongolia

No	Law and Regulation relating to SWM	Category	Year	Status				2012年4月11日確認
				DRAFTED	Comments collected	City Mayor Board Meeting	Approval by City Council	
	Schedule in 2010							
1	Revision of WSF Regulation	WSF	2010	○	○	○		Draft version has been created and already submitted to City Mayor Board Meeting. It is planned that it will be reviewed and revised after "Law on Household and Industrial Waste" has been revised.
2	Revision of Current Fee Tariff	Fee	2010					City Mayor directed EPWMD to review tariff of waste collection service fee. Concequently our project has created "Guideline on Estimation of appropriate waste collection fees".
3	Provisional Regulation on Chemicals, Toxic and hazardous substances	Hazardous Waste	2010	○				It has not been drafted.
4	Amendment of Law on Household and Industrial Waste	Law	2010					The draft of "Law on Waste" which integrated current 3 laws of "Law on Household and Industrial Waste", "Law on Export and Prohibition of Import and Trans-boundary Transportation of Hazardous Waste" and "Law on Prohibition of Ultra Thing Plastic Bag" has been submitted to congress throughout central government. The law was enacted at May 2012. (* investigated August 2012)
5	Regulation of Waste Collection and Transportation	Waste Collection	2010	△				EPWMD is investigating to draft
6	Regulation on Selection, Evaluation and Financing of Waste Collection Organizations	Waste Collection	2010	○				EPWMD planned to draft it as "Law on waste" was enacted.
7	Regulation on Waste Separation	3R	2010	○	○	○		EPWMD is drafting it.
8	Law to Impose an Import Tax on Products that can not be reused	Law	2010	○				EPWMD has not been authorized to formulate laws. EPWMD has submitted the draft of "Proposal to Impose an Import Tax on Products that can not be reused" to MONET. MONET has been preparing a draft for "Law on Eco-Tax" based on the draft submitted by EPWMD.
9	Ordinance, Regulations, Instructions and manuals related to the Introduction of 3Rs	3R	2010					Basic policy of the one has been applied to "11. Waste Reduction Program"
10	Regulation on Activities related to car servicess and maintenance shops, washing pit, shops that sell oil and lubricant	Business Waste	2010					It is not investigated since it is not important for revision of institutions of SWM of M/P
11	Waste Reduction National Program	3R	2010					MONET has drafted. However currently they did not submit to central government because "Law on Household and Industrial Waste" will be revised. They planned to modify and submit the draft to the authority as the new law was approved.
12	Guidelines to inspect operation of NEDS of waste management division of CMPUA under Mayor's Office of UBC	Landfill	2010	○				The one has been created in cooperation between JET and EPWMD and we begun the implementation from 20th
	Schedule in 2011							
1	Regulation on Activities related to car servicess and maintenance shops, washing pit, shops that sell oil and lubricant	Business Waste	2011	○				It is not investigated since it is not important for revision of institutions of SWM of M/P
2	Regulation on activities of organizations, companies and individuals in the Sukhbaatar Square	Business Waste	2011	○				It is not investigated since it is not important for revision of institutions of SWM of M/P
3	Regulation on collection, sorting, selling and purchase of secondary raw materials	3R	2011	○				EPWMD is drafting it.
4	Amendment of Regulation on Certification of Toxic Chemicals and Hazardous Waste	Law	2011					MONET has created the original draft and it was approved by central government 4th Oct 2012. However no action has been taken after that.
5	Regulation on Collection and Trasnportation	Waste Collection	2011	○				EPWMD is investigating to draft.
6	Regulation on Delivery of Construction Waste to Final Disposal Sites	Business Waste	2011	○				EPWMD drafted and it has been submitted to city council throughout city mayor.
7	Examine the possibilities to increase household waste fee tariff in Baganuur, Bagakhangai, and Nalaikh Districts and amend Resolution No182	Fee	2011	○				It is not investigated since it is not important for revision of institutions of SWM of M/P
8	Regulation to collect waste generation fees from Ger area households and to follow for financial operations	Fee	2011	○	○	○		This is a regulation that determined authorities collect waste collection service fee from residents together with their electricity bill. The regulation was promulgated 17th Jun 2011 and enacted 1st Jul.

SECTION B
Activities for Operation and Maintenance of Equipment

B Activities for Operation and Maintenance of Equipment

B.1 Procurement of Spare Parts

B.1.1 List of Parts Distributors

1. Mitsubishi Fuso Truck and Bus Corporation
Shenzhen Zhanbao Industrial Development Co., LTD.
Mr. Jianlin Huang (Director)
E-mail Address: zb@szzb.cn
Address: Northern Xinyi Autocity, Heng Gang, Long Gang strict, ShenZhen.
Tel: 86-755-89738868, 89738899, 89738833

2. Isuzu Motors
Local Distributor: KHET Company (Official Toyota Distributor)
Responsible person: Mr. Tumurkhuyag, Service Manager (mobile phone: 9911 7164)
Mr. Battugs, Officer for Spare Parts (mobile phone: 9911 9802)

3. ShinMaywa
Contact person in Japan (communicate by English or Japanese)
Mr. Keiji Yamanaka
E-mail Address: yamanaka.k@sb.shinmaywa.co.jp
Fax: +81-45-575-9837
Tel: +81-45-584-1321
Bank account:
The Bank of Tokyo-Mitsubishi UFJ,Ltd. Osaka Main Office
5-6, 3Chome, Fushimimachi, Chuo-Ku, Osaka, Japan
Savings Account No.7224
Swift Code : BOTKJPJT
Account Name : ShinMaywa Industries, Ltd.

4. Komatsu
Local Distributor: KOMIT SERVICE Company (Official Komatsu Distributor)
Responsible person: Mr. Damdinpurev, Service Manager (mobile phone: 9909 1029)
E-mail Address: damdinpurev_komit@komatsu.mn
Ms. Ganchimeg, (Office phone: 341 415)

5. Case
Local Distributor: MSM Company (Official Case Distributor)
Responsible person: Mr. Mark Gabel, General Manager of Automotive Department
(mobile phone: 9909 0744)
Mr.Unurbayar, Officer for Spare Parts (office phone: 7014 8141)
Office phone: 318 138
E-mail Address: mark.gabel@msmco.net

B.1.2 Spare Parts Order Sheet (for Shinmaywa Industries Ltd.)

a. Request for Quotation

見積依頼書/ Нэхэмжлэх хүсэх тухай

No.
日付/
Огноо

新明和工業株式会社/ ШинМэйва ХХК

山中様/К.Яманака

Факс: + 81-45-575-9837

社名/Компанийн нэр
住所/Шуудангийн хаяг
電話番号/Утас
Ｆａｘ番号/Факс
Ｅメール/E-mail

下記の見積・納期の連絡をお願いいたします。
Дараах сэлбэгийн захиалгын үнэ, Монгол руу илгээх боломжит огноог мэдэгдэнэ үү.

	部品名 Сэлбэгийн нэр	部品番号 Сэлбэгийн дугаар	数量 Тоо ширхэг	備考 Тайлбар
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

希望納期/Хүлээн авах боломжит огноо	
送付先/Илгээх хаяг	

b. Spare Parts Order Form

部品発注書/ Сэлбэгийн захиалга

No.

日付/
Огноо

新明和工業株式会社/ ШинМэйва ХХК

山中様/К.Яманака

Факс: + 81-45-575-9837

社名/Компанийн нэр

住所/Шуудангийн хаяг

電話番号/Утас

Ｆａｘ番号/Факс

Ｅメール/E-mail

下記の部品を注文いたします。/ Дараах сэлбэгийн захиалгыг үүгээр хийж байна.

	部品名 Сэлбэгийн нэр	部品番号 Сэлбэгийн дугаар	数量 Тоо ширхэг	単価 Нэгж үнэ	金額 Нийт үнэ
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
	合計金額 / Нийт үнийн дүн				

希望納期/ Хүргүүлэх огноо	
送付先/Илгээх хаяг	

B.2 Presentations and Training Materials

B.2.1 Training on Maintenance of Collection Trucks

Investigation of condition of collection trucks
Engine oil viscosity
TS-3 HPD
Truck Synthetic
W40 Mineral
MANNOL
Volume:208L
Date:2009.06.26
Batch No.:14702
GSFED0M65
10
Investigation of condition of collection trucks
Gear oil viscosity
GEAR OIL VISCOSITY CHART
GEAR OIL VISCOSITY GRADE – AMBIENT TEMPERATURE
SAE 140
SAE 90
SAE 80W
SAE 75W
SAE 80W-90
SAE 80W-140
Investigation of condition of collection trucks
Gear oil viscosity
Mobil
Mob lub
LS
Investigation of condition of collection trucks
Hydraulic system (1)
3
Investigation of condition of collection trucks
Hydraulic system (2)
4
Investigation of condition of collection trucks
Hydraulic system (3)
Cause
•Critical temperature : Below +10°C
1) The hydraulic oil becomes so "Stiff"
→"Churned up" the pump is damaged due to resultant cavitations.
2) Oil heater
→ Working condition. Poor or Not?
More than 30minute heating, start the bubbles in oil
15
Investigation of condition of collection trucks
Hydraulic system (4)
Countermeasure
1. Warming up engine running idle and the PTO ON position.
2. Keep the trucks in side of the warm garage.
Sukhbaatar and Chingeltei
3. Do not loading Ger waste and construction waste
16
Fuel Consumption in Winter 25liter/100km?
☐ Warm up Engine
☐ Warm up hydraulic Oil
☐ Heating up Cabin
☐ Fuel Consumption in Winter should be more than in Summer
☐ Good for Engine! Good for Hydraulic Pump! Good for Cylinder! Good for Worker! Good for Company!
17
Counter Measures for Insulating Cylinder
18

Investigation of condition of collection trucks
Hydraulic system (5)

3-2 Loading Cycle

(1) Turning back

(1) Throw refuse in the hopper and operate the loading control lever into [LOAD] position. The press plate begins to turn back from the position shown.

(2) Lowering

(2) The press plate lowers and crushes refuse by pressing against the bottom plate of the hopper.

Investigation of condition of collection trucks
Hydraulic system (6)

(3) Compressing

(3) The press plate turns forward to raise refuse in and compresses it against the front plate of the bottom of the hopper.

(4) Rising

(4) While crushing, the press plate rises with refuse and packs it into existing refuse in the body. After refuse is compressed into the body, the press plate returns to the step (1) and repeats the subsequent steps of loading.

Investigation of condition of collection trucks
Hydraulic system (7)

21

How to keep good condition of your trucks?

Countermeasures ⇐ Reporting

How to report?

Drivers = Daily operation and maintenance report

Engineers = Monthly operation and maintenance report

23

How to keep good condition of your trucks?

Driver = Daily operation & maintenance report

Mechanic = Monthly operation & maintenance report

Engineer = Quarter operation & maintenance report

Senior officer = Input for DATABASE

Budget → Salary, Spare parts, Fuel, Repairing

24

Investigation of condition of collection trucks
Tire and puncture

22

Daily operation and maintenance report
-Daily maintenance report-

26

Monthly operation and maintenance report

27

Daily operation and maintenance report
-Daily operation report-

25

Monthly operation and maintenance report

АШИГЛАЛТ БА ҮЙЛЧИЛГЭЭНИЙ САРЫН ТАЙЛАН

Үйлчилгээний агуулга	1	Үйлчилгээ (Тогтмол, Тоуд, Угаа	6	Перда диск, Кробка, Сэнс, Диффцл
	2	Мотор (Радиатор, Усны помп, Реме	7	Амортизатор, Пүрш
	3	Түлш (Түлшний насос, Форсунк	8	Тормоз (Урд, Хойд, Зогсоолын)
	4	Цахилгаан (Стартер, Генератор	9	Дугуй (болт, гайка), хагарах
	5	Гидр (Насос, Цилиндр)	10	Бусад

Үйлчилгээ												
Нийт хэдэн удаа засвар үйлчилгээ хийсэн, төрлөөр										Ажилласан цаг	Ажилласан хүний тоо	Засварын өртөг
1	2	3	4	5	6	7	8	9	10			

28

МИЦУБИШИ маркийн машины жолооч өдөр тутам машиндаа шалгаж байх ёстой зүйлүүдийн хяналтын хуудас

Хяналт хийх байрлал		№	Агуулга	Тэмдэглэл
Машины нүүрэн хэсэг	Урд тал	1	Гэрэлтүүлэх эд ангийн байдал	
		2	Машины улсын номер, шил арчигч болон гадна талын толь	
		3	Консны шингэн болон тосолын түвшинг шалгах	
		4	Шил арчигчийн шингэний түвшинг шалгах	
	Урд талын доод хэсэг	5	5. Моторын тос гоожсон эсэх	
		6	Тормосны шингэн гоожсон эсэх	
		7	Радиаторын тосол гоожсон эсэх	
		8	Хүрд (руль)-ийн шингэн гоожсон эсэх	
		9	Гидрийн шингэн гоожсон эсэх	
		10	Дизель түлш гоожсон эсэх	
Машины зүүн тал	Зүүн тал	11	Зүүн талын урд дугуй	
		12	Зүүн талын урд нум	
		13	Гидрийн шингэний түвшин шалгах	
		14	Түлшний тунгаагчийг шалгах	
		15	Хүч дамжуулах эд ангийн (хурдны хайрцаг) тос гоожсон эсэх	
		16	Шахах төхөөрөмжийн цилиндрийг шалгах	
		17	Зүүн хойд дугуй	
		18	Зүүн хойд нум	
Машины ар тал	Ар тал	19	Гэрэлтүүлэх эд ангийн байдал	
		20	Машины улсын номер	
	Доод хэсэг	21	Дифференциалаас тос гоожсон эсэх	
Машины баруун тал	Баруун	22	Шахах төхөөрөмжийн цилиндрийг шалгах	
		23	Баруун хойд дугуй	
		24	Баруун хойд нум	
		25	Тормосны шингэн гоожсон эсэх, түүний түвшинг шалгах	
		26	Хийн баллоны тундасыг гаргах	
		27	Аккумлятор шалгах	
		28	Моторын тосны түвшинг шалгах	
		29	Консны цилиндрээс тос гоожсон эсэх	
		30	Баруун урд дугуй	
		31	Баруун урд нум	
Машины кабин дотор		32	Жолоодох нөхцөл (орон зай) бүрдсэн эсэх	
Машины урд талд	Бухзэгний урд болон дээд хэсэг	33	Бухзэг өргөхөд хангалттай орон зай байгаа эсэх	
Машины баруун талаас	Бухзэг өргөсний дараа	34	Машины бухзэгийг өргөөд, бэхэлгээний гол төмрийг цоожилсон эсэхийг шалгах	
	Моторын хэсэг	35	Тосолын шингэн гоожсон эсэх	
		36	Тос гоожсон эсэх (моторын тос, хүрд (руль)-ийн гидрийн шингэн)	
		37	Сэнсний байдлыг шалгах	
		38	Хүрд (руль)-ийн шингэний түвшинг шалгах	
	Бухзэг буулгасны дараа	39	Бухзэгийг буулгаад, цоожилсон эсэхийг шалгах	
Ерөнхий байдал		40	Машины ерөнхий байдлыг шалгах	

29

ИСУЗУ маркийн машины жолооч өдөр тутам машиндаа шалгаж байх ёстой зүйлүүд

Хяналт хийх байрлал		№	Агуулга	Тэмдэглэл
Машины нүүрэн хэсэг	Урд тал	1	Гэрэлтүүлэх эд ангийн байдал	
		2	Машины улсын номер, шил арчигч болон гадна талын толь	
		3	Конс болон шил арчигчийн шингэний түвшинг шалгах	
	Урд талын доод хэсэг	4	Моторын тос гоожсон эсэх	
		5	Тормосны шингэн гоожсон эсэх	
		6	Радиаторын тосол гоожсон эсэх	
		7	Хүрд (руль)-ийн гидрийн шингэн гоожсон эсэх	
		8	Гидрийн шингэн гоожсон эсэх	
		9	Дизель түлш гоожсон эсэх	
Машины зүүн тал	Зүүн тал	10	Зүүн урд дугуй	
		11	Зүүн урд нум	
		12	Гидрийн шингэний түвшин шалгах	
		13	Агаарын шүүгчийн индикаторыг шалгах	
		14	Түлш тунгагчийг шалгах	
		15	Хүч дамжуулах эд анги (хурдны хайрцаг)-аас тос гоожсон эсэх	
		16	Шахах төхөөрөмжийн цилиндрийг шалгах	
		17	Зүүн хойд дугуй	
		18	Зүүн хойд нум	
Машины ар тал	Ар тал	19	Гэрэлтүүлэх эд ангийн байдал	
		20	Машины улсын номер	
	Доод хэсэг	21	Диференциал (редуктор)-аас тос гоожсон эсэх	
Машины баруун тал	Баруун	22	Шахах төхөөрөмжийн цилиндрийг шалгах	
		23	Баруун хойд дугуйн	
		24	Баруун хойд нум	
		25	Аккумлятор шалгах	
		26	Тормосны шингэн гоожсон эсэх, түүний түвшинг шалгах	
		27	Хийний баллоны тундасыг гаргах	
		28	Моторын тосны түвшинг шалгах	
		29	Тосолын түвшинг шалгах	
		30	Консны цилиндрээс тос гоожсон эсэх	
		31	Баруун урд дугуй	
		32	Баруун урд нум	
Машины кабин дотор	Жолооны ард	33	Жолоодох нөхцөл (орон зай) бүрдсэн эсэх	
Машины урд тал	Бухзэгний урд болон дээд хэсэгт	34	Бухзэг өргөхөд машины урд талд болон дээр нь хангалттай орон зай байгаа эсэх	
Зүүн	Машины бухзэг өргөсний дараа	35	Машины бухзэг өргөөд бэхэлгээний гол төмрийг цоожилсон эсэхийг шалгах	
	Моторын хэсэг	36	Тосолын шингэн гоожсон эсэх	
		37	Тос гоожсон эсэх (моторын тос, рулийн гидрийн шингэн)	
		38	Сэнсний байдлыг шалгах	
		39	Рулийн гидрийн шингэний түвшин	
	Машины бухзэг буулгасны дараа	40	Бухзэг буулгаад цоожилсон эсэхийг шалгах	
Ерөнхий байдал		41	Машины ерөнхий байдлыг шалгах	

30

The end

31

B.2.2 Seminar on Improvement for Maintenance of Collection Trucks

Seminar on Improvement for Maintenance of Collection Trucks

Koji UZAWA
JICA Expert Team

Kazutoshi MATSUDA
JOCV Senior volunteer

9th December 2010
Central Work Shop of CMPUA

Seminar on Improvement for Maintenance of Collection Trucks

1. Condition of waste collection trucks
2. Engine oil and Gear oil
3. Fuel filter
4. Periodic service
5. Body (Compactor)
6. Body (body and chassis)
7. Cold start (Isuzu and Mitsubishi)
8. Hydraulic operation at cold weather
9. How to change the brake lining
10. Operation & maintenance report

1. Condition of waste collection trucks

Check point

- Mileage
- Periodic service
- Condition

Investigation of condition of collection trucks BZD TUK (23 Nov.)

No.	Company	Truck type	Vehicle No.	Max Mileage(km)	Now Mileage(km)	Mileage(km)	Checking date	Periodic service (Oct.)	Condition
1	BZD TUK	15m3	7215	19,550	30,234	10,684	Nov. 23	✔	
2	BZD TUK	15m3	7230	23,301	39,304	16,003	Nov. 23	✔	
3	BZD TUK	15m3	7232	17,908	28,108	10,200	Nov. 23	✔	
4	BZD TUK	15m3	7233	21,237	32,818	11,581	Nov. 23	✔	
5	BZD TUK	8m3	7243	27,990	42,773	14,783	Nov. 23	Dec. 3	Hydrolic pump

Investigation of condition of collection trucks BGD WSF ND TUK (23 Nov.)

No.	Company	Truck type	Vehicle No.	Max Mileage(km)	Now Mileage(km)	Mileage(km)	Checking date	Periodic service (Oct.)	Condition
1	BGD WSF	15m3	7224	5,048	12,990	7,942	Nov. 23	Not	

No.	Company	Truck type	Vehicle No.	Max Mileage(km)	Now Mileage(km)	Mileage(km)	Checking date	Periodic service (Oct.)	Condition
1	ND TUK	15m3	7234	6,051	7,294	1,243	Nov. 23	✔ (Own budget)	
2	ND TUK	15m3	7235	4,782	9,274	4,612	Nov. 23	✔ (Own budget)	

Investigation of condition of collection trucks BGD TUK (24 Nov.)

No.	Company	Truck type	Vehicle No.	Max Mileage(km)	Now Mileage(km)	Mileage(km)	Checking date	Periodic service (Oct.)	Condition
1	BGD TUK	8m3	7245	26,709	41,783	15,074	Nov. 24	Not	
2	BGD TUK	15m3	7221	18,969	29,094	10,125	Nov. 24	✔	
3	BGD TUK	15m3	7231	7,425	18,661	11,236	Nov. 24	✔	
4	BGD TUK	8ton	7201	27,973	42,593	14,620	Nov. 24	Not	
5	BGD TUK	15m3	7229	19,107	28,925	9,818	Nov. 24	✔	
6	BGD TUK	15m3	7226	18,606	28,556	9,950	Nov. 24	✔	
7	BGD TUK	15m3	7223	18,141	-	-	Nov. 24	Not	Accident

Investigation of condition of collection trucks KhUD TUK (24 Nov.) ChD TUK(26 Nov.)

No.	Company	Truck type	Vehicle No.	Max Mileage(km)	Now Mileage(km)	Mileage(km)	Checking date	Periodic service (Oct.)	Condition
1	KhUD TUK	15m3	7226	16,080	27,459	11,379	Nov. 24	✔	
2	KhUD TUK	15m3	7219	14,201	24,819	10,618	Nov. 24	✔	

No.	Company	Truck type	Vehicle No.	Max Mileage(km)	Now Mileage(km)	Mileage(km)	Checking date	Periodic service (Oct.)	Condition
1	ChD TUK	15m3	7220	7,490	17,842	10,352	Nov. 26	✔	
2	ChD TUK	15m3	7228	2,908	-	-	Nov. 26	✔	
3	ChD TUK	15m3	7238	7,720	19,396	11,676	Nov. 26	✔	
4	ChD TUK	8m3	7241	20,090	35,996	15,906	Nov. 26	Not	
5	ChD TUK	8m3	7242	24,253	39,866	15,613	Nov. 26	Not	

Investigation of condition of collection trucks SKhD TUK (27 Nov.)

No.	Company	Truck type	Vehicle No.	Max Mileage(km)	Now Mileage(km)	Mileage(km)	Checking date	Periodic service (Oct.)	Condition
1	SKhD TUK	15m3	7216	11,830	18,031	6,401	Nov. 27	Dec. 3	
2	SKhD TUK	15m3	7217	12,109	19,587	7,478	Nov. 27	Dec. 3	
3	SKhD TUK	15m3	7218	14,533	22,873	8,340	Nov. 27	Dec. 3	
4	SKhD TUK	8m3	7244	19,813	32,687	12,874	Nov. 27	Dec. 3	Brake cup

Investigation of condition of collection trucks SBD TUK (29 Nov.)

No.	Company	Truck type	Vehicle No.	Max Mileage(km)	Now Mileage(km)	Mileage(km)	Checking date	Periodic service (Oct.)	Condition
1	SBD TUK	15m3	7236	18,370	29,936	11,566	Nov. 29	Not	
2	SBD TUK	15m3	7237	12,151	21,984	9,833	Nov. 29	Not	
3	SBD TUK	15m3	7240	9,942	22,421	12,479	Nov. 29	Not	
4	SBD TUK	8m3	7239	18,786	39,086	20,300	Nov. 29	Not	Brake cup
5	SBD TUK	8m3	7240	25,517	44,789	19,272	Nov. 29	Not	

Investigation of condition of collection trucks CMPUA (30 Nov.)

No.	Company	Truck type	Vehicle No.	Max Mileage(km)	Now Mileage(km)	Mileage(km)	Checking date	Periodic service (Oct.)	Condition
1	CMPUA	8ton	7208	-	39,780	-	Nov. 30	✔	
2	CMPUA	8ton	7209	-	46,225	-	Nov. 30	✔	
3	CMPUA	8ton	7205	-	44,081	-	Nov. 30	✔	
4	CMPUA	8ton	7206	-	42,889	-	Nov. 30	✔	
5	CMPUA	8ton	7207	-	44,774	-	Nov. 30	✔	
6	CMPUA	8ton	7208	-	-	-	Nov. 30	✔	
7	CMPUA	8ton	7209	-	39,601	-	Nov. 30	✔	
8	CMPUA	8ton	7210	-	41,085	-	Nov. 30	✔	
9	CMPUA	8ton	7211	-	27,746	-	Nov. 30	Not	Axle shaft
10	CMPUA	8ton	7212	-	50,845	-	Nov. 30	✔	
11	CMPUA	8ton	7213	-	47,805	-	Nov. 30	✔	
12	CMPUA	8ton	7214	-	52,997	-	Nov. 30	✔	

Investigation of condition of collection trucks NEDS (1 Dec.)

No.	Company	Truck type	Vehicle No.	Max Mileage(km)	Now Mileage(km)	Mileage(km)	Checking date	Periodic service (Oct.)	Condition
1	NEDS	10ton	7247	-	18,222	-	Dec. 1	4-Dec.	
2	NEDS	10ton	7248	-	12,180	-	Dec. 1	4-Dec.	
3	NEDS	water	7252	-	5,164	-	Dec. 1	4-Dec.	
4	NEDS	D65	8698	-	1,602 H	-	Dec. 1	4-Dec.	
5	NEDS	D85	8699	-	2,332 H	-	Dec. 1	4-Dec.	
6	NEDS	D85	8700	-	2,070 H	-	Dec. 1	4-Dec.	
7	NEDS	PC200	8701	-	2,264 H	-	Dec. 1	4-Dec.	
8	CMPUA	CASE	8702	-	3021 H	-	Nov. 30	Not	
9	CMPUA	CASE	8703	-	-	-	Nov. 30	Not	Tire

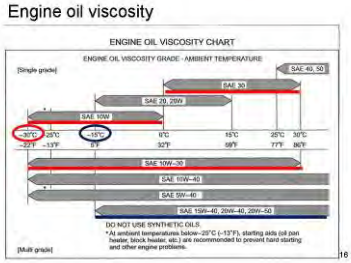
Brake down vehicles

No.	Company	Truck type	Vehicle No.	Max Mileage(km)	Now Mileage(km)	Mileage(km)	Checking date	Periodic service (Oct.)	Condition
1	BGD TUK	15m3	7223	18,141	-	-	Nov. 24	Not	Accident
2	CMPUA	8ton	7211	-	27,746	-	Nov. 30	Not	Axle shaft
3	CMPUA	CASE	8703	-	-	-	Nov. 30	Not	Tire
1	BZD TUK	8m3	7243	27,990	42,773	14,783	Nov. 23	Dec. 3	Hydrolic pump
2	SBD TUK	8m3	7239	18,786	39,086	20,300	Nov. 29	Not	Brake cup

2. Engine oil and Gear oil

- Viscosity
- Duration of the changing

Engine oil viscosity



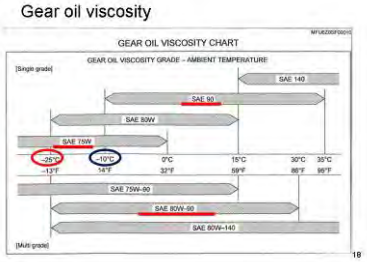
Engine oil viscosity

- Using 15w-30 engine oil in winter time

1. Keep the trucks in warm garage

2. Sufficient engine warm up
check the oil pressure gauge

Gear oil viscosity



Duration of the Changing

Mitsubishi capacity	22 liter + 4-4.5 liter
duration	12,000 km
Isuzu capacity	14.5 liter
duration	8,000km

Notice

April and October

At least 2 / year ⇒ Severe condition
-30℃～+25℃ = 55℃

After filling the engine oil

5 minutes idling ⇒ Check the amounts

3. Fuel filter

1. Remove filter using filter wrench
2. Apply a thin coat of engine oil to gasket.
3. Turn new filter until the gasket contacts sealing surface.

4. Filter turn in the filter 2/3 turn by hand.

4. Periodic service

- April 2011
  = Extensive periodic service

1) Transmission, Differential, Hydraulic, Brake and Clutch oil
2) LLC

4. Periodic service

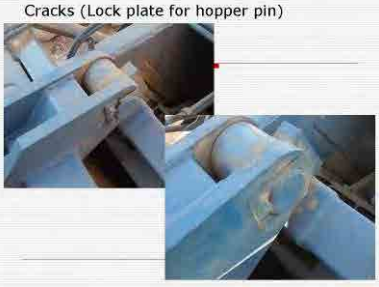
Periodic service	Trucks	
Changing oil and parts	Isuzu	Mitsubishi
Engine oil	8,000 km / April and October	12,000 km / April and October
Engine oil filter	8,000 km / April and October	12,000 km / April and October
Fuel filter	16,000 km / October	24,000 km / October
Air cleaner	16,000 km / October	24,000 km / October
Transmission & Differential oil	Every October	Every October
Coolant (LLC)	24 months	24 months
Brake fluid & Clutch fluid	24 months	24 months
Hydraulic oil	24 months	24 months
Steering gear box & Power steering oil	36 months	36 months
Wheel hub bearing grease	Brake lining change'd	Brake lining change'd

5. Body (Compactor)

- Cracks (top of hopper)
- Cracks (Lock plate for hopper pin)

Cracks (top of hopper)

Cracks (Lock plate for hopper pin)



Countermeasure

Do NOT run with Hopper opened

Reinforcements

6. Body (body and chassis)

1) Spacer between body and chassis

2) Hopper lock U-bolt

3) Hydraulic pump drive shaft

1) Spacer between body and chassis

Countermeasure

Tighten the bolt frequently

2) Hopper lock U-bolt

Tighten the bolt frequently

3) Hydraulic pump drive shaft

Grease up frequently

7. Cold start (Isuzu)

Turn the starter key to the "H" position and hold until the control resister becomes red hot.

CAUTION
Do not keep the starter motor engaged for more than 10 seconds at a time, or the starter motor and battery will be adversely affected.

7. Cold start (Mitsubishi)

1. Turn the starter key to the ON position.
2. Place the Cold start switch in the ON position.
3. Hold down the Air heater switch.
4. Wait for 40 to 60 seconds. When the air heater indicator becomes completely red.

CAUTION
The engine preheating system consumes a large amount of electricity. If it is used repeatedly at short intervals, the battery can be completely discharged.

8. Hydraulic operation at cold weather

Cause

Critical temperature : Below 0℃
1) The hydraulic oil becomes so "Stiff"
—"Churned up" the pump is damaged due to resultant cavitations.
2) Oil heater
— Working condition. Poor or Not?
More than 30minute heating, start the bubbles in oil

Countermeasure

1.Warming up engine running idle and the PTO ON position.

2.Keep the trucks in side of the warm garage.

Amount of Hydraulic oil

Shortage = Leakage

9. How to change the brake lining

☐ How to rivet the brake lining

Riveting the brake lining

10. Operation & maintenance report

How to keep good condition of your trucks?

Driver = Daily operation & maintenance report

↓

Mechanic = Monthly operation & maintenance report

↓

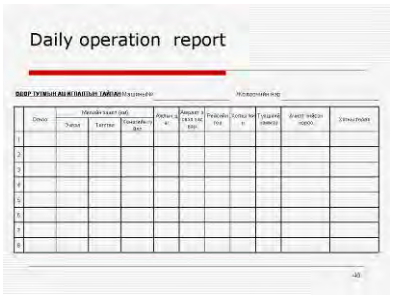
CMPUA Accountant = Combine All Monthly O&M report

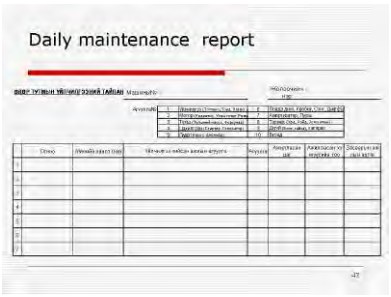
↓

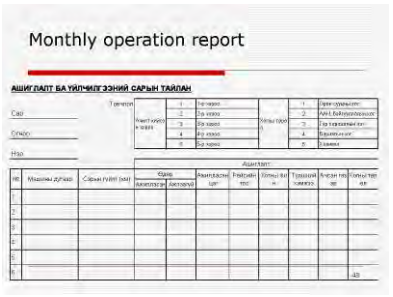
EPWMD Officer = Input for DATABASE → **Budget**

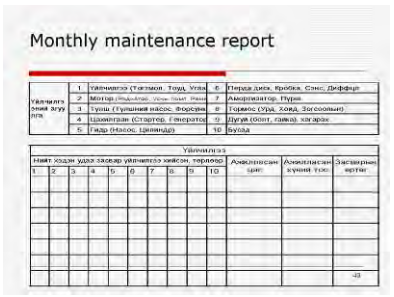
Operation & maintenance report

Review and revise the document


Daily operation report


Daily maintenance report


Monthly operation report


Monthly maintenance report


The end

B.2.3 Seminar on Maintenance of Collection Trucks

a. Contents of workshop: Presenter Mr. Kono (JET PM)

Item1

Contents of Workshop

May 19, 2011
JICA Expert Team

For Strengthening the Capacity for Solid Waste Management in Ulaanbaatar City

1

Agenda

1. Objective
2. Contents of Workshop
3. Principle of Utilizing Grant Aid Equipment

2

Objective of Workshop

- To realise necessary reinforcement of the body frame and warming up measures for longer use of collection trucks
- To realise the improvement of hydraulic system.
- To realize the importance of "Operation and maintenance report"
- To realize necessary periodical maintenance schedule in future
- Discussion among parties concerned.

Date, Venue and Participants

- **Date and Venue**
  - Date: May 19th (Thu), 2011
  - Place: Ulaanbaatar Hotel 6th Floor, Hall "Kharkhorin"
- **Participants**
  - EPWMD
  - CMPUA
  - CMPUA CWS
  - CMPUA NEDS
  - Sukhbaatar district TUK
  - Chingeltei district TUK
  - Songinokhairkhan district TUK
  - Bayanzurkh district TUK
  - Bayangol district TUK
  - Khan-Uul district TUK
  - Nalaikh district TUK
  - Bayangol Waste service fund

Contents of Workshop

Chairperson: Senior officer of EPWMD
Venue: Ulaanbaatar Hotel 6th Floor, Hall "Kharkhorin"

Topic	Expositor	Time
Opening Address	Director of EPWMD	9:00 - 9:10
1. Contents of workshop	JICA expert team	9:10 - 9:30
2. Operation and maintenance report	Senior officer of EPWMD	9:30 - 9:50
3. Future planning of maintenance of trucks introduced by grant aid	Director of CMPUA	9:50 - 10:10
Tea Break		10:10 - 10:20
4. Hydraulic system (Hydraulic power, Cylinder, Pump)	JOCV senior volunteer	10:20 - 10:50
5. Improving maintenance of waste collection trucks (Body reinforcement, Daily checking)	JICA expert	10:50 - 11:30
6. Questions and comments	All participants	11:30 - 12:00
7. Lunch		12:00 -

Separate Discussion

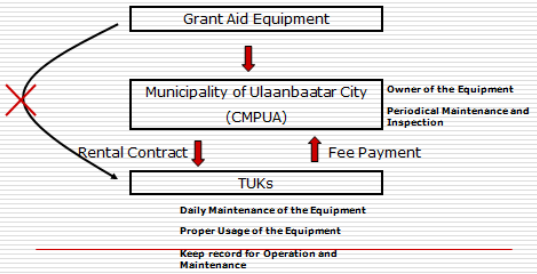
Group meeting : Management group (EPWMD, CMPUA, TUK directors)
Chairperson: Senior officer of EPWMD
Venue: Ulaanbaatar Hotel 5th Floor, Room No. 527

Topic	Expositor	Time
1. Discussion on current issues	EPWMD, CMPUA and TUK directors	10:20 -11:20
2. Interview from JICA Mid Term Evaluation Team	JICA Mid Term Evaluation Team	11:20 -12:20

Principle of Utilizing GA Equipment

- Grant Aid Equipment is donated using Tax from Japanese People.
- These Equipment should be utilized for the people of Ulaanbaatar City
- These Equipment should not be utilized for the benefit of private company

Agreement Between Japanese Government and MUB




Please Utilize Japanese Grant Aid Equipment as long as possible under good working Conditions
JICA
JAPAN
Official Development Assistance

b. Operation and maintenance report: Presenter Mr. Ariguun (EPWMD)

Item 2

Operation and Maintenance report

May 19, 2011
EPWMD

Workshop on Operation and Maintenance of Collection trucks

Result of submission of O&M report

Company	Truck type	Vehicle No.	2010: 4	5	6	7	8	9	10	11	12	2011: 1	2	Submission Rate
SBD TUK	15m3	7236							✔					9%
ChD TUK	15m3	7220	✔	✔	✔	✔	✔	✔	✔					64%
BZD TUK	15m3	7215	✔	✔	✔	✔	✔	✔	✔					64%
SKhD TUK	15m3	7216							✔					9%
BGD TUK	8m3	7245			✔	✔	✔	✔	✔	✔	✔			64%
BGD WSF	15m3	7224												0%
KhUD TUK	15m3	7225							✔					9%
ND TUK	15m3	7234	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	100%
CMPUA	6ton	7203			✔				✔	✔				27%

Revised O&M report

MONTHLY OPERATION AND MAINTENANCE REPORT

Company name

Monthly term: –

Submission date:

Contact person:

Abbreviations

Contents of maintenance	No.	Item	No.	Item
	1	Periodic service (April, October service)	8	Steering (Steering linkage, Ball joint)
	2	General service (Grease, Oil change, Cleanin	9	Body (Cabin, Frame, Compactor, Dump)
	3	Engine (Radiator, Water pump, Belts, Oil filte	10	Brake (Front, Rear, Parking)
	4	Fuel (Fuel pump Nozzle, Filter)	11	Wheel (Clip bolt, nut, Hub)
	5	Electric (Starter, Alternator, Lights, Wiring)	12	Puncture (Tube)
	6	Chassis (Clutch, T/M, Propeller, Diff)	13	Hydraulic (Pump, cylinder)
	7	Suspention (Spring, Absorber)	14	Others

No.	Vehicle No.	Mileage: Mileage (Bigining of a mouth)	Mileage (End of a mouth)	Monthly mileage(km)	Operation: Days: Work	Off	Repair	Amout of refuel	Maintenance: Times of maintenance: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Cost of spare parts
1																							
2																							
3																							

Revised drivers maintenance report

DAILY MAINTENANCE REPORT | Truck No. | Driver's name

Contents of maintenance	No.	Item	No.	Item
	1	Periodic service (April, October service)	8	Steering (Steering linkage, Ball joint)
	2	General service (Grease, Oil change, Cleaning)	9	Body (Cabin, Frame, Compactor, Dump)
	3	Engine (Radiator, Water pump, Belts, Oil filter)	10	Brake (Front, Rear, Parking)
	4	Fuel (Fuel pump Nozzle, Filter)	11	Wheel (Clip bolt, nut, Hub)
	5	Electric (Starter, Alternator, Lights, Wiring)	12	Puncture (Tube)
	6	Chassis (Clutch, T/M, Propeller, Diff)	13	Hydraulic (Pump, cylinder)
	7	Suspention (Spring, Absorber)	14	Others

Date	Operation: Days: Work	Off	Repair	Maintenance: Times of maintenance: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Cost of spare parts

Combined O&M report

Operation & Maintename report evaluation sheet

Month:

No	Organization	Vehicle No.	Mileage (Bigining of a mouth)	Mileage (End of a mouth)	Monthly mileage(km)	Work	Off	Repair	Amount of Fuel	Fuel price 1300	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Spare parts cost	1 A/E	2 100/1	3 G/A	4 (F+G)/A	5 B/30days	6 C/30days	7 D/30days
					A	B	C	D	E	F															G							
	CMPUA	7203	26,534	27,793	1,259	26	4	0	225	292,500	1	4	0	0	2	0	0	0	0	1	0	4	0	0	50,000	5.60	17.87	39.71	272.04	0.87	0.13	0.00
	CMPUA	7204	32,789	33,986	1,197	27	3	0	385	500,500	1	2	0	1	0	0	0	0	0	0	0	10	1	0	0	3.11	32.16	0.00	418.13	0.90	0.10	0.00
	BGD	7309	29,745	32,578	2,833	22	6	2	380	494,000	0	0	0	5	2	0	0	1	1	1	1	8	0	0	100,000	7.46	13.41	35.30	209.67	0.73	0.20	0.07
	SBD	7300	43,670	46,073	2,403	25	5	0	350	455,000	0	4	0	0	3	0	0	0	0	0	0	2	0	0	0	6.87	14.57	0.00	189.35	0.83	0.17	0.00
	SKhD	7399	38,554	38,996	442	18	0	12	50	65,000	1	2	0	0		3	0	0	0	1	0	2	2	0	350,000	8.84	11.31	791.86	938.91	0.60	0.00	0.40
	ND	7388	42,982	43,527	545	15	3	12	90	117,000	1	0	2	4	6	0	2	0	2	0	2	8	3	0	140,000	6.06	16.51	256.88	471.56	0.50	0.10	0.40
				Total	8,679	133	21	26	1,480	1,924,000	4	12	2	10	13	3	2	1	3	3	3	34	6	0	640,000	–	–	–	–	–	–	–
				Average	1,447	22	4	4	247	320,667	1	2	0	2	3	1	0	0	1	1	1	6	1	0	106,667	6.32	17.64	187.29	416.61	0.74	0.12	0.14

O&M report evaluation (1)

Vehicle No.	Mileage: Mileage (Bigining of a mouth)	Mileage (End of a mouth)	Monthly mileage(km)	Operation: Days: Work	Off	Repair	Amount of Fuel	Fuel price 1300	Maintenance: Times of maintenance: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Spare parts cost
			A	B	C	D	E	F															G
7203	26,534	27,793	1,259	26	4	0	225	292,500	1	4	0	0	2	0	0	0	0	1	0	4	0	0	50,000
7204	32,789	33,986	1,197	27	3	0	385	500,500	1	2	0	1	0	0	0	0	0	0	0	10	1	0	0
7309	29,745	32,578	2,833	22	6	2	380	494,000	0	0	0	5	2	0	0	1	1	1	1	8	0	0	100,000
7300	43,670	46,073	2,403	25	5	0	350	455,000	0	4	0	0	3	0	0	0	0	0	0	2	0	0	0
7399	38,554	38,996	442	18	0	12	50	65,000	1	2	0	0		3	0	0	0	1	0	2	2	0	350,000
7388	42,982	43,527	545	15	3	12	90	117,000	1	0	2	4	6	0	2	0	2	0	2	8	3	0	140,000
		Total	8,679	133	21	26	1,480	1,924,000	4	12	2	10	13	3	2	1	3	3	3	34	6	0	640,000
		Average	1,447	22	4	4	247	320,667	1	2	0	2	3	1	0	0	1	1	1	6	1	0	106,667

O&M report evaluation (2)

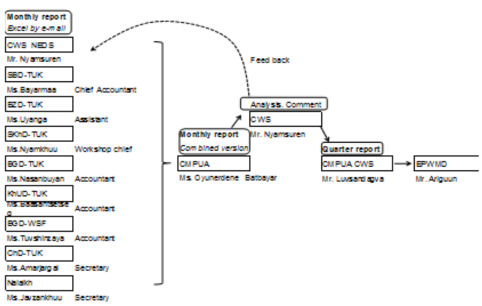
1	2	3	4	5	6	7
A/E	100/1	G/A	(F+G)/A	B/хоног	C/хоног	D/хоног
5.60	17.87	39.71	272.04	0.87	0.13	0.00
3.11	32.16	0.00	418.13	0.90	0.10	0.00
7.46	13.41	35.30	209.67	0.73	0.20	0.07
6.87	14.57	0.00	189.35	0.83	0.17	0.00
8.84	11.31	791.86	938.91	0.60	0.00	0.40
6.06	16.51	256.88	471.56	0.50	0.10	0.40
–	–	–	–	–	–	–
6.32	17.64	187.29	416.61	0.74	0.12	0.14

	F	=	Fuel cost	
1	A/E	=	km/liter	Fuel efficiency
2	100/1	=	Liter/100km	Fuel efficiency
3	G/A	=	Tg/km	Cost performance (Spare parts)
4	(F+G)/A	=	Tg/km	Cost performance(Spare+Fuel)
5	B/30days	=	Working retio	
6	C/30days	=	Day off retio	
7	D/30days	=	Repairing retio	

Revised submission flow chart

Grant aid trucks Operation and maintenance report

New plan from May. 2011



Submission date from each TUK to CMPUA

Report is submitted within five days after it ends for the term.

Monthly report responsible person

Place	Responsible person	Position	Working term	
			From	up to
SSD	Mr.Purevdorj	Workshop chief	26	25
	Mr.Bayanmunkh	Chief Accountant		
GLD	Mr.Oyuntsetseg	Director	21	20
	Mr.Dashdondog	Workshop chief		
	Mr.Amarjargal	Secretary		
BZD	Mr.Dayshinlenyam	Workshop chief	1	30
	Mr.Uyanga	Assistant		
SKhD	Mr.Nyamkhuu	Workshop chief	21	20
BGD	Mr.Tsogtbaatar	Engineer	1	30
	Mr.Bayarsuren	Workshop chief		
	Mr. Naranbayar	Accountant		
BGD-WSF	Mr.Tsyshinsuren	Accountant	1	30
KhUD	Mr.Batsaikhan	Workshop chief	21	20
	Mr.Bumantsetseg	Accountant		
Nalaikh	Mr.Baldorj	Director	21	20
	Mr.Jayamkhuu	Secretary		
CWS	Mr. Nyamsuren	Central mechanic	1	30

c. Future planning of maintenance of trucks introduced by grant aid:
Presenter Mr. Byambadorj (CMPUA director)

Item 3

Project on Strengthening the Capacity of Solid Waste Management in Ulaanbaatar city

Future planning of maintenance of trucks introduced by grant aid

Purpose

- Improve operation and maintenance of waste collection trucks
- Maintain service level of waste management in UBC in longer term

Vehicle distribution by districts

No.	District, organization	Number of trucks	
1	Sukhbaatar: TUK	5	31
2	Chingeltei: TUK	5	
3	Bayanzurkh: TUK	5	
4	Songinokhairkhan: TUK	4	
5	Bayangol: TUK	7	
6	Bayangol: WSF	1	
7	Khan-Uul: TUK	2	
8	Nalaikh: TUK	2	
9	CMPUA	15	

Periodic service 2009-2010

Oils and parts	Engine oil	Engine oil, filter	Fuel filter	Air filter	Transmission, Differential oil	Brake, Clutch oil	Hydraulic	Power steering oil
Replacement interval	6	6	12	12	18	24	24	36
4/2009	✔	✔	-	-	-	-	-	-
10/2009	✔	✔	✔	✔	✔	-	-	-
4/2010	✔	✔	-	-	-	-	-	-
12/2010	✔	✔	✔	✔	-	-	-	-

Schedule for periodic service 2011-2016

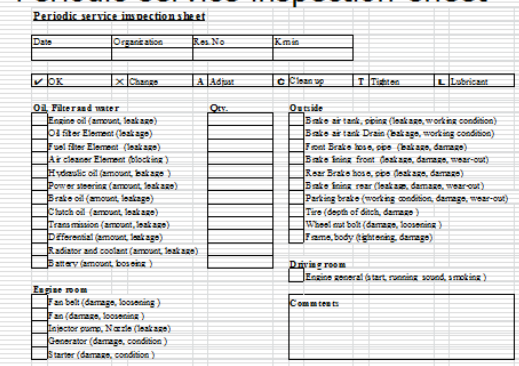
Oils and parts	Engine oil	Engine oil, filter	Fuel filter	Air filter	Transmission, Differential oil	Brake, Clutch oil	Hydraulic	Power steering oil
Replacement interval	6	6	12	12	18	24	24	36
4/2011	✔	✔	-	-	-	✔	-	-
10/2011	✔	✔	✔	✔	✔	-	✔	-
4/2012	✔	✔	-	-	-	-	-	-
10/2012	✔	✔	✔	✔	-	-	-	✔
4/2013	✔	✔	-	-	✔	✔	-	-
10/2013	✔	✔	✔	✔	-	-	✔	-
4/2014	✔	✔	-	-	-	-	-	-
10/2014	✔	✔	✔	✔	✔	-	-	-
4/2015	✔	✔	-	-	-	✔	-	-
10/2015	✔	✔	✔	✔	-	-	✔	✔
4/2016	✔	✔	-	-	✔	-	-	-
10/2016	✔	✔	✔	✔	-	-	-	-

Maintenance role sharing table

Maintenanse responsibility table

CMPUA	TUKs
1. April periodic seervice	1. Mid term oil change (if required)
2. October periodic service	2. Grease up
1) Engine oil	3. Tire, Tube change
2) Engine oil, filter	4. Battery change
3) Fuel filter	5. Radiator water change
4) Air filter	6. Hydraulic repairing
5) Transmission, Differential oil	7. Brake repairing
6) Brake, Clutch oil	8. Clutch repairing
7) Hydraulic	9. Electric system repairing
8) Power steering oil	10. Body reinforcement (welding)
3. Technical advice	

Periodic service inspection sheet



Periodic service inspection sheet

Date	Organization	Res. No	Kmis

✔ OK	× Change	A Adjust	C Clean up	T Tighten	L Lubricant

Oil, Filter and water	Qty.	Outside
Engine oil (amount, leakage)		Brake air tank, piping (leakage, working condition)
Oil filter Element (leakage)		Brake air tank Drain (leakage, working condition)
Fuel filter Element (leakage)		Front Brake hose, pipe (leakage, damage)
Air cleaner Element (blocking)		Brake lining front (leakage, damage, wear-out)
Hydraulic oil (amount, leakage)		Rear Brake hose, pipe (leakage, damage)
Power steering (amount, leakage)		Brake lining rear (leakage, damage, wear-out)
Brake oil (amount, leakage)		Parking brake (working condition, damage, wear-out)
Clutch oil (amount, leakage)		Tire (depth of ditch, damage)
Transmission (amount, leakage)		Wheel nut bolt (damage, loosening)
Differential (amount, leakage)		Frame, body (tightening, damage)
Radiator and coolant (amount, leakage)		
Battery (amount, looseng)		Driving room
		Engine several (start, running sound, smoking)

Engine room
Fan belt (damage, loosening)
Fan (damage, loosening)
Injector pump, Nozzle (leakage)
Generator (damage, condition)
Starter (damage, condition)

Comments

Training schedule

CWS Maintenance training plan

Year	Month	Contents	Organaizer		
2010	March	Periodic service	JET	CWS	
	December	Proper maintenance	JET	JOCV SV	CWS
2011	May	Hydraulic cylinder Overhaul	JET	JOCV SV	CWS
		Brake Overhaul	JET	JOCV SV	CWS
	October	Electrical system	JOCV SV	CWS	
2012	April	Hydraulic system	JOCV SV	CWS	
	August	Undecided	CWS	JOCV SV	
2013	April	Undecided	CWS		
	October	Undecided	CWS		

Outcome

- Increase operational duration of waste collection trucks
- Maintain service level of waste management in UBC in longer term
- Support the implementation of projects and programs related to waste issues
- Ensure health living environment for the city residents

Thank you very much for your attention

d. Hydraulic and Fuel system: Presenter Mr. Matsuda (JOCV SV)

Item 4

Hydraulic and Fuel system

May 19, 2011
JOCV Senior Volunteer
Matsuda

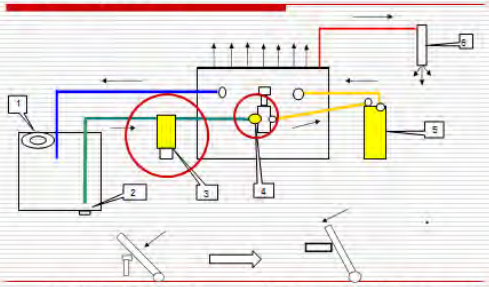
1

Agenda

- Fuel system
- Hydraulic system

2

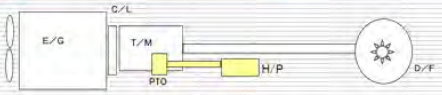
Fuel system



Accelerator Full pedal Fuel pump lever Full stop

3

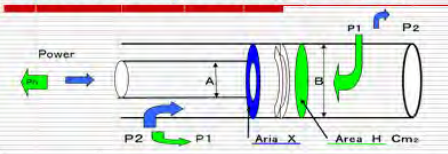
Hydraulic system (Pump)



	Model	E/G	E/G rev	Hyd. Pump rev.	Pump Model	Amount of oil exhalation	Oil pressure
Mitsubishi 15m3	FV515JA	Idling	650rpm	520rpm		42 L/min	1.0 Mpa
	GC16-4	PTO ON	781rpm	625rpm	GPP1-A0C80	50 L/min	14.7 Mpa(150)
Isuzu 8m3	JALFGR33F	Idling	650rpm	488rpm		25 L/min	1.0 Mpa
	GT085-863-M	PTO ON	1205rpm	904rpm	SGP2A52F1H9-L	47 L/min	17.5 Mpa(180)

6

Hydraulic system (Cylinder)



	8m3	Isuzu	15m3	Mitsubishi
	Rod Outside diameter (A)	Tube Inside diameter (B)	Rod Outside diameter (A)	Tube Inside diameter (B)
Lift		45	50	75
Press	45	65	50	90
Pack	45	65	50	90
Ejection	40 - 60 - 80		65	120

8

Keep the good condition for Hydraulic system

- Warming up engine running idle and the PTO ON position.
- Do not loading Ger waste and construction waste
- Keep the trucks in side of the warm garage.

10

e. Improvement of waste collection truck maintenance: presenter Mr. Uzawa (JET consultant)

Item 5

Improvement of waste collection truck maintenance

May 19, 2011
JICA Expert Team
Maintenance of Equipment

1

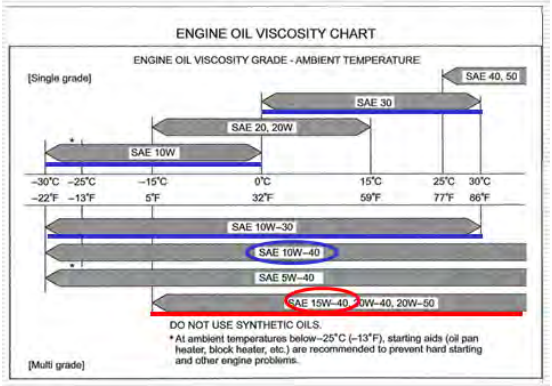
Agenda

- Oil viscosity and Grease up (Truck)
- Daily inspection (Driver)
- Special service tools (Mechanic)
- Spare parts
- Training Seminar (Chief)

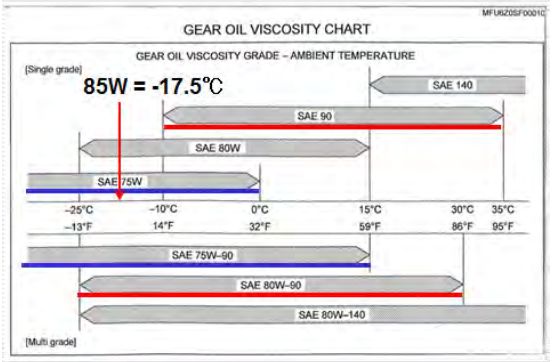
- Role of Workshop chief

2

Engine oil



Transmission / Differential oil



Grease up Point

- Isuzu — 12 points, Every 4,000km
- Mitsubishi — 16 points, Every 5,000km

7

Daily inspection by driver

8

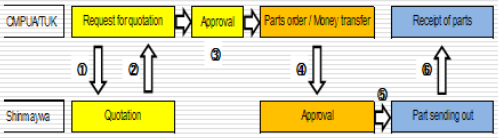
Special Service Tools

Brake overhaul

Hydraulic cylinder overhaul

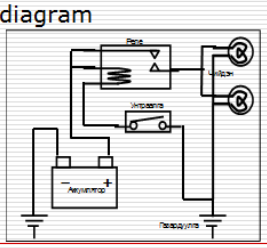
Spare parts for Shinmaywa (Waste collection truck body)

Direct order to Shinmaywa Co., LTD. in Japan

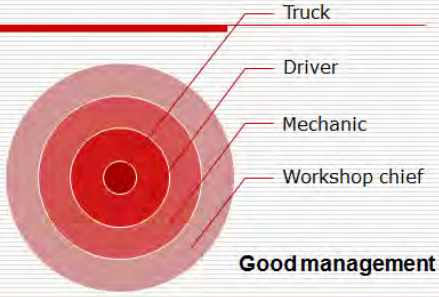


Training/Seminar schedule Electrical maintenance

- Circuit diagram
- Relay



Role of Workshop chief



B.2.4 Workshop on Submission of Operation and Maintenance Report for the Grant Aid Equipment

Purpose

1. Maintain service level of waste management in UBC in longer term
2. Prepare relevant guidelines on timing to change spare parts under severe weather conditions
3. Important data for future procurement of collection trucks

Submission of O&M Report

	2010												2011								
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9			
SBD TUK							O														
ChD TUK	O	O	O	O	O	O	O						O	O	O	O	O	O			
BZD TUK	O	O	O	O	O	O	O								O	O	O	O			
SKhD TUK							O														
BGD TUK			O	O	O	O	O										O	O			
BGD WSF																					
KhUD TUK							O														
ND TUK	O	O	O	O	O	O	O	O	O	O	O							O			
CMPUA			O				O								O	O	O	O			

Result of submission of O&M report since May 2011

- ChD TUK, BZD TUK and CMPUA provided June to September reports
- BGD TUK has submitted Aug and Sep reports
- ND TUK provided July report (not full) and Sep report
- Others are not fulfilling their commitments

Submission of Operation and Maintenance Report for the Grant Aid equipment

Chief advisor to the project
JICA Expert Team

Processing of Operation and Maintenance Report

- The operation and maintenance report made at each TUK is submitted to the internal affair officer (IAO) of the CMPUA each month. The IAO processes the operation and maintenance report into a cross-tabulation table and submits it to CWS's control mechanic
- After the operation and maintenance report are collected, the control mechanic analyzes the data, checks how the vehicles are being operated, attaches comments, and then submits it to the CWS director. The CWS director submits the analyzed operation and maintenance report to EPWMD every 3 months.

5

Operation report (filled in by Mechanic or Engineer each month)

MONTHLY OPERATION AND MAINTENANCE REPORT

Company name		Abbreviations		
Monthly term:	~	Contents of maintenance	1 Periodic service (April, October service)	8 Steering (Steering linkage, Ball joint)
Submission date:			2 General service (Grease, Oil change, Cleanin	9 Body (Cabin, Frame, Compactor, Dump)
Contact person:			3 Engine (Radiator, Water pump, Belts, Oil filte	10 Brake (Front, Rear, Parking)
			4 Fuel (Fuel pump Nozzle, Filter)	11 Wheel (Clip bolt, nut, Hub)
			5 Electric (Starter, Alternator, Lights, Wiring)	12 Puncture (Tube)
			6 Chassis (Clutch, T/M, Propeller, Diff)	13 Hydraulic (Pump, cylinder)
			7 Suspention (Spring, Absorber)	14 Others

No.	Vehicle No.	Mileage: Mileage (Bigining of a mouth)	Mileage: Mileage (End of a mouth)	Mileage: Monthly mileage(km)	Operation: Days: Work	Off	Repair	Amout of refuel	Maintenance: Times of maintenance: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Cost of spare parts
1																							
2																							
3																							

Maintenance report (to be filled by driver every day)

DAILY MAINTENANCE REPORT Truck No. Driver's name

Contents of maintenance	1	Periodic service (April, October service)	8	Steering (Steering linkage, Ball joint)
	2	General service (Grease, Oil change,Cleaning)	9	Body (Cabin, Frame, Compactor, Dump)
	3	Engine (Radiator, Water pump, Belts, Oil filter)	10	Brake (Front, Rear, Parking)
	4	Fuel (Fuel pump Nozzle, Filter)	11	Wheel (Clip bolt, nut, Hub)
	5	Electric (Starter, Alternator, Lights, Wiring)	12	Puncture (Tube)
	6	Chassis (Clutch, T/M, Propeller, Diff)	13	Hydraulic (Pump, cylinder)
	7	Suspention (Spring, Absorber)	14	Others

Date	Operation: Days: Work	Off	Repair	Maintenance: Times of maintenance: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Cost of spare parts

Combined O&M report

Operation & Maintenance report evaluation sheet

Month :

№	Organization	Vehicle No.	Mileage: Mileage (Bigining of a month)	Mileage: Mileage (End of a month)	Mileage: Monthly mileage(km)	Operation: Days: Work	Off	repair	Amount of Fuel	Fuel price 1300	Maintenance: Times of maintenance: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Spare parts cost	1	2	3	4	5	6	7
																										A / E	100/1	G / A	(F + G) / A	B / 30days	C / 30days	D / 30days
					A	B	C	D	E	F															G							
	CMPUA	7203	26,534	27,793	1,259	26	4	0	225	292,500	1	4	0	0	2	0	0	0	0	1	0	4	0	0	50,000	5.60	17.87	39.71	272.04	0.87	0.13	0.00
	CMPUA	7204	32,789	33,986	1,197	27	3	0	385	500,500	1	2	0	1	0	0	0	0	0	0	0	10	1	0	0	3.11	32.16	0.00	418.13	0.90	0.10	0.00
	BGD	7309	29,745	32,578	2,833	22	6	2	380	494,000	0	0	0	5	2	0	0	1	1	1	1	8	0	0	100,000	7.46	13.41	35.30	209.67	0.73	0.20	0.07
	SBD	7300	43,670	46,073	2,403	25	5	0	350	455,000	0	4	0	0	3	0	0	0	0	0	0	2	0	0	0	6.87	14.57	0.00	189.35	0.83	0.17	0.00
	SKhD	7399	38,554	38,996	442	18	0	12	50	65,000	1	2	0	0		3	0	0	0	1	0	2	2	0	350,000	8.84	11.31	791.86	938.91	0.60	0.00	0.40
	ND	7388	42,982	43,527	545	15	3	12	90	117,000	1	0	2	4	6	0	2	0	2	0	2	8	3	0	140,000	6.06	16.51	256.88	471.56	0.50	0.10	0.40
				Total	8,679	133	21	26	1,480	1,924,000	4	12	2	10	13	3	2	1	3	3	3	34	6	0	640,000	—	—	—	—	—	—	—
				Average	1,447	22	4	4	247	320,667	1	2	0	2	3	1	0	0	1	1	1	6	1	0	106,667	6.32	17.64	187.29	416.61	0.74	0.12	0.14

O&M report evaluation (1)

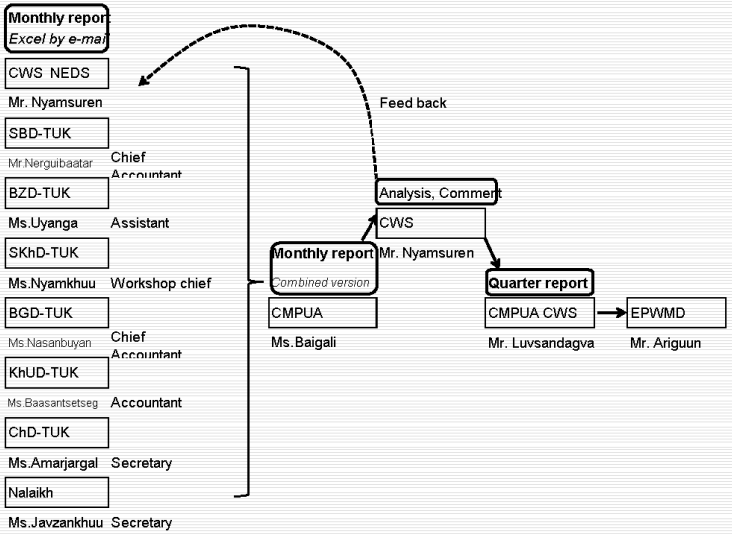
Vehicle No.	Mileage			Operation					Maintenance																Spare parts cost
	Mileage (Bigining of a mouth)	Mileage (End of a mouth)	Monthly mileage(km)	Days			Amount of Fuel	Fuel price	Times of maintenance																
				Work	Off	repair		1300	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
			A	B	C	D	E	F																	G
7203	26,534	27,793	1,259	26	4	0	225	292,500	1	4	0	0	2	0	0	0	0	1	0	4	0	0	50,000
7204	32,789	33,986	1,197	27	3	0	385	500,500	1	2	0	1	0	0	0	0	0	0	0	10	1	0	0
7309	29,745	32,578	2,833	22	6	2	380	494,000	0	0	0	5	2	0	0	1	1	1	1	8	0	0	100,000
7300	43,670	46,073	2,403	25	5	0	350	455,000	0	4	0	0	3	0	0	0	0	0	0	2	0	0	0
7399	38,554	38,996	442	18	0	12	50	65,000	1	2	0	0		3	0	0	0	1	0	2	2	0	350,000
7388	42,982	43,527	545	15	3	12	90	117,000	1	0	2	4	6	0	2	0	2	0	2	8	3	0	140,000
		Total	8,679	133	21	26	1,480	1,924,000	4	12	2	10	13	3	2	1	3	3	3	34	6	0	640,000
		Average	1,447	22	4	4	247	320,667	1	2	0	2	3	1	0	0	1	1	1	6	1	0	106,667

O&M report evaluation (2)

1	2	3	4	5	6	7
A / E	100/1	G / A	(F + G) / A	B / xoHor	C / xoHor	D / xoHor
5.60	17.87	39.71	272.04	0.87	0.13	0.00
3.11	32.16	0.00	418.13	0.90	0.10	0.00
7.46	13.41	35.30	209.67	0.73	0.20	0.07
6.87	14.57	0.00	189.35	0.83	0.17	0.00
8.84	11.31	791.86	938.91	0.60	0.00	0.40
6.06	16.51	256.88	471.56	0.50	0.10	0.40
—	—	—	—	—	—	—
6.32	17.64	187.29	416.61	0.74	0.12	0.14

	F	=	Fuel cost	
1	A / E	=	km / liter	Fuel efficiency
2	100 / 1	=	Liter / 100km	Fuel efficiency
3	G / A	=	Tg / km	Cost performance (Spare parts)
4	(F + G) / A	=	Tg / km	Cost performance(Spare + Fuel)
5	B / 30days	=	Working retio	
6	C / 30days	=	Day off retio	
7	D / 30days	=	Repairing retio	

Revised submission flow chart



Submission date from each TUK to CMPUA

Report is submitted within five days after it ends for the term.

Monthly report responsible person			Working turm	
Place	Responsible person	Position	From	up to
SBD	Mr.Perenlei	Workshop chief	26	25
	Mr.Nerguibaatar	Chief Accountant		
ChD	Mr.Dashdondog	Workshop chief	21	20
	Ms.Amarjargal	Secretary		
BZD	Mr.Dovchinbavuu	Workshop chief	1	30
	Ms.Uyanga	Assistant		
SKhD	Ms.Nyamkhuu	Workshop chief	21	20
BGD	Mr.Tsogbadrakh	Workshop chief	1	30
	Mr.Urtnasan	Mechanic		
	Ms. Nasanbuyan	Chief Accountant		
KhUD	Mr.Tsogoo	Workshop chief	21	20
	Mr.Soninbayar	Mechanic		
	Ms.Baasantsetseg	Accountant		
Nalaikh	Mr.Batdorj	Director	21	20
	Ms.Javzankhuu	Secretary		
CWS	Mr. Nyamasuren	Control mechanic	1	30
NEDS	Ms.Baigali	CMPUA Internal affair offecer		

Schedule for periodic service

Oils and parts	Engine oil	Engine oil, filter	Fuel filter	Air filter	Transmission, Differential oil	Brake, Clutch oil	Hydraulic	Power steering oil
Replacement interval	6	6	12	12	18	24	24	36
4/2011	✔	✔	-	-	-	✔	-	-
10/2011	✔	✔	✔	✔	✔	-	✔	-
4/2012	✔	✔	-	-	-	-	-	-
10/2012	✔	✔	✔	✔	-	-	-	✔
4/2013	✔	✔	-	-	✔	✔	-	-
10/2013	✔	✔	✔	✔	-	-	✔	-
4/2014	✔	✔	-	-	-	-	-	-
10/2014	✔	✔	✔	✔	✔	-	-	-
4/2015	✔	✔	-	-	-	✔	-	-
10/2015	✔	✔	✔	✔	-	-	✔	✔
4/2016	✔	✔	-	-	✔	-	-	-
10/2016	✔	✔	✔	✔	-	-	-	-

Thank you very much for your kind attention