ULAANBAATAR CITY MONGOLIA

Strengthening the Capacity for Solid Waste Management in Ulaanbaatar City

FINAL REPORT MAIN REPORT

September 2012

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA) Project Team for SWM in Ulaanbaatar City KOKUSAI KOGYO CO.,LTD.



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Anne	ex-1	Master Plan on Solid Waste Management in Ulaanbaatar City(Revised year 2011)	

- Annex-2Operation and Maintenance Manual of EquipmentAnnex-3Landfill Operation ManualAnnex-4Guideline on Estimation of appropriate waste collection fees
- Annex-5 Strategy for Public Awareness Raising in SWM of the Ulaanbaatar City

Data Book(Separate-Volume)

Section A	Activities on Policy Making and Planning	Section H	Project Design Matrix
Section B	Activities for Operation and Maintenance of Equipmen	Section I	Capacity Assessment
Section C	Activities for Disposal Site Management	Section J	Public Relations
Section D	Activities for Management of Waste Collection Organizations	Section K	Weekly Meeting
Section E	Pilot Project	Section L	Joint Coordinating Committee Meeting
Section F	Baseline Survey		C C

Section G Activities not specified in PDM

Abbreviation

	Japanese	English	Mongolia
AP	行動計画	Action Plan	Үйл ажиллагааны төлөвлөгөө (YT)
AOU	アパート管理組合	Apartment Owner's Union	Сууц Өмчлөгчдийн Холбоо (СӨХ)
CA	能力向上	Capacity Assessment	Чадавхийн үнэлгээ (ЧҮ)
CD	キャパシティ・ディベロ プメント	Capacity Development	Чадавхийг хөгжүүлэх (ЧХ)
CMPUA	都市保全公共施設庁	City Maintenance and Public Utility Agency	Хот тохижилтын газар (ХТГ)
C/P	カウンターパート	Counterpart	Төсөл хэрэгжүүлэх Монголын хамтрагч тал (X/T)
EPD	市役所環境保全部	Environmental Protection Department	Нийслэлийн байгаль хамгаалах газар (НБХГ)
EPWMD	環境汚染廃棄物管理部	Environmental Pollution and Waste Management Department	Орчны бохирдол, хог хаягдлын менежментийн хэлтэс (ОБХХМХ)
IC/R	作業計画書	Inception Report	Удиртгал тайлан (У/Т)
JCC	合同調整委員会	Joint Coordinating Committee	Хамтарсан зохицуулах хороо (X3X)
JICA	国際協力機構	Japan International Cooperation Agency	Японы Олон улсын хамтын ажиллагааны байгууллага (ЖАЙКА)
MECS	教育文化科学省	Ministry of Education Culture and Science	Боловсрол соёл шинжлэх ухааны яам (БСШУЯ)
MOF	財務省	Ministry of Finance	Сангийн яам (СЯ)
MOH	保健省	Ministry of Health	Эрүүл мэндийн яам (ЭМЯ)
MONET	自然環境観光省	Ministry of Nature, Environment and Tourism	Байгаль орчин, аялал жуулчлалын яам (БОАЖЯ)
M/P	基本計画	Master Plan	Мастер төлөвлөгөө (М/Т)
MSW	都市廃棄物	Municipal Solid Waste	Хотын хатуу хог хаягдал (ХХХХ)
MUB	ウランバートル市役所	Municipality of Ulaanbaatar	Улаанбаатар хотын Захирагчийн ажлын алба (ЗАА)
NGO	非政府機関組織	Non-Governmental Organization	Төрийн бус байгууллага (ТББ)
OJT	オンサ゛シ゛ョフ゛トレーニンク゛	On the Job Training	Ажлын байран дахь сургалт (АБС)
PCR	プロジェクト完了報告書	Project Completion Report	Төслийн эцсийн тайлан (ТЭТ)
PDM	フ゜ロシ゛ェクト・テ゛サ゛イン・マトリックス	Project Design Matrix	Төсөл төлөвлөлтийн матрикс (TTM)
PO	活動計画表	Plan of Operation	Үйл ажиллагааны төлөвлөгөө (Y/T)
POS	住民意識調査	Public Opinion Survey	Олон нийтийн санал асуулга (ОНСА)
P/R	進捗報告書	Progress Report	Явцын тайлан (Я/Т)
PSD	区産業サービス部	Production and Service	Үйлдвэр, үйлчилгээний хэлтэс (YYX)
R/D	討議議事録	Record of Discussion	Ярианы тэмдэглэл (Я/Т)
SWM	廃棄物管理	Solid Waste Management	Хатуу хог хаягдлын менежмент (XXXM)
WS	ワークショップ	Workshop	Бага хурал (Б/Х)
WSF	廃棄物サービス基金	Waste Service Fund	Хог хаягдлын үйлчилгээний сан (XXYC)



Figure 1: Project Area

1 Outline of the Project

1.1 Background

Ulaanbaatar City (UBC) in Mongolia occupies an area of 4,704 km² and has a population of approximately 1,031,000 (2007, as of the project applied for) which is where a little under 40 % of Mongolia's 2,600,000 citizens live. Due to a recent population surge (3.9 % from 2000 – 2007) and a switch to a market economy, there has been a variation in consumption resulting in a rise in the amount of discarded waste and issues related to Solid Waste Management (SWM) have become severe.

Illegal dumping became a big issue, especially in the Ger area where many nomadic people have settled, due to a shortage of waste collection services. Furthermore, final disposal site in Ulaanchuluut, where 90 % of the wastes from UBC were disposed, became nearly full and open dumping conditions without soil cover gave a negative impact to the surroundings.

Under such circumstances, Japan International Cooperation Agency (JICA) implemented a development study "The Study on SWM Plan for Ulaanbaatar City in Mongolia" for the duration of around 2 years from 2004 and a Master Plan (M/P) for Ulaanbaatar City (Target Year 2020) was formulated.

The fundamental goal of the M/P for SWM in Municipality of Ulaanbaatar (MUB) is: "To establish an environmentally sound SWM system in MUB by the target year 2020". In the environmentally sound SWM system, the 3Rs (Reduce, Reuse and Recycle) of waste are promoted and the following situation should be established.

- (1) Waste reduction is encouraged at the generation source such as households and business enterprises.
- (2) Waste generated after the attempt of waste reduction is reused or recycled as much as possible.
- (3) Waste is properly collected only after the efforts of waste reduction, reuse or recycling at the generation source, and recycled/treated, then finally disposed of in a manner without negative environmental impacts.
- (4) Such a SWM system will be established by requiring the governmental sector, private sector and general public to bear adequate responsibilities under a transparent and fair rule is achieved.

MUB is taking several measures in order to implement M/P mainly such as ①Improvement of waste collection system such as revision of fee collection systems and development of waste service fund (WSF), ②Implementation of sanitary landfilling, ③Promoting 3Rs, ④ Improvement of relevant institutions and management organizations such as establishment of City Maintenance and Public Utility Agency (CMPUA).

Japanese grant aid project "The Project for Improvement of Waste Management in Ulaanbaatar City" was implemented in 2008, new Narangiin Enger Disposal Site was constructed and equipment such as waste collection vehicles and heavy machineries were procured. SWM system is improving rapidly in order to implement M/P formulated in development study but there is still room for improvement. Furthermore, due to rapid change of organizations and system of SWM and introduction of new concepts such as 3 Rs, development of capacities of human resources and organizations for SWM are urgently required.

Under the situations above, MUB requested JICA to implement a technical cooperation project for strengthening the capacity for SWM in Ulaanbaatar City. Based on the request, JICA dispatched a Detailed Planning Survey Team in December 2008 and April 2009. Based on the survey, JICA and MUB came to an agreement on the basic plan of the project, as well as the implementation system and responsibilities of each party, etc., in the Minutes of Meeting (M/M) and the Record of Discussion (R/D), which was signed on 6th August 2009.

1.2 Objectives

The objective is to strengthen the capacity for Solid Waste Management in Ulaanbaatar City. Overall goal, project purpose and outputs are as follows.

(1) Overall Goal

Deteriorated urban environment and sanitary conditions, caused by the inappropriate solid waste management, will be improved in Ulaanbaatar City.

(2) Project Purpose

Capacity for solid waste management in Ulaanbaatar City is strengthened through human resource development.

(3) Outputs

Output 1 :	Development of human resources of EMWMD for solid waste separation, recycling and treatment policy making and planning.
Output 2 :	Development of human resources of CMPUA and EPWMD for operation and maintenance of waste collection vehicles and heavy machineries.
Output 3 :	Development of human resources of CMPUA for appropriate operation of Narangiin Enger Disposal Site (NEDS)
Output 4 :	Development of human resources of EPWMD and WSF for administration ¹ /financial management of solid waste management.
Output 5 :	Development of human resources of EPWMD and District Office for promotion of public awareness and participation in solid waste management.
Output 6 :	Recommendation for appropriate system of waste separation and recycling in Ulaanbaatar City (UBC).

1.3 Scope

1.3.1 Target Area

Ulaanbaatar City in Mongolia (6 Districts except Baganuur, Bagakhangai and Nalaikh)

1.3.2 Target Waste

Municipal Solid Waste

1.3.3 Relevant Bodies of the Project

1) Counterparts

Implementation Body : EPWMD of MUB Cooperation Bodies : CMPUA, WSF and District Offices

2) Beneficiaries

¹ Output 4 was slightly changed because not only financial but also overall management is necessary to strengthen and changes were approved through JCC meeting No4.

Direct Beneficiaries : EPWMD (7 staff), CMPUA (around 100 staff), WSF (around 20 staff), District Offices (18 staff) Indirect Beneficiaries : TUKs, Citizens in Ulaanbaatar City (1,031,200 in 2007)

1.4 Administration of the Project

1.4.1 **Project Implementing Body**

In the Project, full time counterpart personnel are assigned as below to implement the Project activities in collaboration with Japanese Expert Team.

Project Director : General Manager of Ulaanbaatar City and Chief of the Mayor's Office, Municipality of Ulaanbaatar

Project Manager : Director, Environmental Pollution and Waste Management Department of the Mayor's Office, Municipality of Ulaanbaatar

Counterpart Personnel

Counterpart personnel are appointed according to the output as follows.

Table 1: Counterpart Personnel according to the Output as of August 2012

Out	tout	Main C/P	Supporting C/P
Ou	ipui	Ivialit 0/1	
1.	Policy making and	EPWMD (S.Ariguun)	CMPUA (D.Purevdorji),*1
	Planning		
2.	O&M of Equipment	CMPUA (O.Luvsandagva)*1	EPWMD (T.Enkh-Amgalan)
3.	Operation of NEDS	CMPUA (D.Amgalan) *1	EPWMD
	-		(S.Chantsalnurmaa)
4.	Waste Service Fund	EPWMD (Z.Mungunzul)	*2
5.	Public Awareness	EPWMD (E.Batbileg)	CMPUA (A.Oyunchimeg)*3
6.	Waste Separation and	EPWMD (O.Odjargal)	CMPUA (E.Iderchuluun),
	Recycling		

*1: Changed due to former CP and approved in JCC No5.

*2:No assignment from district

*3: Changed due to former CP and approved in JCC No5.

1.4.2 Joint Coordination Committee (JCC)

a. Functions of JCC : The JCC shall;

- 1. authorize the annual work plan of the Project based on the plan of operations within the framework of Record of Discussions.
- 2. monitor and evaluate the progress of the Project and the results of the annual work plan.
- 3. discuss and advise on major issues that arise during the implementation period of the Project.

b. Chairperson :

General Manager of Ulaanbaatar City and Chief of the Mayor's Office, Municipality of Ulaanbaatar

c. Member

[Mongolian Side]

• Director-General, Department of Development Financing and Cooperation, Ministry of Finance

- Director, Sustainable Development and Strategy Planning Department, Ministry of Nature, Environment and Tourism
- Director, Public Health Policy and Implementation Coordination Department, Ministry of Health
- Project Manager/Director, Environmental Pollution and Waste Management Department of the Mayor's Office, Municipality of Ulaanbaatar
- Director, City Maintenance and Public Utilities Agency
- Director, Capital City's Specialized Inspection Agency
- Relevant Personnel appointed by the Chairperson, if necessary

[Japanese Side]

- Chief Representative, JICA Mongolia Office
- Japanese Expert Team (JET)
- Relevant Personnel appointed by JICA, if necessary

[Observer]

- Representative(s) of Embassy of Japan in Mongolia
- Other Personnel invited by the Chairperson

1.4.3 Operation Schedule

The project commenced in Sep 2009 and completed in Sep 2012.

Contract						1st	t Ye	ar					Т					:	2nd '	Year											3	rd Ye	ear					
FY				200	9							-	- 2	201	10											20)11						Γ		2	012		
Calendar	9	10	11	12	1	2	3	4	5	6	7	8	9	,	10	11	12	1	2	3	4	5	6	7	8	9	10) 11	12	2 1	2	3	4	5	6	7	8	9
Work in																																						
Mongolia Work in Japan	[(0]P	repa	arato	ry wo	ork i	(A in Jap	.) Ist pan	Year	in Mo	ongo	lia							(B)	2nd Y	'ear i	n Mo	ngoli	ia								(c)3	Brd Ye	ar in	Mon	golia			
						F	has	ie 1											Ph	ase	2										F	Phas	e 3					
Report		IC/	R				P/I	▲ R(1)			Compl	>/Ri	(2) ★ n Rep	ort	(1)				P/	/R(3)			с	F	▲ /R(4 ★	1) 1 teport	(2)					P/R	(5)		Con	DP	CR CR	PCR
Seminar								3Rs	(1)		ŀ	laza	irdou	r s V	Naste		C	isse	▲ 3Rs(emin	(2) I atior	Main i to /	tena Aima	nce ig Ce	of Eq	uipm ▲	nent	3F	▲ Rs(3)								Cr	ample	etion
Workshop								ws	F(08	M c	▲ of Equ	ipm	ent)																			wsi	F(08	A M of	f Equ	uipm(ent)	
JCC	J						JC(22						J	JCC3					JCC	4							C5)CC	6					
Assessment																		Inte	▲ erme	diate										Fin	al							

2 Input

2.1 JICA Input

2.1.1 Input of Japanese Expert

Field of Expertise	Name
Chief Advisor/Solid Waste Management/	Ichiro KONO
Financial Management 2	
Maintenance of Equipment	Koji UZAWA
Collection and Transportation	Junji ANAI
Landfill Management	Hiroshi FUJITA
Financial Management 1	Susumu SHIMURA
Public Awareness	Yuko AOKI
Waste Separation and Recycling	Mie NAGAYASU
Data Base Management/Coordinator	Shinnosuke ODA

1. 1st Year

					200)9																	20	010												T	1st Y	'ear
Assignment	Name	9		10			11			12			1			2			3			4			5			6			7			8			Mor	ıth
 		 														1	st `	Year																			UB	JP
 Team Leader/SWM/Finan cial Management 2	Ichiro KONO	5	1	0			90					7				16					89				15			12		70					20	-	8.30	0.17
 Maintenance of Equipment	Koji UZAWA																		16	30		14														-	1.00	
Collection and Transportation	Junji ANAI							30	20	1	9																	15		4!		2	9			-	2.17	
Sanitary Landfilling	Hiroshi FUJITA	5	10		30	8					Ę	5	30		3									8		20	1								╞	-	2.67	0.17
 Financial Management 1	Susumu SHIMURA		10	14	23					21		33	2	2								1	19	6		Π										-	2.20	
Public Education	Yuko AOKI														1	6		30	1	7			Ï		5	45		18			14		3		21	-	3.80	
 Waste Separation and Recycling	Mie NAGAYASU								3			80	T		31				13	Τ	58	Τ		Τ	9	2	9	4.9	Π		15					_	5.53	
Coordination	Shinnosuke ODA			10	15				78			8				16	15				75					16		14							23	(6.00)	
	Total																																			4	25.67	0.34

2. 2nd Year

		1 1													Sec	cond	Ye	ar																	т	otal	
	Accimment	Nama				20	10															20	11													otai	
	Assignment	Inallie	9		10			11			12		1		2			3			4			5			6			7			8		M	onth	
		1													Yu Y	育2 左	F次																_				
	Team Leader	Ichiro KONO		2			63			2							3	23	25				8	35		11		22			59		1	9	6.00		
	Maintenance of Equipment	Koji UZAWA						2	0	30	19									5		60	_			3									3.00		
	Collection and Transportation	Hiroshi Fujita																													25	19	12		0.63		
golia	Sanitary Landfilling	Hiroshi Fujita															5	15 11		2	23	24	3 13	15				22	33		24				2.67		
in Mong	Financial Management	Susumu SHIMURA				25	7																					20	28	17					1.40		
Worl	Pubric Education	Yuko AOKI			14	30		12																											1.00		
	Waste Separation and Recycling	Mie NAGAYASU				25		56			19						1 20	2)			20		79					8						5.17		
	Data Base Development	Shinnosuke ODA		2	30																										I	6			1.20		
	Coordination	Shinnosuke ODA					(15)				19						5 15)]					(15)		25					6	(15)		19		(0.00)		
																																	Tota	d I	21.07		

3. 3rd Year

					20)11															:	2012										3rd \	í ear	Тс	tal
	Assignment	Name	9	10)		11		1	2		1			2		3		4	ł		5		6		7		8		9		Mor	nth	Mo	nth
					2nd	Yea	r														3ri	d Ye	ar								Μ	Iongolia	Japan	Mongolia	Japan
	Team Leader	Ichiro KONO		10		60		ç)							5	3	6 3				30						27				5.00		19.30	
	Maintenance of Equipment	Koji UZAWA															2	7	3	0												1.00		5.00	
	Collection and Transportation	Junji Anai																														0.00		2.00	
golia	Sanitary Landfilling	Hiroshi Fujita					23	3 14	7		5	28		1														21				2.10		8.07	
< in Mon≀	Financial Management	Susumu SHIMURA																3	0									12				1.40		5.00	
Worl	Pubric Education	Yuko AOKI																														0.00		4.50	
	Waste Separation and Recycling	Mie NAGAYASU		10		60			9				23 14	5														37				3.70		14.87	
	Database Development	Shinnosuke ODA		10)	60			9																							2.00		3.20	
	Coordination	Shinnosuke ODA														1	12			25							(10	0	(15)			(0.00)		(6.00)	
		Total	 													 														 		15.20		61.94	

2.1.2 Procurement of Equipment

Year	Item	Specification, Model	Price(JPY)	Date of Delivery	Installed Place	Operation Status	Financial Category
1st Year	Projector	EPSON EB-1720	159,980	2009/9/15	Project Office	Being used for mainly weekly meeting, seminars and so on	Carrying Equipment
1st Year	Printer A4	HP2055d A4 Black-and-white, Laser	37,737	2009/10/20	Project Office	Being used for printing materials	Carrying Equipment
1st Year	Printer A3	HP7108 A3 Color, Inkjet	27,090	2009/10/29	Project Office	Being used for color printing, especially for materials for public awareness	Carrying Equipment
1st Year	Copy machine	IR3225 A4,A3, copy machine A4 black-and-white 25sheets/minute	485,065	2009/12/11	Project Office	Being used for copying documents and materials	Carrying Equipment
2nd Year	Data communication device	Internet Antenna for data distribution	24,120	2010/11/4	Narangiin Enger Disposal Site	Being used for transmission of daily information from CMPUA to EPWMD and sending documents and materials needed through internet	Other Equipment
2nd Year	For Waste Amount and Composition Survey(WACS)	Bucket, Tarpaulin, Iron basket etc,	45,180	2010/11/10 - As of 2011/4/13	Project Office, CMPUA etc	Has been used for WACS on both apartment area and ger area on winter season. They are supposed to be used on WACS on summer season.	Other Equipment
3rd Year	Radiator, Grill and Reversible Fan for Bulldozer	Spareparts for KOMATSU D65E-12 bulldozer	5,355,009	2012/3/9	Narangiin Enger Disposal Site	Being installed to Bulldozer and used everyday for proper landfill operation	Provided Equipment
Total cos	st for equipment prov	vided by the Japanese side (yen)	6,134,181				

2.1.3 Site Expense

By Japanese Side]				(Japanese Yen)
Financial Category	1st Year (Oct. 2009- Aug.2010)	2nd Year (Oct.2010- Aug.2011)	3rd Year (Oct.2011-As of 26th.Mar.2012)	Total
Employee	2,351,778	2,979,369	849,581	6,180,728
Expendable	150,667	116,878	25,134	292,679
Communication and Transportation	55,612	80,803	150,075	286,490
Documentation	464,043	590,288	1,194,089	2,248,420
Rent	2,381,962	3,540,137	947,650	6,869,749
Local Training	0	436,303		436,303
Miscellaneous (Cost for Pilot Project)	11,911,056	1,296,523	129,165	13,336,744
Total	17,315,118	9,040,301	3,295,694	29,651,113

[By Japanese Side]

Mongolian Input 2.2

Mongolian Counter Part 2.2.1

Counter part from Mongolian side is shown below.

					as of Aug 2012
No.	Name	Post/ Oraganization	Assignment	Period	Remarks (Current Positon)
		Main	C/P		
1	Mr. Ch. Bat	General Manager and Head of the Mayor's Office of Ulaanbaatar City	Project Director	August 2008 - present	
2	Mr. B. Delgerbayar	Director, Department of Environmental Pollution and Waste Management , Mayor's office of Ulaanbaatar city	Project manager	August 2008 - March 2011	Senior officer, Public Service Department of the Mayor's office, Municipality of Ulaanbaatar (March,2011-present)
3	Mr. L. Baatartsogt	Director, Department of Environmental Pollution and Waste Management , Mayor's office of Ulaanbaatar city	Project manager	March 1, 2011 - Present	
4	Mr. S. Ariguun	Senior Officer in charge of Collection and Transportation, Department of Environmental Pollution and Waste Management, Mayor's office of Ulaanbaatar city	Policy making and Planning	October 26, 2009 - present	
5	Mr. O Odjargal	Officer in charge of Waste diposal site and recycling, Department of Environmental Pollution and Waste Management, Mayor's office of Ulaanbaatar city	Waste Separation and Recycling	October 26, 2009 - present	
6	Mr. E. Batbileg	Officer in charge of Air Pollution, Department of Environmental Pollution and Waste Management, Mayor's office of Ulaanbaatar city	Public awareness	October 26, 2009 - present	
7	Ms. Z. Mungunzul	Officer in charge of WSF, Department of Environmental Pollution and Waste Management Mayor's office of Ulaanbaatar city	Waste Service Fund	October 26, 2009- present	
8	Mr. V. Davaabaatar	Manager, "Narangiin Enger" Waste Disposal Site, City Maintenance and Public Utilities Agency.	Operation of NEDS	October 2009 - April 2010	Resign
9	Mrs. Ch. ENKHJARGAL	Director, Household and Factory waste, "Naranglin Enger" Waste Disposal Site, City Maintenance and Public Utilities Agency.	Operation of NEDS	September 1, 2010 - present	
10	Mr. A. Vandanmagsar	Manager of Household and Factory waste, "Narangiin Enger" Waste Disposal Site, City Maintenance and Public Utilities Agency.	Operation of NEDS	January 1,2011 - September, 2011	Retired
11	Mr. D. Amgalan	Manager of "Narangiin Enger" Waste Disposal Site, City Maintenance and Public Utilities Agency.	Operation of NEDS	September 15, 2011 - present	
12	Mr. G. Damdinsuren	Chief Engineer, City Maintenance and Public Utilities Agency	O&M of equipment	October 2009 - Augsut 2010	Retired
13	Mr. O. LUVSANDAGVA	Head of Central Workshop, City Maintenance and Public Utilities Agency.	O&M of Equipment	January 1, 2011 - present	
		Supportin	ng C/P		
14	Mr. N. Altangerel	Deputy Director, City Maintenance and Public UtilitiesAgency	Support, Policy making and Planning	October 26, 2009 - July 18, 2011	Retired
15	Mr. D. Purevdorj	Deputy Director, City Maintenance and Public Utilities Agency	Support, Policy making and Planning	July 18, 2011 -July 2012	Retired
16	Mr. T. Enkh-Amgalan	Officer in charge of Construction Waste and Public toilets, Department of Environmental Pollution and Waste Management, Mayor's office of Ulaanbaatar city	<u>Support, O</u> &M of equipment	October 26, 2009 - present	
17	Mr. Kh. Ganbaatar	Officer in charge of Soil/ ground water pollution Department of Environmental Pollution and Waste Management, Mayor's office of Ulaanbaatar city	Support. Operation of NEDS	October 2009 - August 2010	Officer, of Public Service Department of the Mayor's office , Municipality of Ulaanbaatar (August, 2010 - present)
18	Ms. S. Chantsalnurmaa	Officer in charge of Soil/ water contamination and hazardous /medical waste, Department of Environmental Pollution and Waste Management, Mayor's office of Ulaanbaatar city	Support, Operation of NEDS	August, 2010 - present	
19	Ms. A. Oyunchimeg	Economist of City Maintenance and Public Utilities Agency	Support, Public Awareness	December 3, 2010 - present	
20	Mr. E. Iderchuluun	Officer in charge of Hazardous waste "Narangiin Enger" Waste Disposal Site , City Maintenance and Public Utilities Agency	<u>Support</u> , Waste Separation and Recycling	October 26, 2009 - present	

Mongolian side beared not only for cost to be beared in technical cooperation project but also additional cost of 350 million Tg for closure of UCDS on Jul 2009 in their own initiative. Furthermore, 1,300 million Tg for road construction was invested by the Mongolian side.

3 Outline of Activities

3.1 Plan of Operation at beginning

Plan of Operation as of Sep 2009 is shown below.

3.2 Plan of Operation at end

Plan of operation as of Jul 2012 together with progress is shown below.

3.3 Work Flow Chart

Work flow is shown in below

	Contact Year					1st Year						_	2nd	Year							3rd Y	/ear			
	Calender Year	2009							2010	-						20	011						2012		
月	Month 9	10	11	12	1 2	3	4	5	6 7 8	9	10 11 12	1	2	3	4 5	6	7	8 9	10 11	1	12 1 2 3	4	5 6 7 8	9	10
Common Item																				_					
A0.1	Preparation of Inception Report (IC/R)					-						<u> </u>								-					
A0.2	Explanation and Discussion on IC/R																								
A0.3	Confirmation of Project Implementation Structure																								
A0.4/B0.1/C0.1	Support for Establishing of JCC and Periodical Meetings																			_					
A0.5	Realization of the Project Implementation Plan Conduct CA and CD Support for the Establishment of Monitoring and Feedback					-														_					
A0.7	System Setting up PDM Indicators					_																			
A0.8/B0.2/C0.2	Preparation of Annual Action Plan																								-
A0.9/B0.3	Procumenent of Supplied and Carried-In Equipment																								
A0.10/B0.5/C0.4	Conduct of CA																			_					
A0.11/B0.4/C0.3	Preparation of P/R Preparation of P/R																			_					
Activities for Outpu	t 1																								
A1.1	Conduct CA for EPWMD																								
A1.2	Making and Training Programme and Training Material																								
A1.3/B1.3/C1.3	Onduct In-Mongolia Training																								
C1 4	Instruction on Training on Formulating Policies Regulations and Guidalines on SWM									+														+	
A1 5/D1 5	Investigation on Current Conditions of Henrydeve Wester and Wester									1														+	
A1.0/B1.0	mvesugation on Current Conditions of Hazardous waste and e-Waste																							$\left \right $	
C1.6	Kevision of Master Plan																								
C1.7	Action Plan on Strengthening EPWMD									-							L								
Activities for Outpu	t <u>2</u>																								
A2.1	Conduct CA for CMPUA																								
A2.2	Making and Training Programme and Training Material																								
A2.3/B2.3	Conduct Training									_															
A2.4/B2.4	Practical Training in Maintenance Workshop									Г															
R2 5	Recommendation on Operation Plan of the Maitenance Workshop					_											Ł,								
D2.0						_											E			_					
B2.0	Review and Recommendation on Waste Collection Plan of UBC																			_					
B2.7	Seminar on Maintenance of Waste Collection Vehicle for TUK																			_					
Activities for Outpu	t <u>3</u>																								
A3.1	Conduct CA for CMPUA																								
A3.2	Making and Training Programme and Training Material																								
A3.3/B3.3	Conduct Training		F									1					1								
A3.4	Practical Training on Landfill Management																								
B3.5	Waste Amounta and Composition Survey																								
B3.6/C3.6	Investigation on Condition of Gas Generation in the Landfill					-																			
D0.0/ C0.0	Descention of Environmental Manifording Paraset on Londfill															<u> </u>	<u> </u>								
D3.1/ C3.1						_														_					
Activities for Outpu																				_					
A4.1	Conduct CA for WSF	E																							
A4.2/B4.2/C4.2	Conduct of Financial Analysis on WSF					_																			
A4.3/B4.3	Preparation of Workshop Materials					_								1											
A4.4/B4.4	Local Workshop																								
A4.5/B4.5/C4.5	Recommendation for the Stabilization of Financial Management System																								
A4.6/B4.6/C4.6	Realization of Recommendations for the Standardiztion of Financial System									<u> </u>							<u> </u>								
Activities for Output	t 5																								
A5 1	Conduct CA for EDUAID and District Officers																			_					
A0.1	Conduct CA for EPWMD and District Onicers																			_					
A5.2	Making and Training Programme and Training Material																			_					
A5.3	Conduct Training																								
A5.4	ramming for the rhot project and Social Satisfaction Level Survey						F																		
B5.5	Inplementation of Pilot Project																								
B5.6	Recommendation on Public Education																								
Acticities for Outpu	<u>t 6</u>																								
A6.1	Plan for Output 6															1	1								
A6.2/AB6 2/C6 2	3Rs Seminar											-												<u>├</u>	
16.2	Diat Design Equipment Construction									+						-								+	
70.0	r not rioject racinties and Equipment Construction																			_				$\left \right $	
В6.4	Implementation of Pilot Project																								
B6.5	Monitoring and Evaluation on Pilot Project																· F								
C6.6	Activities																								

	Contract Year					1st Year						2nd Year						1	3rd Year					
	Calender Year		200	09				2010						2011							2012			
2	Month	9	10	11 12	1 2	3 4	5 6	7 8	9	10 11	12 1	2 3	4 5	6 7	8	9 10	11 12	1 2	3 4	5	6	7	8 9	10
Common Item																								
A0.1	Preparation of Inception Report (IC/R)																							
A0.2	Explanation and Discussion on IC/R																							
A0.3	Confirmation of Project Implementation Structure																							
A0.4/B0.1/C0.1	Support for Establishing of JCC and Periodical Meetings																							
A0.5	Realization of the Project Implementation Plan Conduct CA and CD Support for the Establishment of Monitoring and					_																		
A0.6	Feedback System																							
A0.8/B0.2/C0.2	Preparation of Annual Action Plan																							
A0.9/B0.3	Procumenent of Supplied and Carried-In Equipment																							
B0.4	Cooepration to the chnge of PDM																							
A0.10/B0.5,B0.7/C	0.4 Conduct of CA																							
A0.11/B0.6,B0.8/C	0.3 Preparation of P/R																							_
A0.12/B0.9/C0.5,6	Preparation of PCR																							<u> </u>
At 1	Conduct CA for EDUA (D																							
A1.1	Conduct CA for EPWMD																				_			
A1.2	Making of Training Programme and Training Material																							
A1.3/B1.3/C1.3	Conduct In-Mongolia Training																							
C1.4	Instruction on Training on Formulating Policies, Regulations and Guidel																							
A1.5/B1.5	Investigation on Current Conditions of Hazardous Waste and e-Waste																							
B1.6/C1.6	Revision of Master Plan												<u>}</u>											-
C1 7	Action Dian on Strengthaning EDW34D							+ +							┦──┼─									
01.1	Action Fian on Strengthening EPWMD							+						┼──┤───	+ +									<u> </u>
Activities for Outpu	<u>t 2</u>													ļļ										_ _
A2.1	Conduct CA for CMPUA																							
A2.2	Making and Training Programme and Training Material																							
A2.3/B2.3	Conduct Training																							
A2.4/B2 4/C2 4	Practical Training in Maintenance Workshop								1				C							=				-
D0 5	Decrementation of Operation Discontinue Workshop						• +	+ +						┗	+ $+$						+			
B2.5	Recommendation on Operation Plan of the Maitenance Workshop																							
B2.7	Seminar on Maintenance of Waste Collection Vehicle for TUK																							
CR2.8	Monitoring Operation and Maintenance Report																							
Activities for Outpu	<u>t 3</u>																							
A3.1	Conduct CA for CMPUA																							
12.9	Making and Training Programma and Training Material																							
A3.2			-																					
A3.3/B3.3	Conduct Training																							
A3.4	Practical Training on Landfill Management																							
B3.5	Waste Amounta and Composition Survey																							
B3.6/C3.6	Investigation on Condition of Gas Generation in the Landfill																			2				
B3 7/C3 7	Preparation of Environmental Monitoring Report on Landfill																							
Activites for Output	4																							
Activities for Output	<u>4</u>																							
A4.2	Financial Analysis of WSF																							
AR4.1	Three alternatives of revised WSF regulations																							
AR4.2	Role of each organizations after revision of WSF					_																		
B4.11 B4.12/C4.12	Supporting for Introduction of Tender Process																			_				
CR4 7	JET conduct consultations among senior managements of EPWMD and																							
CD4.9	UMPUA on comprehensive SWM in UB City JET assists EPWMD to formulate guideline for calculation of waste							+ +							┓									
UK4.8	generation fee based on the appropriate waste collection tariff														<u> </u>									
CR4.9	waste collection organizations																							
CR4.10	JET assists EPWMD to prepare standard tender documents to sepect waste collection organizations												_	_							Ι Τ			
CR4.11	JET assists EPWMD to prepare guidelines for monitoring waste							1 1																
	collection organizations based on the contract.							+ +						+ +	+ +						+ +			_ _
Activities for Outpu	<u>t b</u>																							
A5.1	Conduct CA for EPWMD and District Officers																							
A5.2	Making and Training Programme and Training Material																							
A5.3	Conduct Training							<u>+</u>																
A5.4	Panning for the Pilot Project and Social Satisfaction Level Survey																							
R5 5	Information of Dilat Desiret												<u> </u>	+ +	+ +						+			
B5.5	Inplementation of Pilot Project																							
B5.5	Recommendation on Public Education																							
B5.7	Preparation of 3R Tools																							
Activities for Outpu	<u> </u>																							
A6.1	Plan for Output 6																							1
A6 2/R6 4/C6 2	3De Saminar							+ +																
A0.2/D0.4/C0.2								+						<u>├ </u>										
A6.3/B6.3	Pilot Project Facilities and Equipment Construction												ļ											
B6.6	Implementation of Pilot Project																							
B6.7	Waste com@osition survey																							
B6.8	Monitoring and Evaluation of PP																							
C6.9	Recommendation on Waste Separation and Recveling														1									-
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Phase							Phase 1											Phase	2								
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Month	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1 2	3	4	5	6	7	8	9	10	11	12
Reports:	IC/	२ 🔺				P	(R(1) 🔺					P/R(2) 🛦						P/R(3)					P/R(4) 🛦				
IC/R Inception Report P/R Progress Report							Seminar 3R (1	1) 🔺				PCR(1)▲	Se	minar 3R (2) 🛦				Midteri	m Project As	ssessment 🛪		I	PCR(2) 🛦	Seminar (3R (3) 🛦		
PCR Project Completion Report DPCR Draft PCR												Seminar(Ha	zardous Wa	aste) ▲			Workshop(Maintenance	of Equip.) 🛦								
JCC: Joint Coordinating Committee		JCC:1					JCC:2													JCC:4	L I	▲Seminar(Training Oth	er Cities)	JCC:5		
		A0.2 E		and Discuss	ion on IC/R						A0 12 C			B0.1						B0.1		50.7	4		C0.1		
	IC/F	A0.3 C	onfirmation	n on Project	Implementa	tion Struct	ure				for end of			Support-						Support-		CA for			Support-		
	n of			of ICC and	holding IC(montingo					1st Year			JCC 3						JCC4		End of 2nd Year	d		JCC5		
	atio			of Duciest		, meetings				'	1 †	A0.13									J h	1 cui	1 🖌				
	epar	AU.5 EX	entation Pla	of Project an			A0.11 P/R(1)					P/R(2)		+			P0.5						B0.8		Formula-		
	ā	A0.6 Ca	pacity Ass	sessment an	d Formulatio	on of								B0.2 Formula-			CA for	P/R(3)					P/R(4)		tion of		
Overall Output	٩.	Monitori	ing System	n for Capaci	ty Developn	nent					from	A0.14		tion of			Mid of 2nd	1				6	└┰┘╽		Operatio		
		+		0.7							A1 A2	PCR(1)		Operatio			Year					B1 B2	B0.9		n Plan		
		A1.1	Se	etting Indicat	ors						A3 A4 A5			n Plan								B3 B4 B5	PCR(2)				
		A2.1 A3.1	l L	A0.8 For	mulation of	Annual	h				A6					Ļ						- B6					
		A4.1		Operation			l↓			L				B0.3 Proc	urement of	Equipment											
		A5.1	A0.9	Procureme	nt of Equipn	nent								B0.4 Chan	ge of PDM		11		1	1							
																								_			
Activities for		A1.1 CA	of EPWMD																								
Output 1	l ì		A1.2	-																							
			Training	A1.3 Co	nduct Traini	ings								B1.3 Con	duct Trainir	195									C1.3 Condu	ict Training	is in the second
EPWMD obtains			and	1											7	.50											
capacity for proper			Material											B1.5 Seminar											O14 Traini		
SWM on policy								ſ	A1 E 1		Comment Co	andition of		on Hererdeu	B1.6 Wa	ste Amoun	t Survey at Generatio	on Source to	o revise MP		,				Regulations	and Guideli	nes on
making and planning								>	Hazardous	Waste and	e-Waste	ondition of		s Waste											SWM		
									L .				1	and e-													
Activities for						A2.1		A2.4 Field							D2 4 5	iald		B2.4 Field	B	2.7 orkshop op	B2.	.5 comme					
Output 2						CMPUA		Training at							Trainin	g at -		Training a	t O	&M of	nda	tion on					
Output 2					L			workshop							worksh	юр		workshop	e	ollection quipment	ope	eration			CR2.8 Monit	oring for su	ubmission (
CMPUA and EPWMD						A2.	2		ļ											1	wor	rkshop			Maintenance	of Equipm	ent .
Operation and						Tra	ning gram			+																	
Maintenance of						and		A2.3 Conduct Tr	ainings																		
Equipment						Mat	erial	o oniduot in	annigo																		
		A3.1 CA of	400	_				A3.4														B3.7					
Activities for Output		CMPUA	A3.2 Training					Field														mental					
3			Program					Sanitary	י										B3.6			Monitor	i		C3.6		
			Material					Landfilling											Monitorin	g Condition	of Gas	 Report 			Monitoring C	ondition of	Gas Gene
CMPUA obtains				-				Ť											Generatio	on at Dispos	al Site						
Operation of NEDS																											
				A3.3 Conduct	Trainings									B3.3 ► Conduct T	rainings												
						l						1			8-			1	1								
		44.5						14.0						B4.7	B4	8 Training	R4 9	1	1	1					CR 4.7 Cons	ultation amo	ng senior m
Activities for Output		A4.2 Financial	Analysis or	n WSF (1)				A4.2 Financial A	nalysis					CA on WSI	- Pro	ogram and terials	Conduct Tr	raining					+		CR 4.8 Guide	line for calc	ulating was
4								on WSF (2)									1	1	1	1 1				fee based on t	the appropria	ate waste c
EPWMD and WSF										AR4.3 P	reparation o	of			B4	.10									C C	R 4.9 Stand	lard tender
obtain capacity for			AR4 Alte	.1 Preparat ernatives for	ion of Three Revision of	WSF	AR4.2 Rol Organizatio	e of Each ons under F	Revised	Prototype	rocedure and e of Tender	nd			→ Su	pporting to	establish GWSF								se	siect waste	Sollection of
Administration/Financi			Reg	ulation		···· →	WSF Regul	ations		Documen	t for Select	tion of		B4.12		·	B4.11		1	•					B4.12		SR 4.10 St select wast
al Management					1					waste Co	Dilection Pro	ovider		Supporting	for Weighb	ridge	Support	orting for Intr	roducing Te	nder System	n		+		Supporting for Weighbridge	·	1 5
														Operation				1	1	1					Operation		
Activities for Output						A5.1	A5.2	A5.3																			
5						CA of EPWMD	Fraining Progra	Conduct T	rainings					B5.5				1	1		L	B5. Rec	o commendatio	ons			
						& District	m and	A5.4 Plan	ning for Pil	ot Project :	and Public			 Implement 	ation of Pile	ot Project											
EPWMD and District Offices obtain capacity							material	Opinion Su	urvey																		
for Public Education																								L,	C5.7 Devel	opment of	3R tools
													<u> </u>	B6 2	DØ			-	De s	<u> </u>							
Activities for Output				A6.1 Planning o	n Pilot Proi	ect	-	A6.3 Procureme	ent Equipme	ent and Co	nstruction of	of Facilities		Installation	of 3R 5	Seminar (2)		1	3R Pub	lic Event					C6.9 3R Seminar (3)	
6				L				for Pilot P	roject					Equipment		^				1					· · · · ·	A	
Appropriate Waste														B6.6 Imple	mentation	of Pilot Pro	ject		1		'						
Separation and															B6.8 Mor	nitoring and	Evaluation of Pilot P	roject	1	1			<u> </u>		08.4		
Recycling Plan for UBC								A6.2 3R Seminar										1	1						Recommend	ations	
is formed							1	(1)							B	6.7 Waste C	omposition Survey			B	3.7 Waste Co	omposition	Survey				

Figure 4: Work Flow



3.4 [A1] Activities for Output 1 (Policy Making and Planning Capacity)

a. [1.1] Capacity Assessment for EPWMD

Capacity Assessment for EPWMD was conducted 5 times overall. Details are shown in Section 4.5.

b. [1.2] Training plan and training materials

b.1 Background

EPWMD of Ulaanbaatar City Hall is the target of Capacity Development of Planning Capacity. EPWMD is an organization which manages and controls overall process of waste management, discharging, collection, intermediate treatment and final disposal. Roles to be played by EPWMD are varied such as development of regulations for WSF or other organizations, revision and development of necessary rules for recycling promotion and introduction of transparent and fair selection process for waste collection companies.

EPWMD is still a young organization established January 2009, there are only 7 staff under the general manager, it is the first time for some of them to be involved in solid waste management, hence knowledge and skills of solid waste management need to be instructed for them.

Training for Capacity Development of Planning Capacity is going to start from weekly lectures about overall knowledge and skills of waste management to improve the basic level of understandings. Then, through implementation of the planning process for the pilot projects together with JET, development of Planning Capacity is expected.

As for the policy making capacity such as making regulations etc.., JET has introduced overseas regulations, how to promote 3Rs according to the request of CP through weekly meetings and other occasions.

b.2 Objectives

- To strengthen the capacity of solid waste management planning and making policies for EPWMD
- To level-up the knowledge and skills on solid waste management for EPWMD's young staff.

b.3 Summary of Training

Summary of Training, time and place are shown below.

	Summary of Training	Time	Place
1.	Overall knowledge and skills of waste management	Weekly, through period of the project	Meeting room of EPWMD
2. •	Strengthening the planning capacity of Solid Waste Management Planning the Pilot Projects Holding the 3R seminar/workshop	Once a week April, 2010, February and October 2011.	Meeting room of EPWMD Conference room with microphone and screen in the city.

	Summary of Training	Time	Place
•	Holding the JCC meeting	Once a every half a year	Meeting room of EPWMD
•	Study on the e-waste and holding seminar	March, 2010 – Nov, 2010	Conference room with microphone and screen in the city.
•	Waste Amount Survey	Octorber 2010 onwards	Apartment Area
•	Revision of the Master Plan	June, 2012	Meeting room of
•	Formulating the Action Plan	July, 2012	EPWMD
			Meeting room of EPWMD
3.	Strengthening the capacity of policy making		
	on Solid Waste Management	September,2009 ~	Meeting room of
•	Revision of Regulation, Guidelines	accordingly	EPWIND
•	Consolidating the waste separation	September,2009 ~	
	The guideline on selection of the waste	accordingly	
•	collection companies	Jun,2010 ~	
	Training for dissemination to other cities	accordingly	
•		JUIY,2011	
c.	[1.3] Training in UBC		

Training in UBC was conducted as shown in the table above and training materials are compiled in Section A of Data Book.

d. [1.4] Training on preparing regulations and guideline for SWM

Training on preparing regulations, guidelines on SWM was conducted during the project and summarized in Section A of Data Book.

e. [1.5] Survey on Hazardous Waste and e-waste in UBC and Organize Seminar on them

Hazardous waste generated from household, especially focus on e-waste, were surveyed. Survey result are compiled in Section A of Data Base. Seminar on hazardous waste was organized in 3 March 2010, with participation of representatives from MOE, MOH and District office.

f. [1.6] Revision of Master Plan on SWM

Master plan (M/P) which was formulated in 2006 was revised. Waste amount and composition survey was conducted in 2010 winter and 2011 summer in order to reflect the changes of waste generation into revised M/P. Revised M/P is shown in Annex 1 of this report.

g. [1.7] Action Plan on Strengthening EPWMD

Each department of MUB should formulate annual action plan compling City Mayor's three year action plan. JET was requested by EPWMD to assist to formulate three year action plan from 2013 to 2016 in order to present to new city mayor who will be elected in May 2012. This action plan is shown in Section A of Data Book.

h. [1.8] Conduct diffusion workshop on SWM for provinces

In Mongolia, due to rapid economic growth, urbanization in many provincial cities are progressing. Provincial cities as well as UBC are facing serious environmental problems due to inappropriate solid waste management caused by rapid urbanization.

In order to improve these situations, MONET requested all provincial cities to formulate M/P on SWM. The proper formulation of M/P at provincial cities, MONET requested JICA and MUB/EPWMD/CMPUA to provide technical support to formulate M/P on SWM in central provincial cities based on the experience of formulating M/P on SWM in UBC from 28 June 2011 to 30 June 2011. This workshop gave participants the great opportunity to learn experience of improvement of waste management in UB. Also after the workshop EPWMD and CMPUA officials taucht additionally local authorities waste management by their initiative or cooperation with JET so that it can be said the workshop contributed to improve the ability of our counterparts.

Details are shown in Section A of Data book

3.5 [A2] Activities for Output 2 (Operation and Maintenance of Equipment)

a. [2.1] Conduct CA for CMPUA

Capacity assessments for CMPUA were conducted total 5 times. The results are shown in 0

Capacity Assessment.

b. [2.2] Making Training programme and materials, [2.3] Conduct Training in Mongolia and [2.4] Practical Training at Central Workshop

Trainings in Mongolia were conducted through Seminar, Workshop and Practical repairing training when the expert arrived in Mongolia. The contents, results and training materials are shown in Section A of Data Book.

c. [2.5] Recommendations for operation and maintenance for Central Workshop

Recommendations regard with operation and maintenance for Central Workshop was given on May 2011. The contents are shown in Data book Section B. CMPUA was commenced specific improvement works that rehabilitate maintenance building, lead-in water supply, upgrading of boiler facility, installing washing bay since 2011 according to recommendations and some of them are still in progress.

d. [2.6] Conduct seminar for operation and maintenance of collection equipment for TUK

Collection equipments which were procured by Japanese grant aid scheme were owned by Municipality of Ulaanbaatar; however TUKs are utilized those equipments upon making a rental contract between them. In order to long term utilization of the equipments, seminar for operation and maintenance of equipments for TUK was conducted on 19 May 2011.

The following contents of agreement were made between director of central workshop of CMPUA and each TUK workshop chief. Central workshop will be conducted regular maintenance 2 times per year and Other than the regular maintenance such as daily maintenance will be conducted by each TUK.

e. [2.7] Monitoring of report for operation and maintenance

Operation and maintenance reports will be prepared in every month by TUK and submit CMPUA, CMPUA will be compile the submitted report and submit it to EPWMD 4 times in a year. The content of report consists of daily operation report prepared by driver and monthely report which is complied daily reports. This reporting system was defined obligation of TUK in maintenance contract between CMPUA and TUKs.

3.6 [A3] Activities for Output 3 (Operation of NEDS)

a. [3.1] Conduct CA for CMPUA

Capacity assessments for CMPUA were conducted total 5 times. The results are shown in Capacity Assessment.

b. [3.2] Making Training Program and Training Materials

b.1 Background

CMPUA which was in depended from the waste management section of MUB has now more than 170 staff and mainly is operating the final disposal site while there were only few staff when beginning of the development study in 2004.

Narangiin Enger Disposal Site (NEDS) which equips a leachate pond, a control office and a truck-scale was constructed by the Japanese grant aid in 2009. Heavy equipment (bulldozers, excavators, dump trucks and tire shovels) were also procured to operate the sanitary land filling.

The truck-scale was set at the entrance of the landfill to weigh the amount of waste by the collection vehicles to the landfill and the amount of recyclable materials from the landfill. Since those weight are bases for payments to the collection companies, it is required more transparency and accuracy.

b.2 Objectives

To strengthen the operational capacity of CMPUA operates the NEDS

b.3 Summary of Training

Summary of Training, time and place are shown below.

	Summary of Training	Time	Place
1	. Overall knowledge and skills of waste management	Weekly, through period of the project	Meeting room of EPWMD
•	 Training to strengthen the operation and management capacity of landfill On site training of sanitary landfill and making the environmental monitoring report 	May and October, 2010 February and June, 2011	NEDS
•	Organizing the WP at the landfill site	April, 2010∼	NEDS
•	Improvement of the vehicle registration system at weighbridge	April, 2010~	NEDS

c. [3.3]Conduct of Training in Mongolia and [3.4] Practical Training on Landfill Operation

Training in Mongolia which shown in the above was conducted. The details are shown in Section C of Data book.

d. [3.5] Conduct Waste composition survey

Waste composition survey was conducted as a part of waste separation Pilot Project at separation yards in NESD. Results are shown in Data book Section E Report for results of Pilot Projects.

e. [3.6] Gas monitoring in NEDS and [3.7] Report for Environmental Monitoring of NEDS

Environmental monitoring should be conducted according to EIA report which was approved by MONET before construction of NEDS. Environmental monitoring is important for the residents surrounding NEDS and also for the CMPUA staff who are working everyday. Appropriate monitoring is necessary for MUB to plan future extension or site selection of new disposal site in future.

Narangiin Enger Recycle Complex is planned to be developed near NEDS, cooperation with surrounding residents is essential to concrete the plan for MUB as well.

Field training on environmental monitoring of NEDS was conducted in 19th April at NEDS and followings are the topics presented to CMPUA staff.

- Purpose of conducting Environmental Monitoring
- What are the meanings of each monitored figure.
- What is the next course of action when abnormal figure is observed
- Training materials for monitoring report are shown in Section C of Data book.

f. [3.8] Monitoring committee for NEDS

Evaluation of landfill operation by the third parties is becoming a very important tool for conducting sanitary landfill. EPWMD has establish monitoring guideline which is consist of purpose of evaluation committee, member of committee , time of evaluation and contents of evaluation on October 2010.

Accordance with the guideline, First committee was held on October 2010, second committee was held on May 2012.

Results of evaluation were almost successful in terms of environmental condition, operation, landfill facilities. It is considered that landfilling works were conducted sanitary.

Detailed results are shown in Section C of Data book.

3.7 [A4] Activities for Output 4 (Financial Management)

a. [4.1] Conduct WSF financial analysis

Baseline survey for WSF in each district was conducted twice on November 2009 and April

2010. Resulting that each district WSF are reported their financial status evaluated accordance with law of Mongolia and it reported to each district office.

b. [4.2] Prepare three alternatives of revised WSF regulation

After the decision made by the City Council on 23 Dec 2009 that DWSF should be abolished and recommendation to the City Mayor to revise WSF regulation, City Mayor has instructed EPWMD to draft revised WSF regulations. Accordingly, EPWMD requested JET to support to draft revised WSF regulations. JET supported to draft WSF regulation from end of Dec 2009 to end of Jan 2010. Accordingly EPWMD has submitted revised WSF regulations to City Mayor through General Manager.

JET has advised in cooperation with EPWMD on formulating for waste fee collection method, selection of collection firm by bid and contract for Collection Company, its management.

c. [4.4] Assistance for Introducing Tender System

Under the law on household and industrial waste, chapter 2 clause 9.5.2 stated district governor should select waste collection organization through competitive bidding system. Furthermore, guideline on collection of waste collection fee from ger resident together with electricity bill issued by GM under clause 4 of annex, same responsibility for district governor was stipulated.

In stead of stipulating in law and order, only few tenders were conducted before for selecting waste collector at SBD.

To prepare appropriate tender document and to conduct fair tender for selecting waste collector are essential to improve service level of waste collection and utilize waste collection fee charged from all the residents in UBC. In fact, it is responsibility for EPWMD to promote this tender system.

Under this circumstance, JET assisted to prepare appropriate standard tender document for selecting waste collector through competitive bidding system.

Guideline for Operation of standard tender form was prepared which contained Prequalification document, Standard tender form and work flow of tender procedure. Details are shown in Datebook Section C.

Results of evaluation were almost successful in terms of environmental condition, operation, landfill facilities. It is considered that landfilling works were conducted sanitary.

Detailed results are shown in Section C of Data book.

d. [4.5] Assistance for Management of Weighbridge Data

In order to get weight of waste carried in to NESD, weighbridge was installed and measured waste collection truck about 200 trips, 1000 ton in a day in 2009. The collected figures are public resource and it is very important for gain a right value and it will assist for landfill management. The collected figures need to correctly recorded, maintained and have to have a transparency t the public. It is obligation of public agency. Under this background, "Weighbridge manual" was prepared which contained three sections "1.Record measurement data", "2.Maintein recorded data and publish for public" and "3.Brousing data for public".

The details are shown in Data book Section D.

e. [4.6] Assistance for formulating Guideline on calculating appropriate waste collection fee

Cost of waste collection was born by the fee collected from waste discharger who are residents and business entities. Current waste collection fee is 2000tg/hh/month in apartment area and 2500TG/hh/month in Ger area. Waste collection fee from the residents in apartment area was collected by OSNAAG together with electricity bill and other public utility bill and paid to waste fee collection organizations such as TUKs and DWSF.

As for Gear area, waste collection fee was collected by fee collector who accompanies with waste collection trucks during waste collection one by one up to Jun 2011. After Jul 2011, this system was changed and waste collection fee was collected together with electricity bill by power Distribution Company then paid to waste fee collection organizations

On the other hand, waste collection tariff which is basis for the payment to waste collection company, was seta in each district. Some are based on the unit rate per ton of waste per km, and some are based on lump sum basis such as how much per trip to disposal site. This waste collection tariff is not uniform that some districts are following district council and some districts are following city council recommendation.

Firstly, in this guideline, appropriate waste collection tariff to waste collection company is calculated based on Japanese grant aid equipment which are Compactor Truck(15m3) and Compactor Truck(8m3) for apartment area collection, and Dump Truck(6ton) forger area collection since those specification and price are known. Secondary, in order to cover this waste collection cost, several simulation was made for determining what the necessary waste collection fee is for the residents.

Details are shown in Annex 4.

f. [4.7] Comprehensive administration/ financial management on SWM

According to recommendation which obtained in mid term evaluation by JICA, meeting was organized with decision makers of EPWMD and CMPUA at around once in two months. Important data and results obtained through implementation of pilot projects were presented to them for considering necessary step to introduce separate collection and recycling in future.

Total three times of meeting was held, it was presented that separate discharge and collections were feasible under certain conditions. JET requested them to decide their policy for introducing these systems as soon as possible.

3.8 [A5] Activities for Output5 (Public Awareness)

a. [5.1] CA for EPWMD and District officer

Capacity assessments for EPWMD were conducted total 5 times. The results are shown in Capacity Assessment.

Capacity AssessmentThere is no section in charge of public awareness in district office, it is taking care by district WSF. However CA for WSF has been chandelled due to the decision

of abolishing the WSF rule.

b. [5.2] Making Training programme and its materials and [5.3] Training in Mongolia

Strengthen of public awareness activities are conducted to EPWMD, WSF staffs in target area, Khoroo Governor and Representative of AOU though PP1 (Improvement of discharge manner and separate discharge)

c. [5.4] Planning for Pilot project and socially satisfaction survey

Prior to commencement of pilot project socially satisfaction survey regard with waste management were conducted covering residences in target area and businesses. The results of survey which conducted before and after are showing in Section E of data book.

d. [5.5] Conduct pilot project

Pilot project was conducted from October 2010 to May 2012. Details are shown in Section E of Data book.

e. [5.6] Recommendation for activities for Public awareness to district officer

The recommendation on the public awareness activities in the UB city through implementation of the pilot project will be summarized below.

e.1 Improvement of Awareness of the Khoroo Governor on SWM

The administrative organizations of UB city are divided into three levels such as city, district, khoroo. One district has 5000 to 10000 people on average and divided into about 20 khoroos. The district is in charge of waste collection, while the khoroo has direct connection with citizens by paying attention to the citizen's waste discharge manner, hearing the complaints on the collection manner of the collection providers, and working for the clean up of the streets etc., therefore, improving awareness of the khoroo governor on the SWM as a top of the khoroo can be directly contributed to the satisfaction level of the citizens on the SWM.

As well as in promoting the 3R and recycling in the future, it is recommendable to focus on raising awareness of khoroo governor through the seminar and workshop and training etc. Then, waste separation activities on pilot scale should be implemented one by one in the khoroo with the higher awareness on SWM, so that it will be expanded to the surrounding khoroos gradually.

e.2 Public Awareness in Cooperation with the AOU and Jijur

In the apartment area, the individual or a number of the apartments belongs to the Apartment Owner's Union (AOU) and one AOU leader is chosen for each AOU. This AOU leader serves as a medium of communication between khoroo governor and residents and plays an important role.

On the other hand, generally speaking, a cleaner called Jijur is working by live-in at each entrance of the higher apartment with more than 9 stories or at each two or more entrances of the lower apartment with 3 to 5 stories. They collect and take valuables form the waste discharged by residents, and put out waste at the collection point when the collection truck

comes, so they also play an important role between collection provider and residents.

Therefore, it is recommendable to utilize the AOU leaders and jijurs when improving waste discharge manner and waste separation activities. Working on them from the upper and lower sides at the same time seems to be one of the most effective approaches.

e.3 Role of DWSF and Countermeasure upon Abolition of DWSF

The abolishment of DWSF is decided at the city council on December 23, 2009 and clause of WSF was deleted from Law on Waste which revised on May 2012.

As of August 2012, Chigertei DWSF is only one DWSF who existing and collected waste fee. DWSF will be abolishing, however, 88 members out of 139 of khoroo is still collecting waste fee by themselves and its paid to collector, or waste is collected by themselves

Basic condition for the public awareness such as improvement of the waste discharging manner, punctual discharge, and waste separation at source is good management (point collection with fixed schedule) of collection providers. Only governmental organization which pays money to the collection provider can manage collection providers, so this point also needs to be considered as one of the options.

f. Training for Environmental Education Leader

In order to raise public awareness on SWM, it is important to teach environmental education in elementary and secondary schools. It is promising effort that they become more environmental conscious as they grow, and it also can expand their knowledge to the adults at home.

To that end, it is higher for efficiency to cooperate in development of the educational program for enhancing the fundamental knowledge on SWM with teachers rather than EPWMD goes directly to the schools to teach on SWM.

Our project assisted EPWMD to prepare training program for environmental education leader. (Refer to Progress Report No.4 Annex 5)

Currently, JICA is implementing a technical cooperation project on "Strengthening Systems for Improving and Disseminating Child-Centered Teaching Methods, II Phase" in cooperation with the Ministry of Education, Culture and Sciences (MECS). In this project, the teachers' guidebooks are being prepared.

Therefore, it is recommended that making further cooperation with the above organization for preparing waste educational materials, education programmes and guidebooks.

g. Activities for Public Awareness Raising and Proper Control of Collection Services

During implementation of pilot projects, concrete outputs such as closure of dust chute and abolition of outside discharge points (ODP) which were cause of unsanitary conditions in the residential area. But we have experienced that, due to insufficient collection services, dust chute and ODP turned back to full of wastes and residents complained more than before. Public awareness raising to get cooperation from residents are important to improve waste discharge manner and promoting waste separation and generation source, but all the efforts

became useless in case waste collection service is not up to the standard.

As of July 2011, khoroos which DWSF is collecting waste fee from residents decreased, TUK is getting back right of fee collection and waste collection activities. It has arising a big problem that by whom will take care and manage for waste collection in future. Therefore it is a time to consider that strengthen on waste management of district organization.

Therefore, it is recommendable to utilize the AOU leaders and jijurs when improving waste discharge manner and waste separation activities. Working on them from the upper and lower sides at the same time seems to be one of the most effective approaches.

h. [5.7] Development of tools for raising public awareness on SWM

As a part of activities of the PP1 phase 2, PR tools such as brochures and posters had been prepared and distributed to improve waste discharging manner and waste separation by the residents in July, 2011. Then, in order to make these activities well-known to more citizens, EPWMD and CMPUA requested again to prepare TV programs, commercials (two kinds each), booklets, calendars for 3R promotion and leaflet for improvement of waste discharging manner by residents and business entities. Upon their requests, JET decided to support them with supplementary budget for the 3rd year of the project.

Details are shown in Annex .5.

3.9 [A6] Activities for Output 6 (Appropriate Waste Separation and Recycling Plan for MUB)

a. [6.1] Planning of Pilot Project

Basic Plan of implementing PP is designed as follows.

a.1 Principal of 3R promotion and Pilot Project

The objective is to evaluate the effectiveness of pilot project for planning the adequate waste separation and recycling program of Ulaanbaatar city.

Priority of 3R starts from Reduce, Reuse and Recycle. It should be encouraged "Reduce" the amount of waste discharged here in Ulaanbaatar city. Ulaanbaatar city has already conducting the new regulation approved charging fee on plastic bags (50-100tg per bag) to reduce using plastic bags. Using Eco-Bags is also encouraged. According to the Waste Amount and Composition survey at the development study, amount of waste discharge by source are 286g/capita/day in summer and 640g/capita/day2 in winter, which are less than half of those developed countries3. The project was planned while keeping current life style and continue promoting the plastic bag charge and using Eco bags.

To promote "Reuse", reuse of beer bottles and vodka bottles, repairing home appliances and cloths to reuse are still common in Ulaanbaatar city while they used to do in Japan. These

² Data is about per capita/day (2005) in the city area. There is more waste in winter due to the coal ash generation.

³ Amount of the waste discharged in cities of developed countries are, 1100g/cap/day (Japan), 1000g/cap/day (Korea), 1300g/cap/day (UK) and 1500g/cap/day (Germany) etc...all generate more than 1kg.

good habits and reuse "system" should be encouraged and protected when needed by public administration.

The first step to promote Recycle is to extract materials from the waste to be used for other purpose. To know that, several verifications are required as separation at source or at final disposal site, verify in view of technology, cost, social and sanitation. Currently, Material Recycling as collecting recyclables is widely conducted in Ulaanbaatar city but Thermal Recycle is not implemented yet. Master Plan recommends to do Thermal Recycle by utilizing low quality paper and plastics to produce Refuse Plastic Fuel (RPF) and use it at the power generation plant or hot water plant which operate and incinerate continuously in high temperature.

Pilot Project (PP) was conducted for aiming to verify the possibilities of that recycle.

a.2 Basic policy

Basic policy of waste separation and recycling of the Master Plan which target year is by 2010, is shown below before planning the pilot project

- 1. First priority is to reduce waste at generation source.
- 2. Waste separation at source shall be two types, recyclable and others.
- 3. Recyclable includes valuables such as PET, Metal, Textile, Bottles and low quality plastic and paper.
- 4. Separate collection for recyclable and others will be introduced to try reducing the amount of waste disposed at the final disposal site.
- 5. Recyclables shall be separated into valuables and RPF materials at the sorting yard beside the final disposal site. The sorting yard is the place of employment for Waste Pickers and valuable picking at this place shall be prohibited.

The flow chart is shown below.



Figure 5: Flow chart of Waste separation and Recycling in Master Plan

a.3 Current waste collection and recycling system

Pilot Project site was selected on March, 2010. To make detail plan for the four selected candidate sites, Time and Motion survey was conducted. The survey revealed that watchmen and waste collection workers were collecting big amount of recyclables (valuables). The current situation of waste collection and recycling system is shown below.



Figure 6: Current waste collection and recycling system

a.4 Problems of introduction of separate collection

Many of the watchmen live at the entrance of apartments and doing cleaning common space, waste management and checking the visitors in Ulaanbaatar city. Their salary⁴ is very low and they collect recyclables and sell at recycling shop to complement their incomes. Time and Motion survey from March 2010 revealed that waste collectors were also collecting recyclables, the amount recyclable collected was 1-2% of the total amount of waste collected, and income from selling recyclable was the same amount of their salary⁵.

In current situation, if waste separation by households are made obligatory and introduce separate collection, watchmen and waste collectors will take almost all the recyclable as much as they can do, and residues will arrive at the sorting yard with few recyclables. The situation above can be shown as a flow chart below.

⁴ Majority of them receive 108,000Tg/month in average which is the same as the lowest salary designated by the government (as of July, 2010).

⁵ Waste collectors at PP areas receive 5,000 Tg /trip for collecting waste and transport it to the final disposal site. They receive the same amount from selling recyclables.



Figure 7: Current problems and M/P implementation

a.5 Basic Policy of Pilot Project

The situation above will be dissolved when salary of people increase, economy of Ulaanbaatar goes up and the recycling market does not work in future. However Introduction of separate collection to all apartment areas is measured as being premature at this moment. Thus, following policies are for this waste separation and recycling Pilot Project.

- 1. Promote waste separation at source, by residents and businesses
- 2. Separate the waste into two types, Recyclable and Others.
- 3. Recyclables6 are PET, Metal, Textile and Bottle etc...those valuables
- 4. There is no limitation of collecting recyclable by watchmen and waste collectors.
- 5. Separate collection for the recyclables will be implemented at PP area as an experiment and feasibility will be investigated under the ground of cost, public cooperation, quality of recyclables and appropriate separate system will be determined.
- 6. Part of mixed waste also transported to Sorting facility for investigating feasibility for separating recyclables from mixed wastes.
- 7. At the sorting facility, both manual sorting and semi-mechanical sorting will be examined.

⁶ EPWMD, Ulaanbaatar city is in the mid of formulating the Regulation on Waste Separation, separation of hazardous waste from household and medical waste are under discussion. However, the collection and management system of those hazardous waste are sill not established yet, nor there is concrete plan off treatment facility for those waste. Those wastes are out of targets of separation for the Pilot project at this moment.



Figure 8: Flow chart of Waste separation and recycling of the Pilot Project

b. [6.2] Conduct 3R seminer

3R seminer was conducted total 3 times participating Pilot Project participants. First seminer was conducted to explane for contens of Pilot Project on April 2010, Second seminer was conducted to report of progress of Pilot Project on October 2010 and third seminer was conducted to report of final results of Pilot Project and explaine of policy for waste separation and recycling on October 2011.

c. [6.3] Preparing of facilities and equipments for Pilot Project

The sorting yard and facility to separate the waste from recyclables was constructed at the area of NERC (Recycling complex) in NEDS. Sorting yard have manual serection and belt conveyer selection.

c.1 Layout of facilities



Figure 9: Layout of sorting yard and facilities

c.2 Tender of sorting facility and contract

Tender of sorting facility was divided into two, civil construction of facility, and procurement and installation of belt conveyor with related equipment. Construction work began on April 2010 and completed on July. As for the installation work, our project made contract with the contructor on the July. Then the facility was utilized for our project to conduct the experiment of sorting.

RPF manufacturing plant has been constructed besides our facility in accordance with Korean government aid so that MUB authorities will run our facility with new plant.





d. [6.4] Condut Pilot Project

Following Pilot Projects which related to Output 5 and Output 6 were conducted.

1. Pilot Project related with Public awareness

- PP1-1: Improvement of waste discharge manner and
- PP1-2: Promotion of waste separation at generation source
- PP2-1: Improvement of waste collection manner
- PP2-2: Improvement of waste collection efficiency

2. Pilot Project which related with separation and recycle

- PP1-3: Conduct waste separate discharge at generation source
- PP2-3: Conduct separate waste collection
- PP3-1,2,3: Conduct waste sorting at landfill site

PP1 is composed from phase I, which is initiated by JET, and phase II which is initiated by EPWMD based on the experience of phase I. Relation between these Pilot Project and Output (Public awareness), Output 6 (Separate and recycle are summarized following table.

		Output 5 Public Awareness	Schedule	in charge	Output 6 Waste Separation and Recycling	Schedule	in charge
PP1 Waste	Target	 1st 4 khoroos(Phase I) 	2010/4-	JET	•SBD#7 horoo	2011/5-	JET
Storage and	Turgot	 2nd 4 khoroos(Phase II) 	2010/11-	EPWMD		7	021
Discharge	Contents	1. Improvement of Discharge N	lanner		Separate Discharge at Generation	source	
Bloonlaige	Contents	2. Waste Separation at Genera	tion Sourc	e			
	Torret	 waste collection company for 1st 4 khoroos 	2010/4-	JET	•SBD#7 waste collection company	2011/5-	ICT
PP2 Waste Collection	Target	•waste collection company for 2nd 4 khoroos	2010/11 -	EPWMD	(Tsuzuku Yume Co.)	7	JET
	Contonto	1. Improvement of Collection S	Services		3. Separate Collection		
	Contents	2. Improvement of Collection E	fficiency				
	Torgot				•Mixed Waste(Hand and Conveyor Sorting)	2010/7-	JET
PP3 Sorting	Target				 Separate Collection (Hand and Conveyor Sorting) 	2011/5- 7	JET
Experiment					1. Construction of Sorting Facility		
	Contents				2. Sorting Operation with Mixed Was	tes	
					3. Sorting Operation with Separated	Wastes	

Table 2: Relation between PP and Output

Followings are the implementation schedule for each PP.

Table 3: Implementation Schedule of each PP

Description	2009 2010														20)11							
Description	11	12	1	2	3 4	4 5	6	7	8	9	#	# ;	#	1	2	3	4 5	56	7	8	9 #	#	#
			rati		$\overline{}$	\square	1		Ŀ	mnl	em	ente	atio		Star				\overline{A}	/			
		repa	rau			\searrow	\mathbf{r}							T		50		\neg	1				
Planning for PP																							
PP1(Phase I): Waste Storage and Discharge																							
1.Improvement of Discharge Manner																							
2.Waste Separation at Generation Source																							
3.Separate Storage and Discharge of Recyclables	3												Z			//							
PP2: Waste Collection																							
1.Improvement of Waste Collection Manner																							
2.Improvement of Waste Collection Efficiency																							
3.Separate Collection of Recyclables																//							
PP3: Sorting Operation at NEDS																							
1.Construction of Sorting Facility																							
2.Sorting Operation for Mixed Collection Waste												/				//							
3.Sorting Operation for Separate Collection Wast	e																						
Monitoring																							
Evaluation and Recommendation																							
PP1 (Phase II): :Extension of PP area by EPWMD																							
1.Selection of Target Area											ĺ												
2.Baseline Survey including POS													-										
3.Time and Motion Survey																							
4.AOU Meeting, Resident Meeting																	-						

e. [6.5] Conduct waste composition survey

Conduct waste composition survey for waste bringing into landfill site to confirm composition of valuable materials amount and ratio of paper and plastic which are raw materials of RPF. It is used for calculation of RPF facility operation cost. Results were separated for Mix waste and Separated waste. Details are shown in Section D of Data book.

f. [6.6] Monitoring and evaluation of Pilot Project

Monitoring and evaluation of Pilot Project was conducted by following method.

			Ν	Iethod of Monitoring and Evaluation		Evaluation results
PP1: Storage and discharge of waste	1.	Improvement of discharge manner	• •	Public opinion survey before and after of PP Stationary measurement	/ f	 After implementing of PP, acknowledgement and cooperation for discharge manner of residents were risen.
	2.	Promotion of separation at generation source	•	Record of bought-out at recycle shops Record of separation by Jichur	t N	 Bought-out amount was constantly growing up since till 3 months. It was deceased coming to winter.
	3.	Separate discharge at generation source	•	Record of Weighbridge T&M survey	f	 Separate discharge amount was increased week by week. Proportion of Kitchen waste was only a few % in the separated waste

		Ν	Aethod of Monitoring and Evaluation	Evaluation results
PP2: Waste collection	1. Improve of collectio manner	ement • waste on •	Questionnaire to residences at before and after Analysis of disruption time between schedule and actual	 Not much improved collection manne before and after of PP In order to applicable evaluation, standard deviation was introduced fo schedule
	2. Improve of colle efficient	ement • ection cy •	Analysis of disruption time between schedule and actual T&M survey	 Collection efficiency was much improved by closure of dus chute and introducing bell collection system.
	3. Separa collectio	te • on •	Record of Weighbridge Analysis of collection and transportation cost	 Proven collection and transportation cost will be down introducing separate collection due to reducing volume such as a hardboard etc.
PP3: Trial Sorting at disposal site	1. Constru of s facilities	orting	Contract management	
	 Trial s by waste Trial s by sep waste 	orting Mixed orting parate	WCS analysis for target waste Cost analysis by working records Income analysis by valuable selling Sorting cost analysis by unit weight Evaluation of working environment Evaluation of safety Evaluation for sanitary condition	 Amount of residues were 83% for mixed collection and 22% fo separate collection. Sorting cost by separate collection is cheaper than by mixed collection. Separate waste sorting was much better than mixed waste in terms of safety, sanitation and working condition

Details are shown in Section E of Data book.

g. [6.7] Recommendation on Waste Separation and Recycling Activities

Considering the results of various PP conducted, following recommendation is made to introduce waste separation and recycling UBC.

g.1 Promotion of Waste Separation at Generation Source

As a character of many apartments in UBC, cleaning lady (Jijuur) is stationed in entrance of the building and she is in charge of cleaning entrance, public space and checking visitors. Normally in the apartment where this jijuur is stationed, there is a dust chute room in 1st floor where store the wastes falling down from upstairs. This dust chute room can be used for the space for string separated wastes in the apartment.

Jijuur can play an important role for separating wastes at generation source since she is the contact point between waste collection truck and the residents who discharge wastes. At this

moment, 2% of the wastes are recycled at generation source mainly by this jijuur. Promotion of this waste separation at generation source is encouraged since it is quite efficient.

Dust chute has problems when we request people to separate waste at generation source since people can discharge waste whenever and whatever they want. But same time, if dust chute is closed and utilize the dust chute room as storage for separated waste, waste separation at source can be feasible.

It is recommended for MUB to promote waste separation at generation source utilizing these particulars of apartment with dust chute and try to reduce the wastes to transport to disposal site. On the other hand, wastes discharged from ger area does not contain much recyclables, therefore, waste separation at generation source is not encouraged but separation of ash from other wastes will be promoted in long term.

g.2 Introduction of Separate Discharge and Separate Collection

Pilot project for separate collection was conducted in 2006 through JICA development study. The conclusion was that introduction of separate collection was too early.

Pilot project for separate discharge and separate collection was again conducted in 2011 through JICA technical cooperation project, it was found that the separate discharge and separate collection is feasible technically and socially under certain conditions. Certain conditions are such that khoroo governor is keen to improve SWM, waste collection company can provide scheduled and reliable collection services.

MUB has allocated budget to purchase 163 numbers of waste collection trucks in late 2011. As of Jul 2012, part of the collection trucks arrived and the level of waste collection service is very high in terms of mechanical condition of trucks. It satisfies the latter condition to introduce separate collection. Furthermore, recycling facility was constructed in NERC using foreign aid, it is the time for MUB to introduce separate discharge and separate collection system in UBC in near future.

It is planned under M/P of SWM in UBC that the introduction of separate collection system is commenced from 2013 with target population is 20,000 people and this system will be increased to 360,000 people in 2020 which cover 65% of the population in apartment area.

g.3 Waste Separation in Ger Area

Particular of waste composition in UBC is that many ash was discharged from ger area in winter season. Waste generation amount in winter is double the amount in summer. This phenomena makes difficult for waste collection services since it requires double the waste collection trucks in winter compared to trucks in summer.

In long term, it is expected to reduce the generation of ash, following government policy to fight with air pollution such as changing fuel from coal to oil or electricity. In mid and short term, separate discharge of ash is recommended.

Recycling of ash to construction material is one of options and providing special disposal site for ash might be another option to solve waste collection problems and reduction of final disposal amount will be expected.

g.4 Promotion of Recycling by Government Sector
Recycling activities led by government sector is not implementing actively at this moment in UBC. Reuse and recycling activities are carried out by informal sector including waste pickers. Furthermore, most of the final users of recyclables are in China, therefore the wastes which are recycled are limited.

Recycling activities by Informal sector or private sector are limited to those which can be profitable. Wastes such as low quality plastic or paper which obstruct landfill operation at disposal site can not be recycled by those informal or private sectors since they are not profitable to salvage.

Fundamental goal of M/P is "To establish environmentally sound SMW system in UBC by the year 2020" In order to achieve this goal, 65% of the population in apartment area and 25% of that in whole city are covered by separate collection system. Recyclable wastes and others are separated at source, and recyclable wastes are collected and transported to sorting facility in NERC and after recovering recyclables such as can and PET bottles, low quality paper and plastic which can not be recycled are formed to RPF and used as fuel. This RPF will be mixed to coal with few percentages and incinerated in continuous and high temperature burning plant such as power plant or heating plant.

As of Jul 2012, Sorting facilities and RPF manufacturing plant were constructed in NERC (Narangiin Enger Recycling Complex) next to NEDS by foreign aid. Expected operation cost for this facilities are presented in revised M/P.

In order to implement this M/P, it is recommended for MUB to take a step to find final user of produced RPF, allocate budget to operate the sorting and introduction of separate collection.

As a result, promotion of recycling by government sector will be realized.

4 Administration of the Project

4.1 Joint Coordinating Committee

Roles of the JCC

- 1. To approve annual activity plans based on the Plan of Operation (PO) within the framework of the Record of Discussions.
- 2. To monitor and evaluate the progress of the Project and the achievements of the annual activity plans.
- 3. To discuss and advise on major issues that arose during the implementation of the Project

Chairperson: General Manager of Ulaanbaatar City and Chief of the Mayor's Office, Municipality of Ulaanbaatar.

Member

[Mongolian side]

- 1) Director-General, Department of Development Financing and Cooperation, Ministry of Finance
- 2) Director, Sustainable Development and Strategy Planning Department, Ministry of Nature, Environment and Tourism
- 3) Director, Public Health Policy and Implementation Coordination Deparatment, Ministry of Health
- 4) Project Manager/Director, Environmental Pollution and Waste Management Department of the Mayor's Office, Municipality of Ulaanbaatar
- 5) Director, City Maintenance and Public Utilities Agency
- 6) Director, Capital City's Specialized Inspeation Agency
- 7) Relevant Personnel appointed by the Chairperson, if necessary

[Japanese side]

- 1) Chief Representative, JICA Mongolia Office
- 2) Japanese Expert Team (JET)
- 3) Relevant Personnel appointed by JICA, if necessary

[Observer]

- 1) Representative(s) of Embassy of Japan in Mongolia
- 2) Other Personnel invited by the Chairperson

	Organized date	Place	Contents of the Meetings										
1 st Meeting	21 Oct 2009	Meeting room of the Mayor's Office, 6 th floor, UBC Government	Approval of the ICRConfirmation of C/P membersConfirmation of JCC members										
2 nd Meeting	30 Mar 2010	Same as above	 Approval of the PR-1 Change of C/P members Approval of PDM₂ 										
3 rd Meeting	13 Oct 2010	Same as above	 Approval of the PR-3 Change of C/P members Approval of PDM₃ Approval of the activity plan for the 2nd year 										
4 th Meeting	17 May 2011	Same as above	 Presentation of the mid-term evaluation results Approval of PDM₄ 										
5 th Meeting	11 Nov 2011	Same as above	 Approval of the PR-4 Change of C/P members Approval of the activity plan for the 3rd year 										

	Organized date	Place	Contents of the Meetings
6 th Meeting	18 May 2012	Same as above	Presentation of the terminal evaluation results
mooting			 Summary of the Project

4.2 Seminars and Workshops

The following seminars were organized throughout the project implementation.

Seminars	Date	Contents	Participants
The 1 st 3Rs Seminar	2010/4/14	Introduction to the 3Rs and explanation of the pilot projects	About 100 persons from MONET, MOH, EPWMD, CMPUA, PSDs of District Offices, WSFs, KhorooGovernors, representatives of residents and NGOs.
The 2 nd 3Rs Seminar	2010/11/25	Explanation of progress of the PPs and discussion of measures for promotion of waste separation on generation sources	Same as above
The 3 rd 3Rs Seminar	2011/11/24	Presentation of the PP achievements and explanation of the policies of the MUB for promotion of 3Rs based on the achievements.	Same as above
Seminar on Hazardous Waste	2010/10/3	Discussion of Hazardous Waste Management in UBC among relevant organizations referring to the experiences in Japan.	About 50 persons from MONET, MOH, PSDs of District Offices and EPWMD.
Seminar on O & M of Equipment	2011/6/19	Discussions and agreement on check-items and schedule of periodic inspections to be organized for the collection vehicles provided under the Japanese Grant Aid and being utilized by the TUKs, payment to the Central Workshop of CMPUA and the contract form.	EPWMD, CMPUA, TUKs
Dissemination Seminar for Provincial Cities	2011/6/28- 6/30	The training organized in order for officials of provincial cities to formulate SWM M/P based on the experience in UBC.	About 35 persons from MONET, CMPUA, EPWMD and officials in charge of SWM invited from 10 provincial cities
The Final Seminar	2012/8/15	The summar of the technical cooperation project implemented for the past 3 years and recommendations for the future SWM of UBC	About 100 persons from MONET, MOH, EPWMD, CMPUA and PSDs of District Offices, WSF, Khoroo Governors, residents' representatives and NGO

In relation to the O & M of equipment, following workshops and practical trainings were organized.

Workshops	Date	Contents	Participants
Workshop on O & M of Collection Vehicles (1)	2010/4/6	Presentation of current conditions of O & M of collection vehicles, training on O & M methods formulated in consideration of the severe natural conditions in UBC, explanation of formats of O & M reports and instructions on utilization of the report data.	EPWMD, CMPUA and TUKs
Practical Training on O & M of Collection Vehicles (1)	2010/12/9	Instructions on body repair of compactor trucks and instructions on repairing hydraulic cylinders	Same as above
Practical Training on O & M of Collection Vehicles (2)	2011/10/26	Practical training on basic understanding of electric circuit of collection vehicles	Same as above
Workshop on O & M of Collection Vehicles (2)	2012/4/10	Guidance on submission of O & M reports for TUKs and instructions on data analysis	Same as above

4.3 Weekly Meeting

The weekly meeting is an important opportunity of transferring SWM knowledge and techniques and strengthening the capacity of planning and policy formulation. The weekly meeting was organized <u>103 times in total</u> from 26 Oct 2009 through 21 May 2012.

In relation to the completion of the technical cooperation project, the weekly meeting was decided to be transformed into monthly meeting of the Appropriate Waste Management Study Team.

4.4 Trainings in Japan

The following trainings were conducted in Japan.

	Implementation Period	Name of the Training	Accepting Organization								
1 st training	2009.11.29-2009.12.26										
2 nd training	2010.11.28-2010.12.18	Administration of SWM	JICA Chubu Center, Municipality of Nagoya								
3 rd training	2011.11.03-2011.11.30										

The list of participants is the following.

a. 1st Training in Japan

Name	SEX	Position
GALDAN Damdinsuren	М	A Chief Engineer, City Maintenance and Public Utilities department
ORSOO Davaasuren	М	The Vice Governor of the Governor Administrative Office of Sukhbaatar district.

Name	SEX	Position									
OTGONBAATAR Odjargal	М	The Officer of the Department of Environment Pollution and Waste Management, Mayor's Office of Ulaanbaatar city									
BUDRACHAA Batdorj	М	The Officer, Department of Production Service, Governor's Office of Songinokhairkhan district, Ulaanbaatar city.									
DORJJATSAN Enkhtuya	F	Specialist of the Urban Development and Pollution, Department of Manufacture and service, Governor's Office of the Bayanzurkh district, Ulaanbaatar city.									

b. 2nd Training in Japan

Name	SEX	Position
SETEVSUREN Enkhbold	М	Head, Central Workshop, City Maintenance and Public Utilities Agency.
ALTANTSETSEG Erdenebat	М	Director, Waste Service Fund, Chingeltei District Governor's Office.
YUBA Erdenechuluun	F	Head, Administration department, Governor Office of Songinokhairkhan district.
PUREVTSEREN Baigalmaa	F	Governor, 7th khoroo, Bayanzurkh district of Ulaanbaatar city
TUMENDEMBEREL Enkh-Amgalan	Μ	Officer, Department of Environment Pollution and Waste Management, Mayor's Office Capital City Ulaanbaatar.

c. 3rd Training in Japan

Name	SEX	Position							
ZANDMAA Mungunzul	F	Officer, Department of Environment Pollution and Waste Management, Mayor's Office Capital City Ulaanbaatar.							
ERDENECHULUUN Iderchuluun	М	Officer in charge of Hazardous waste "Narangiin Enger" Waste Disposal Site, City Maintenance and Public Utilities Agency							
TUMEN Erdene	М	Specialist in charge of landfill technology ,City Maintenance Public Utilities Agency							
BYAMBADORJ Lhagvabaatar	М	Head of the Division of Manufacturing and Retail Service, Bayangol district of Ulaanbaatar City							
AMGALAN Oyunchimeg	F	Economist of City Maintenance and Puplic Utilities Agency							

d. JICA International Training

5 C/P members participated in the JICA International Training Program. The list of the participant is as follows:

Cource	Duration	Name	SEX	Position						
Waste Management and 3R(Reduce,Reus e and Recycle) Policies (A)	2010.11.16 -2010.12.1 8	AVIRZED Vandanmagsar	Μ	Officer in charge of Household and Factory waste, "Narangiin Enger" Waste Disposal Site, City Maintenance and Public Utilities Agency.						
Urban Solid Waste Management by Local Government	2009.08.10 -2009.10.2 1	SARANKHUU Ariguun	М	Officer, Department of Environment Pollution and Waste Management, Mayor's Office Capital City						

Cource	Duration	Name	SEX	Position
Urban Solid Waste Management by Local Government	2010.08.09 -2009.10.2 0	ENKHBOLD Batbileg	Μ	Officer, Department of Environment Pollution and Waste Management, Mayor's Office Capital city
Waste Management and 3R (Reduce,Reuse and Recycle) Policies(A)	2011.06.12 -2011.07.1 4	SHAGDARSUR EN Chantsalnurma a	F	Officer, Environment Pollution and Waste Management Department, Ulaanbaatar City Mayor's Office
Waste Management Technique (A)	2011.08.21 -2011.10.2 2	JUGDERBARA M Batzolboo	М	Officer, Environmental Protection Agency of Ulaanbaatar city

4.5 Capacity Assessment

4.5.1 Target of Capacity Assessment

During the 3 years of the project implementation, the C/P members changed as follows. The director of EPWMD, which is a department of the Mayor's Office, was replaced during the project implementation. As all the officers of the department except one were not reshuffled throughout the period, capacity development for the EPWMD members was conducted smoothly. Although most top officials in the MUB change following the change of the Mayor after the election, general officers do not usually change. Therefore, capacity development of young officers was not interrupted throughout the project implementation.

As for CMPUA, which is a public company⁷, the director of the organization possesses rights to transfer personnel. As the director of the organization changed 2 times during the project implementation, most of the initial personnel in the organization quitted their jobs. Since the previous opposition party formed the majority after the election that took place in Jun 2012, a drastic change of the personnel has been expected in the MUB; and therefore, it can be considered as a structural problem in terms of the sustainability in both technical aspects and direction of policy.

⁷ Although the operation of disposal sites is financed by the Municipal Budget, CMPUA is allowed to collect fees for their services such as waste collection and increase profits.

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The C/P members at the time of the project completion are shown in the table below.

Output				Main C/P	Supporting C/P	
1.	Policy making and		and	EPWMD (S.Ariguun)	CMPUA (D.Purevdorji),*1	
	Planning					
2.	O&M of I	Equipment		CMPUA (O.Luvsandagva)*1	EPWMD (T.Enkh-Amgalan)	
3.	. Operation of NEDS			CMPUA (D.Amgalan) *1	EPWMD	
					(S.Chantsalnurmaa)	
4.	Waste S	ervice Func		EPWMD (Z.Mungunzul)	*2	
5.	Public Av	wareness		EPWMD (E.Batbileg)	CMPUA (A.Oyunchimeg)*3	
6.	Waste	Separation	and	EPWMD (O.Odjargal)	CMPUA (E.Iderchuluun),	
	Recyclin	g				

*1:Changed following the resignation of former Vice Director of CMPUA and approved by the JCC during its 5^{th} meeting.

*2: No personnel appointed by district offices

*3: Appointed by CMPUA and approved by the JCC during its 5th meeting

4.5.2 Process of Assessment

Capacity assessment was conducted based on the following method.

- 1. Capacity assessment was conducted separately for individuals and organizations by the Chief Advisor of the JET based on interviews using prearranged assessment sheets.
- 2. As for the individual capacity, the assessment items were selected from the knowledge on SWM and categorized into "knowledge", "skill" and "attitude". An individual capacity assessment sheet was prepared by citing the items that were going to be learnt by the C/P members through the technology transfer activities.
- 3. As for the organizational capacity, the goals to be achieved and the items to be implemented were divided into three fields management capacity, technical capacity

and working environment. The capacity assessment was made using a detailed list of acquirement items prepared for each field and the prearranaged organizational capacity assessment sheet.

- 4. The assessment was made based on scores between 0 and 4.
- 5. The 1st assessment was conducted in Nov 2009, the 2nd in Jul 2010, the 3rd in Mar 2011, the 4th in Jul 2011 and the 5th in Mar 2012.

4.5.3 Results of Assessment

The detailed information about the results of the assessment was attached in Section-I of Databook. In the following section introduces the results of the individual and organizational capacity assessments for EPWMD where the change in personnel was smaller.

a. Results of Individual Capacity Assessment

The results of the individual capacity assessment, which were based on self-assessments by respective personnel, are the following.

Items		Assessment for Individual EPWMD									
		Ariguun	Odjargal	Batbileg	Ganbaatar	Mungunzul	Enkh-Amgalai	Nurmaa	Average		
6	Knowledge	1.1	2.3	2.1	2.9	1.5	1.2		1.9		
010	Skills	1.6	1.8	2.1	1.9	1.7	2.3		2		
	Attitude	2.7	3.0	3.0	3.9	2.9	3.1		3.3		
2	Average	1.8	2.4	2.4	2.9	2.0	2.2		2.4		
0	Knowledge	1.5	2.2	2.3	2.2	2.2	1		1.8		
-10	Skills	2.3	2.3	2.2	2.1	2.2	1.3		1.9		
-In(Attitude	2.9	2.1	3.0	2.3	3.0	2		2.4		
,	Average	2.2	2.2	2.5	2.2	2.5	1.4		2.0		
Mar-11	Knowledge	2.1	2.3	2.4		2.4	1.5	0.7	1.9		
	Skills	2.4	2.4	2.3		2.3	1.8	0	1.9		
	Attitude	3.0	3.0	3.0		3.0	3.1	3.3	3.1		
	Average	2.5	2.6	2.6		2.6	2.1	1.3	2.3		
1	Knowledge	2.7	2.9	2.9		2.9	2.3	1.8	2.6		
Jul-11	Skills	2.8	2.7	2.8		2.7	2.4	0.9	2.4		
	Attitude	3.4	3.0	3.3		3.0	3.1	3.4	3.2		
	Average	3.0	2.9	3.0		2.9	2.6	2.0	2.7		
-12	Knowledge	3.2	3.2	3.1		3.0	2.7	2.4	2.9		
	Skills	3.4	2.9	2.9		2.8	2.7	1.5	2.7		
/ar	Attitude	3.4	3.1	3.3		3.0	3.1	3.4	3.2		
2	Average	3.3	3.1	3.1		2.9	2.8	2.4	3.0		

Table 5: Results of Individual Capacity Assessment

Although the average value of the individual capacity assessments for all 6 members of the department declined from 2.4 points of the 1st assessment to 2.0 points during the 2nd, it rised continuously to 2.3 points, 2.7 points and 3.0 points during the 3rd, 4th and 5th assessments respectively.

The knowledge and skills of 5 out of the 6 staffs, who have been working for EPWMD since the beginning of the project, have improved significantly. As many indicators of the attitude depend on personal characters, it was revealed that the improving attitude through trainings is limited, somehow.

b. Results of Organizational Capacity Assessment

The results of the organizational capacity assessment for EPWMD were as follows.

Date of	Management	Technical	Working	Average
assessment	Capacity	Capacity	Environment	
Nov 2009	1.9	1.5	1.8	1.8
Jul 2010	2.5	2.3	1.9	2.2
Mar 2011	2.7	2.7	2.2	2.5
Jul 2011	3.1	3.2	2.5	2.9
Mar 2012	2.9	3.2	2.5	2.9

Table 6 [.] The	Results of	Organzational	Capacity	Assessment
		organzational	Oupdoily	//0000011011

Results of an organizational capacity assessment tend to differ depending on the top officials' eagerness. For the 3 years since the establishment of EPWMD, the degree of its management capacity, technical capacity and working environment have reached from the initial 1.8 to 2.9 points at the end of the project.

However, there is high possibility that the change of the Mayor resulted by the election of Jun 2012 will be followed by significant changes in department chiefs of the MUB requiring a careful observation.

5 PDM

5.1 Change of PDM

PROJECT DESIGN MATRIX₁ (PDM₁)

Narrative Summary		Objectively Verifiable Indicators
Overall Goal	1.	People's satisfaction level for urban environment and sanitation
Deteriorated urban environment and sanitary conditions caused by uncontrolled solid waste will be improved in Ulaanbaatar City.		Amount of large scale illegal dumping is decreased by ##%.
Project Purpose		People's satisfaction level for the SWM service throughout the City reaches to ##%.
is strengthened through human resource development.	2.	Waste collection rate in Ger area is increased to ##%. (waste collection cover rate in population)
	3.	Waste collection rate in Apartment area keeps 100% in spite of population growth.
	4.	Collection rate of waste service fee from Ger area is increased to ##%.
Output 1 Development of human resource in	1.	Proposals of draft policy, draft regulation(s) and draft guideline(s) on SWM prepared by EPWMD.
EPWMD for policy making and	2.	Draft updated Master Plan prepared by EPWMD.
planning for solid waste management	3.	Action Plan for the organizational development of EPWMD.
Output 2 Development of human resource in		Report on operation of SWM equipment (collection vehicles and heavy b machineries) is submitted by CMPUA to EPWMD 4 times a year.
maintenance of solid waste collection vehicles and heavy machineries.	2.	Report on maintenance of SWM equipment is submitted by CMPUA to EPWMD 4 times a year.
		CMPUA and each district prepare and submit the waste collection plan to EPWMD once a year.
Output 3 Development of human resource of	1.	Landfilling monitoring committee assesses landfilling operation as sanitary landfilling.
CMPUA for proper management of	2.	Report of waste composition survey is prepared by CMPUA.
Narangiin Enger Landfill	3.	Environmental monitoring including gas emission survey at landfill site is conducted regularly by CMPUA.
Output 4	1.	Common financial management rule for all WSFs is established.
Development of human resource in EPWMD and WSFs for financial management in SWM	2.	Financial condition of each WSFs is monitored regularly by EPWMD.
Output 5	1.	Prototypes of education materials for citizens are prepared.
Development of human resource of EPWMD and District Officers for	2.	Public awareness raising campaign has been held ## times in UB City.
promoting public awareness and participation in SWM.		People's satisfaction level for the public awareness raising on SWM at pilot project site increase ## %.
Output 6 Recommendation for the appropriate system of waste separation and	1.	Waste separation facility is examined in NEDS and report on necessary extra cost, efficiency, sanitary conditions of separation operation is submitted.
recycling in Ulaanbaatar City	2.	Valuable collectors (former waste pickers) will cooperate for sorting operation at sorting yard according to the manual and guidelines.
	3.	Recommendation paper on waste separation and recycling system is officially submitted to UB City authority.

PDM ₂ Bold : Change,	Underline : Pending
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Narrative Summary		Objectively Verifiable Indicators			
Overall Goal		People's satisfaction level for urban environment and sanitation			
Deteriorated urban environment and sanitary conditions caused by uncontrolled solid waste will be improved in Ulaanbaatar City.	2.	throughout the City reaches to 50% Three large scale accumulated illegal disposal site shall be eliminated.			
Project Purpose Capacity for SWM in Ulaanbaatar City	1. 2	People's satisfaction level (more than average) for the SWM service throughout the City reaches to 60%.			
resource development.	۷.	collection cover rate in population)			
	3.	Waste collection rate in Apartment area keeps 100% in spite of population growth.			
	4.	Collection rate of waste service fee from Ger area is increased to ##%.			
Output 1 Development of human resource in	1.	Proposals of draft policy, draft regulation(s) and draft guideline(s) on SWM prepared by EPWMD.			
EPWMD for policy making and	2.	Draft updated Master Plan prepared by EPWMD.			
planning for solid waste management	3.	Action Plan for the organizational development of EPWMD.			
Output 2 Development of human resource in EPWMD and CMPUA for operation and	1.	Report on operation of SWM equipment (collection vehicles and heavy b machineries) is submitted by CMPUA to EPWMD 4 times a year.			
maintenance of solid waste collection vehicles and heavy machineries.	2.	Report on maintenance of SWM equipment is submitted by CMPUA to EPWMD 4 times a year.			
	3.	CMPUA and each district prepare and submit the waste collection plan to EPWMD once a year.			
Output 3 Development of human resource of	1.	Landfilling monitoring committee assesses landfilling operation as sanitary landfilling.			
CMPUA for proper management of	2.	Report of waste composition survey is prepared by CMPUA.			
Narangiin Enger Landfill	3.	Environmental monitoring including gas emission survey at landfill site is conducted regularly by CMPUA.			
Output 4	1.	Common financial management rule for all WSFs is established.			
Development of human resource in EPWMD and WSFs for financial management in SWM	2.	Financial condition of each WSFs is monitored regularly by EPWMD.			
Output 5	1.	Public awareness tool models for waste separation and recycling are prepared.			
EPWMD and District Officers for promoting public awareness and	2.	After implementation of PP, C/P carries out pubic awareness campaign in khoroo other than PP site on its own initiative.			
participation in SWM.	3.	Awareness of residents on waste separation and discharging manner is improved at the PP sites by ## %.			
Output 6 Recommendation for the appropriate system of waste separation and	1.	Waste separation facility is examined in NEDS and report on necessary extra cost, efficiency, sanitary conditions of separation operation is submitted.			
recycling in Ulaanbaatar City	2.	Valuable collectors (former waste pickers) will cooperate for sorting operation at sorting yard according to the manual and guidelines.			
	3.	Recommendation paper on waste separation and recycling system is officially submitted to UB City authority.			

Narrative Summary		Objectively Verifiable Indicators
Overall Goal		People's satisfaction level (more than average) for urban
Deteriorated urban environment and sanitary conditions caused by uncontrolled solid waste will be improved in Ulaanbaatar City.	2.	environment and sanitation throughout the City reaches to 50%. Six large scale accumulated illegal disposal site out of 10 monitoring sites shall be eliminated.
Project Purpose Capacity for SWM in Ulaanbaatar City is strengthened through human	1. 2.	People's satisfaction level (more than average) for the SWM service throughout the City reaches to 60%. Waste collection rate in Ger area is increased to ## %. (waste collection cover rate in population)
	3.	Waste collection rate in Apartment area keeps 100% in spite of population growth.
	4.	Collection rate of waste service fee from Ger area is increased to ##%.
Output 1 Development of human resource in	1.	Proposals of draft policy, draft regulation(s) and draft guideline(s) on SWM prepared by EPWMD.
EPWMD for policy making and	2.	Draft updated Master Plan prepared by EPWMD.
planning for solid waste management	3.	Action Plan for the organizational development of EPWMD.
Output 2 Development of human resource in	1.	Report on operation of SWM equipment (collection vehicles and heavy machineries) is submitted by CMPUA to EPWMD 4 times a year.
maintenance of solid waste collection vehicles and heavy machineries.	2.	Report on maintenance of SWM equipment is submitted by CMPUA to EPWMD 4 times a year.
	3.	CMPUA and each district prepare and submit the waste collection plan to EPWMD once a year.
Output 3 Development of human resource of	1.	Landfilling monitoring committee assesses landfilling operation as sanitary landfilling.
CMPUA for proper management of	2.	Report of waste composition survey is prepared by CMPUA.
Narangiin Enger Landfill	3.	Environmental monitoring including gas emission survey at landfill site is conducted regularly by CMPUA.
Output 4	1.	Common financial management rule for all WSFs is established.
Development of human resource in EPWMD and WSFs for financial management in SWM	2.	Financial condition of each WSFs is monitored regularly by EPWMD.
Output 5	1.	Public awareness tool models for waste separation and recycling are prepared.
EPWMD and District Officers for promoting public awareness and	2.	After implementation of PP, C/P carries out public awareness campaign in Khoroo other than PP site on its own initiative.
participation in SWM.	3.	Awareness of residents on waste reparation and discharging manner is improved at the PP sites
Output 6 Recommendation for the appropriate	1.	Waste separation facility is examined in NEDS and report on necessary extra cost, efficiency, sanitary conditions of separation operation is submitted.
recycling in Ulaanbaatar City	2.	Valuable collectors (former waste pickers) will cooperate for sorting operation at sorting yard according to the manual and guidelines.
	3.	Recommendation paper on waste separation and recycling system is officially submitted to UB City authority.

PDM₄ Bold : Change, <u>Underline : Pending</u>

Narrative Summary		Objectively Verifiable Indicators
Overall Goal Deteriorated urban environment and sanitary conditions caused by uncontrolled solid waste will be improved in Ulaanbaatar City.		People's satisfaction level (more than average) for urban environment and sanitation throughout the City reaches to 50%.
		Six large scale accumulated illegal disposal site out of 10 monitoring sites shall be eliminated.
Project Purpose Capacity for SWM in Ulaanbaatar City	1.	People's satisfaction level (more than average) for the SWM service throughout the City reaches to 60%.
is strengthened through human resource development.	2.	Waste collection rate in Ger area is increased to 90%. (waste collection cover rate in population)
	3.	Waste collection rate in Apartment area keeps 100% in spite of population growth.
	4.	Collection rate of waste service fee from Ger area is increased to 30%.
Output 1	1.	Proposals of draft policy, draft regulation(s) and draft guideline(s) on SWM prepared by EPWMD.
EPWMD for policy making and	2.	Draft updated Master Plan prepared by EPWMD.
planning for solid waste management	3.	Action Plan for the organizational development of EPWMD.
Output 2 Development of human resource in EPWMD and CMPUA for operation and	1.	Report on operation of SWM equipment (collection vehicles and heavy machineries) is submitted by CMPUA to EPWMD 4 times a year.
maintenance of solid waste collection vehicles and heavy machineries.	2.	Report on maintenance of SWM equipment is submitted by CMPUA to EPWMD 4 times a year.
		CMPUA and each district prepare and submit the waste collection plan to EPWMD once a year.
Output 3 Development of human resource of	1.	Landfilling monitoring committee assesses landfilling operation as sanitary landfilling.
CMPUA for proper management of	2.	Report of waste composition survey is prepared by CMPUA.
Narangiin Enger Landfill	3.	Environmental monitoring including gas emission survey at landfill site is conducted regularly by CMPUA.
Output 4	1.	Common financial management rule for all WSFs is established.
Development of human resource in	2.	Financial condition of each WSFs is monitored regularly by EPWMD.
EPWMD and WSFs for administrative/financial management in	3.	EPWMD strengthens understanding about administrative/financial management of SWM.
	4.	EPWMD can design necessary waste generation fee based on the appropriate waste collection tariff to the waste collection organizations.
	5.	EPWMD can prepare standard tender procedure and standard tender document for selection of waste collection organizations.
	6.	Control system of selected waste collection organizations will be developed.
Output 5 Development of human resource of EPWMD and District Officers for	1.	Personnel who are in charge of Public Awareness in EPWMD and District offices are able to conduct the public awareness activities by taking initiatives.
promoting public awareness and participation in SWM.	2.	Public awareness campaign will be conducted in 4 khoroos through PP and another 4 khoroos by the C/P.
	3.	Awareness of residents on waste reparation and discharging manner is improved at the PP sites

Narrative Summary	Objectively Verifiable Indicators			
Output 6 Recommendation for the appropriate	 Waste separation facility is examined in NEDS and report on necessary extra cost, efficiency, sanitary conditions of separation operation is submitted. 			
recycling in Ulaanbaatar City	 Valuable collectors (former waste pickers) will cooperate for sorting operation at sorting yard according to the manual and guidelines. 			
	3. Recommendation paper on waste separation and recycling system is officially submitted to UB City authority.			

5.2 Baseline Survey Conducted for the Indicators of PDM and the Degree of Achievements

5.2.1 Indicators for Outputs in PDM

 PDM_1 was approved by the JCC during its 1st meeting organized after the commencement of the project in Oct 2009 and discussion of the ICR with the C/P.

Accordingly, a baseline survey was conducted from Oct 2009 to Mar 2010 in order to set indicators for evaluation of achievements in the outputs of the PDM. The survey revealed that some indicators had been inappropriate for assessing the outputs while necessary data related to some others was impossible to collect. Based on the circumstances, JET with C/P revised the indicators through several discussions, proposed PDM₂ shown below and obtained approval from the JCC during its 2nd meeting.

Having compiled its recommendations for 2 indicators of Project Purpose and 1 indicator of Output-2, which had not been set in PDM₂, the JET presented PDM₃ in the PR-3. After finalizing the indicators for Project Purpose during the midterm evaluation conducted in May 2011, PDM₄ was prepared and approved by the JCC at its 4th meeting.

The following table shows the initial PDM, results of the baseline survey and the achievements status of the outputs as of the end of the project.

Table 7: Comparison of PDM4 and Progress as of Jul 2012.

		PDM			1	
		In diaster for DDM		Results of Baseline Survey	X 11 <i>c</i>	1
	Output	Indicator for PDM ₁	Means of Verification		Indicator	
Overall	environment and sanitary conditions caused by	People's satisfaction level for urban environment and sanitation throughout the City reaches to ##%	Interview survey to 400 households in apartment area and 400 households in ger area through khoroo government.	43.6% of the residents in apartment area and 40.8% in ger area and42.1% in total considered the level of environment and sanitation condition in UB city is more than average.	People's satisfaction level for urban environment and sanitation throughout the City reaches to 50%	POS v and sa overal
Goal	uncontrolled solid waste will be improved in Ulaanbaatar City.	Amount of large scale illegal dumping is decreased by ## %	Interview survey to each district	10 illegal dump sites were selected for monitoring sites	Large scale 6 illegal dump sites should be eliminated.	5 loca with b there
		People's satisfaction level for the SWM service throughout the City reaches to ## %	Interview survey to 400 households in apartment area and 400 households in ger area through khoroo government.	53.8% of the residents in apartment area and 58.1% in ger area and 55.9% in total considered the level of SWM in UB city is more than average.	60 % of the people considered the level of SWM in UB city is more than average	POS v manag
Project	Capacity for SWM in Ulaanbaatar City is strangthened through	Waste collection cover rate in population in Ger area is increased to ## %	Interview survey to each khoroo,WSF	Waste Collection Rate (per population) was increased to over 90 % as of Jun 2010 with interview survey to Ger Resident.	Waste collection cover rate in population in Ger area keeps more than 90 %.	POS c that, in change this ra
Purpose	human resources development.	Waste collection rate in Apartment area keeps 100% in spite of population growth	Interview survey to EPWMD	Current waste collection rate in apartment area is nearly 100%	No change	CMPU susper
		Collection rate of waste service fee from ger area increased to ## %	Interview survey to each khoroo, WSF.	Collection rate of waste service fee from ger area is 24 % in central 6 districts from Sep 2008 to Aug 2009.	Collection rate of waste service fee from ger area increased to 30%	WSF r counc July s electr
	Development of human	Proposals of draft policy, draft regulations) and draft guideline(s) on SWM prepared by EPWMD.	Draft policy, regulations and guidelines	Confirmation of existing regulations, guidelines on SWM	No change	12 reg City C enacte
Output 1	resources in EPWMD for policy making and planning for solid waste	Draft updated Master Plan prepared by EPWMD	Project completion report	M/P is not updated since JICA development study in 2007	No change	Waste that ir revisio
	management.	Action Plan for the organizational development of EPWMD	Project completion report	There is no Organizational Action Plan as of 2009.	No change	Annua Organi formul
	Development of human resources in EPWMD and CMPUA for	Report on operation of SWM equipment (collection vehicles and heavy machineries) is submitted by CMPUA to EPWMD 4 times a year.	Report on operation of SWM equipment	Report on operation of SWM equipment is not prepared yet	No change	Forma to rele TUKs reques syster
Output 2	operation and maintenance of solid waste collection vehicles	Report on maintenance of SWM equipment is submitted by CMPUA to EPWMD 4 times a year	Report on maintenance of SWM equipment	Report on maintenance of SWM equipment is not prepared yet	No change	Ditto
	and heavy machineries.	CMPUA and each district prepare and submit the waste collection plan to EPWMD once a year.	Waste collection plan from each district and CMPUA	Waste collection plan is not prepared yet	Delete	Waste specif
	Development of human	Landfilling monitoring committee assesses landfilling operation as sanitary landfilling	Assessment report of monitoring committee	There is no assessment report yet.	No change	Dispos monito was in 2012.
Output 3	resources of CMPUA for proper management of Narangijn Enger Landfill	Report of waste composition survey is prepared by CMPUA	Report of waste composition survey.	Waste composition survey has not been conducted since JICA development study in 2007.	No change	Waste constr
		Environmental monitoring including gas emission survey at landfill site is conducted regularly by CMPUA.	Environment monitoring report	Environmental monitoring report is not submitted regularly.	No change	Lectur 2011.F
		Common financial management rule for all WSFs is established.	Auditing Report	The financial statements that are submitted by both CWSF and DWSF are prepared neatly under a same format. But financial management activities other than accounting and the financial statements have not been regulated into a same	No change	The fir under
0.1.11	Development of human resources of EPWMD	Financial condition of each WSFs is monitored regularly by EPWMD.	Interview survey to EPWMD	Each DWSF has been submitting its reports to the EPWMD monthly, quarterly and annual-basis. One staff in charge of WSF is working at EPWMD	No change	Each I annua monite
Output 4	administration/financial	EPWMD strengthen understanding about administrative/financial management of SWM.	Interview survey to EPWMD, Progress Report	-	Bimonthly Meeting PPT	Bimon
	management in SWM	EPWMD can design necessary waste generation fee based on the appropriate tariff to the waste collection organizations	Interview survey to EPWMD, Progress Report	-	Gidelin on Calculating Appropriate Waste	Guide
		EPWMD can prepare standard tender procedure and standard tender	Interview survey to EPWMD, Progress Report	-	Standard Tender Document	Stand
		Control system of selected waste collection organizations will be developed.	Interview survey to EPWMD, Progress Report	-	Guidline on Tender Procedure	Guide
	Development of human	Prototypes of education materials for citizens are prepared.	educational tools	Based on the baseline survey, educational materials on SWM were already exist in each district.	Personnel who are in charge of Public Awareness in EPWMD and District offices are able to conduct the public awareness activities by taking initiatives	Activit PR us
Output 5	and District Officer for promoting public	Public awareness campaign has been held ## times of UB City.	Interview survey to EPWMD, District, Khoroo	Public awareness campaign such as clean up campaign were conducted every year.	Public awareness campaign will be conducted in 4 khoroos through PP and another 4 khoroos by the C/P	PP ph
	participation in SWM	People's satisfaction level for the public awareness raising on SWM at pilot project site increase ## %	Interview survey to people on pilot project site	POS was conducted at PP site at May 2010 before implementing PP.	Awareness of residents on waste separation and discharging manner is increased at the Pilot Project sites.	Based sched
	Recommendation for the	Waste separation facility is examined in NEDS and necessary extra cost, efficiency, sanitary conditions of separation operation are acknowledged.	Report on pilot project and record of 3Rs seminar.	There is no official sorting activities in NEDS	No change	Sortin condu seaso
Output 6	appropriate system of waste separation and recycling in Ulaanbaatar	Valuable collectors (former waste pickers) will cooperate for sorting operation at sorting yard according to the manual and guidelines.	Interview survey to CMPUA	There is no official sorting activities in NEDS	No change	Sortin sorting
	City	Recommendation paper on waste separation and recycling system is officially submitted to UBC authority.	PCR and revised Master Plan.	There is no recommendation paper and revised Master Plan	No change	Recom Appro

PDM ₄
Progress as of Jul 2012
was conducted on Mar 2012. People's satisfaction level for urban environmen sanitary conditions is 43% in apartment area and 37% in ger area and 39.9% in all.
ations out of target 6 locations were cleaned by instruction of EPWMD in 2010 budget of 180 million Tg. Monitoring conducted on November 2010 showed e is no further illegal dump except 2 locations.
was codicted on March 2012. People's satisfaction level for soid waste agement is 53.8% in apartment area and 58.1% in ger area and 55.9% in overall.
conducted in 2007 shows waste collection cover rate was merely 43 %. Afte in 2010, this rate increased to 90 % upon the procurement of equipment, ge of payment system, strengthening the SWM organizations and so on and rate is maintained.
UA staff went on strike on August and October and collection works was ended. But generally, 100% collection at apartment area was maintained.
must be strengthened in order to improve waste fee collection rate. City ncil made a decision to abolish DWSF on 23rd Dec 2009. City mayor order in specified waste collection fee in Ger area should be collected together with tricity bill. Since then, fee collection rate was inproved to 61%
egulations were drafted in 2010 and 2011 and two of them were approved in Council. Revision of Law on HH and IW was condusted and Law on Waste was ted on May 2012
te amount and composition survey in winter was conducted on Dec 2010 and in summer will be conducted in Jun 2011 in order to revised Master Plan. MP sion was completed on May 2012.
ual action plan was formulated in 2010 but it is individual action plan. In 2011, inizational action plan was formulated. Action Plan from 2013 to 2016 was ulated according to EPWMD request.
nat on report on operation of SWM equipment was prepared and disseminated elevant organizations in March 2010. In May 2011, seminar was organized with s and CMPUA and submission of report on maintenance of equipment was ested and specified in the Contract. Contract was signed and institutional em to submit the report was completed.
)
te collection plan is considered as preliminary survey repot to prepare tender ification. sample and how to prepare this report was trained to EPWMD.
osal site monitoring guideline was formulated on October 2010 and 1st itoring activity was conducted. Assessment was made that sanitary landfilling impelmentaed at NEDS. Second monitoring activities was conducted on My
te composition survey was conducted in Aug 2010 at sorting facilities structed at NEDS. Another survey will be conducted in Jun 2011.
ure on how to use gas detector was conducted on Oct 2010 and Mar .Regular monitoring will be implemented in May onwards.
financial statements that are submitted by both CWSF and DWSF are prepared or a same format. After abolish of DWSF, CWSF should be strengthened.
DWSF has been submitting its reports to the EPWMD monthly, quarterly and ial-basis. After abolish of DWSF, It must be important that who and how the itoring of CWSF will be conducted.
onthly meeting was held tree times.
eline was prepared and training was made.
dard tender document was prepared and training wa made.
eline was prepared and training was made.
vities on raising public awareness are planed at EPWMD 2011 action plan, and using media and revision of environmental brochure are planned as well.
phase 2 which EPWMD is taking initiative is now implemented since Dec 2010.
ed on the POS conducted after PP, awareness of residents on collection idule, cooperation to waste separation at source, are increased.
ing facilities are constructed at NEDS. Experiment on sorting operation was lucted on Aug 2010 and another experiment was conducted during summer on in 2011. Necessary data was obtained.
ing operation guideline was formulated and WPs were employed to work at ng facility.
ommendation was made and explained to CP upon the completion of PPs. ropriate plan was compiled to revised MP.

5.2.2 [Overall goal] The Degree of Residents' Satisfaction on Urban Environment and Sanitary Conditions in UBC

Public Opinion Survey (POS) as a baseline survey was conducted twice in Nov 2009 after the commencement and in Mar 2012 at the same time with the terminal evaluation.

The answers to the question "Are you satisfied with the urban environment and sanitary conditions in UBC?" are compiled in the table below.

011	Α	Apartment area		Ger area			Т		
Q.1-1	num	rate		num	rate		num	rate	
1. Yes, it is very good conditions	9	2.2%		5	1.2%		14	1.7%	
2. Yes, it is good conditions	23	5.6%	43.6%	21	5.1%	40.7%	44	5.3%	42.1%
3. Yes, but it is average conditions	147	35.8%		143	34.5%		290	35.1%	
4. No, it is poor conditions	135	32.8%		161	38.8%		296	35.8%	
5. No, it is very poor conditions	93	22.6%	56.4%	77	18.6%	59.3%	170	20.6%	57.9%
(blank)	4	1.0%		8	1.9%		12	1.5%	
Total	411	100.0%		415	100.0%		826	100.0%	

Are you satisfied with urban environment and sanitary conditions in UBC?

2012 Mar										
0.1-1	Α	Apartment area		Ger area						
Q:1-1	num	rate		num	rate		num	rate		
1. Yes, it is very good conditions	4	1.1%		1	0.3%		5	0.6%		
2. Yes, it is good conditions	18	4.8%	43.0%	12	3.0%	37.0%	30	3.9%	39.9%	
3. Yes, but it is average conditions	139	37.2%		135	33.8%		274	35.4%		
4. No, it is poor conditions	127	34.0%		146	36.5%		273	35.3%		
5. No, it is very poor conditions	75	20.1%	57.0%	94	23.5%	63.0%	169	21.8%	60.1%	
(blank)	11	2.9%		12	3.0%		23	3.0%		
Total	374	100.0%		400	100.0%		774	100.0%		

According to the table, no bigger changes were observed in the degree of residents' satisfaction on urban environment and sanitary conditions in UBC between the results at the project commencement and the project completion. However, the degree of satisfaction in ger area tended to decline in some extent.

In the following table, the answers to the question "What do you thing the mos serious problem in in whole Ulaanbaatar City at present?" are presented.

2000 1101							
0.1-2	Apartme	ent area	Ger	area	Total		
Q:1-2	num	rate	num	rate	num	rate	
1. Inadequate supply of safe water	3	0.7%	0	0.0%	3	0.4%	
2. Air pollution	328	80.0%	345	83.1%	673	81.6%	
3. Water pollution	9	2.2%	11	2.7%	20	2.4%	
4. Soil contamination	8	2.0%	5	1.2%	13	1.6%	
5. Noise problems	4	1.0%	0	0.0%	4	0.5%	
6. Solid waste (garbage) problems	17	4.1%	11	2.7%	28	3.4%	
7. Inadequate capacity of sewerage treatment	0	0.0%	3	0.7%	3	0.4%	
8. Public toilet is not sanitary	1	0.2%	3	0.7%	4	0.5%	
9. Sanitary conditions of pit latrine	1	0.2%	1	0.2%	2	0.2%	
10. Traffic congestions	9	2.2%	4	1.0%	13	1.6%	
11. Inadequate supply of electricity	1	0.2%	1	0.2%	2	0.2%	
12. Inadequate supply of public transport	1	0.2%	4	1.0%	5	0.6%	
(blank)	28	6.8%	27	6.5%	55	6.7%	
Grand Total	410	100.0%	415	100.0%	825	100.0%	

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

2012 Mar

0.1-2	Apartme	ent area	Ger	area	Total		
Q.1-2	num	rate	num	rate	num	rate	
1. Inadequate supply of safe water	26	7.0%	22	5.5%	48	6.2%	
2. Air pollution	174	46.5%	216	54.0%	390	50.4%	
3. Water pollution	15	4.0%	11	2.8%	26	3.4%	
4. Soil contamination	14	3.7%	44	11.0%	58	7.5%	
5. Noise problems	4	1.1%	1	0.3%	5	0.6%	
6. Solid waste (garbage) problems	25	6.7%	48	12.0%	73	9.4%	
7. Inadequate capacity of sewerage treatment	4	1.1%	3	0.8%	7	0.9%	
8. Public toilet is not sanitary	3	0.8%	2	0.5%	5	0.6%	
9. Sanitary conditions of pit latrine		0.0%	5	1.3%	5	0.6%	
10. Traffic congestions	33	8.8%	17	4.3%	50	6.5%	
11. Inadequate supply of electricity	2	0.5%	1	0.3%	3	0.4%	
12. Inadequate supply of public transport		0.0%	2	0.5%	2	0.3%	
(blank)	74	19.8%	28	7.0%	102	13.2%	
Grand Total	374	100.0%	400	100.0%	774	100.0%	

The most serious problems in UBC are "air pollution", "solid waste problems" and "traffic congestions" as they were before the project commencement. However, significant difference has been found in the share of the answer that indicate "air pollution" as the most serious one as its share decreased from 80% to 50%. The decrease was resulted by the difference in timing of the surveys as the 1st survey was implemented in winter when the air pollution in UBC usually becomes at its highest while the 2^{nd} survey was implemented in spring when the degree of air pollution decreases.

However, it is also possible to assume that the results of technical cooperation project on air pollution commenced by JICA and various policies taken by the Government of Mongolia might also contributed to the above-mentioned decrease in the air pollution.

On the other hand, the shares of the answers indicating waste management issues and traffic congestions as the most serious problems increased from 3.4% to 9.4% and from 1.6% to 6.5% respectively. As for the waste management issues, it was affected greatly by the residents' low satisfaction in ger area. In Jul 2011, the MUB started new fee collection system in ger area through which waste fees from ger households are collected together with their electricity payments. The new system has forced ger households who usually avoid paying waste fees to pay their fees when making electricity payments Therefore, it can be considered that almost residents expressed the complaint for new system in the questionnaire replying as "waste management is serious problem".

As for the traffic congestion, its seriousness exceeded that of waste management issues in apartment area since apartment area residents considered the problem as the second most serious problem.

Thus we can see residents' degree of satisfaction on urban environment and sanitary conditions does not improve only by improvement of waste management so that it is recommended in final evaluation project team reconsider cause and effect between *overall goal* and *project purpose*. However, consequently project team did not modify the overall goal accordingt to the discussion with EPWMD because MUB planned to take longterm-measure against urban environment and sanitary condition problems.

5.2.3 [Overall goals] Large scale illegal dumping site

a. Results of baseline survey

CP and JET selected 10 places as the target illegal dump site where the problem should be solved afterwards.

ent of ste	щ	Cite a sur /le setie a		Location		Dum	pers	Amo W	ount of aste	Present 0	Condition
Conte wa	#	Site name/location	In ger area	Near ger area	Far from ger area	Local residents	Outsiders	Large	Small	Ongoing	Stopped
	Khan-Uu	<u>d</u>			-						
	1(1)	(KhU5) Khoroo #5 (West of School- 41)	1			1		1		1	
	2(2)	(KhU9) Khoroo #9 (North of White Gate)		1		1		1		1	
	3(3)	(KhU12) Khoroo #12 (Khabitat)		1		1			1	1	
	Chingel	tei district									
		(Ch12) Khoroo #12 (Ditches in the									
	4(5)	North of Central workshop and top of		1		1		1		1	
		the mountain)									
	Bayango	1									
	5(7)	(BG11) Khoroo #11 (Zuun Ard Ayush	1			1				1	
1)	5(7)	& Khuvisgalchid D)	1			1			1	1	
aste	6(8)	(BG10-1) Khoroo #10 (Str-15)	1			1			1	1	
W2	7(9)	(BG10-2) Khoroo #10 (Str-12)	1			1			1	1	
bld		(BG9-2) Khoroo #9 (near SOT Service									
hc	8(12)	Center)	1			1			1	1	
use	9(10)	(BG9-1) Khoroo #9 (Str-18)	1			1			1	1	
Ioi	Songino	khairkhan	-			-					
I	10(14)	(SH4&7) Khoroos #4 & #7 (border)		1		1		1			1
	11(15)	(SH24-1) Khoroo #24 (South East of NFDS)			1		1		1		1
	12(16)	(SH24-2) Khoroo #24 (North East of NEDS)			1		1		1	1	
	13(13)	(SH6&23) Khoroos #6 & #23 (border)	1			1		1		1	
	Bavanzu	rkh	-			-					
		(BZ22) Khoroo #22 (Near the block									
	14(17)	factory and the Grave)		1		1		1		1	
		(BZ9) Khoroo #9 (Uliastai khadan									
	15(20)	(bbs) million (chastar million		1		1			1		1
	Sukhhas	tar									
	16(21)	(SK15) Khoroo #15 (Sharga morit)	1			1			1	1	
uo	Bayango	<u>I</u>	-								
ructi 1ste	17(11)	(BG20) Khoroo #20 (Power Plant-4)			1		1	1		1	
onst wa	Bayanzu	rkh									
C	18(19)	(BZ21) Khoroo #21 (Tsagaan Davaa)			1		1	1		1	
0	Khan-Uu	<u>d</u>									
aste	19(4)	(KhU13) Khoroo #13 (Shuvuu)			1	1	1	1		1	
Wé	Chingel	tei district									
ed	20(6)	(Ch9) Khoroo #9 (Dalan davkhar)		1		1	1	1		1	
lix	Bayanzu	r <u>kh</u>									
N	21(18)	(BZ2&21) Khoroos #2 & #21 (Selbe river)		1		1			1		1

Table 8: Selected 10 Illegal Dump Sites



Figure 10: Surveyed 10 illegal dumping site

Overall goal of the project is set as follows upon discussion with C/P and was approved by JCC on JCC Meeting No2.

[6 large scale illegal dump sites shall be cleaned out of 10 selected sites]

b. Measurement for achievement of target index

Investigation was carried out for illegal dump site on November 2011. MUB was conducted Elimination of illegal dump site champagne and 5 location of illegal dumpsite were eliminated out of 10 target site.

5.2.4 [Project Purpose] Degree of Residents' Satisfaction on SWM Services

Public Opinion Survey (POS) as a baseline survey was conducted twice in Nov 2009 after the commencement and in Mar 2012 at the same time with the terminal evaluation.

The following table shows the answers to the question related with the degree of residents' satisfaction on SWM services in UBC.

0.2-1	Apartment area		Ger area			Total			
Q.2-1	num	rate		num	rate		num	rate	
1. Yes, it is very good service	6	1.5%		9	2.2%		15	1.8%	
2. Yes, it is good service	42	10.2%	53.8%	57	13.7%	58.1%	99	12.0%	55.9%
3. Yes, it is average service	173	42.1%		175	42.2%		348	42.1%	
4. No, it is poor service	136	33.1%		118	28.4%		254	30.8%	
5. No, it is very poor service	43	10.5%	44.8%	38	9.2%	39.0%	81	9.8%	41.9%
6. I do not know	5	1.2%		6	1.4%		11	1.3%	
(blank)	6	1.5%		12	2.9%		18	2.2%	
Grand Total	411	100.0%		415	100.0%		826	100.0%	

Are you satisfied with SWM services in	Ulaanbaatar cit	y (by	Residential	Areas)?
2009 Nov				

2012 Mai										
0.2-1	Apartment area				Ger area		Total			
Q.2-1	num	rate		num	rate		num	rate		
1. Yes, it is very good service	6	1.6%		2	0.5%		8	1.0%		
2. Yes, it is good service	27	7.2%	46.8%	11	2.8%	33.3%	38	4.9%	39.8%	
3. Yes, it is average service	142	38.0%		120	30.0%		262	33.9%		
4. No, it is poor service	128	34.2%		165	41.3%		293	37.9%		
5. No, it is very poor service	50	13.4%	51.1%	90	22.5%	65.3%	140	18.1%	58.4%	
6. I do not know	13	3.5%		6	1.5%		19	2.5%		
(blank)	8	2.1%		6	1.5%		14	1.8%		
Grand Total	374	100.0%		400	100.0%		774	100.0%		

As mentioned above, the degree of residents' satisfaction on SWM decreased significantly in the ger area. Many households in ger area do not pay waste fees. At the same time, most ger households do not usually discharge their waste each month since they are able to store their waste in drum cans in their fences. Although these households had been able to pay one month's fees when discharging their accumulated waste, they were forced to pay waste fees each month when paying their electricity payments after the introduction of the new fee collection system. It is believed to be the main reason for the decrease in their satisfaction on SWM services.

However, further observations revealed that the number of the 3^{rd} answer, which is the lowest answer for satisfaction, decreased from 175 to 118 during the 2^{nd} survey. On contrary, the number of the 4^{th} answer, which is the highest answer for dissatisfaction, increased from 120 to 165 during the same survey. This implicates that the number of the respective answers can be reversed again if quality of ger area collection is improved.

As for apartment areas, degree of residents' satisfaction decreased in smaller extent. It is considered that the decrease in the residents' satisfaction was resulted from the impact on collection service, which in turn resulted by the strikes by collection companies, the commencement of direct collections by district organizations to break the monopoly conditions of the TUKs and the delayed transfers of contract payments from WSFs to TUKs that occurred in 2010.

The MUB should pay attention to the decrease in the degree of residents' satisfaction on SWM despite of the annual increase in collection amount and waste collection rate. It is high time that the MUB should improve the quality of the SWM activities by increasing collection frequency; implementing punctual collection and promoting recycle activities.

5.2.5 [Project Purpose] Collection Rate of Waste Service Fee in Ger Area

a. Results of baseline survey

JET and EPWMD conducted the hearing survey to each district WSF and the Khoroo Government for the amount of waste service fee of one year of Ger Area from September, 2008 to August, 2009, and calculated current collection rate as follows.

Table 9: Collection Rate of Waste Service Fee in Ger Area (September, 20)08 ~
August, 2009)	

District	Population		100% Collection	Actual Collection	Waste Fee Collection Rate	
	Apartment	Ger	Amount	Amount		
			(1000Tg)	(1000Tg)	(%)	
KhUD	8,575	17,112	335,460	35,346	11%	
SHD	14,766	37,900	652,626	180,802	28%	
BGD	27,867	10,652	305,220	45,732	15%	
ChD	6,898	23,309	699,270	128,508	18%	
BZD	18,677	37,550	1,032,210	295,299	29%	
SBD	14,508	16,960	508,800	125,165	25%	
Average			3,198,126	775,506	24%	

Project purpose is set as follows and approved through No4 JCC meetings.

Waste Fee Collection Rate will be increased to 30 %]

b. Measurement of achievement for target index

Method of "waste collection fee" collection was changed that was collected together with electrical bill since July 2011 in Gar area.. Waste collection fee ratio is shown in table below.

"Waste collection fee "collection was much improved to 61% which stated in table below.

100% Collection Amount					Actual Collection Amount in 2011							
	District	HH	F	Tatal Fas	7		0	40		40		
	District	number	Fee	I otal Fee	1	8	9	10	11	12		
		1	Tg/HH	1000Tg	1000Tg	1000Tg	1000Tg	1000Tg	1000Tg	1000Tg	%	
1	BGD	11,963	2,500	29,908	1,731.90	13,462.80	16,003.60	18,272.87	14,431.00	16,541.07	55%	
2	BZD	46,083	2,500	115,208	33,899.10	51,238.20	58,338.41	61,037.00	60,346.10	70,944.09	62%	
3	SBD	20,013	2,500	50,033	13,580.10	25,219.38	25,588.04	28,286.69	26,875.80	28,553.42	57%	
4	SKhD	41,823	2,500	104,558	16,751.20	30,533.28	41,484.95	59,318.84	56,624.80	64,891.61	62%	
5	KUD	18,501	2,500	46,253	14,239.30	22,607.10	23,187.13	24,808.65	25,640.20	25,130.05	54%	
6	CHD	27,105	2,500	67,763	19,545.00	36,259.80	37,590.38	38,897.50	41,043.60	46,008.05	68%	
	Total	165,488		413,720	99,746.60	179,320.56	202,192.51	230,621.55	224,961.50	252,068.29	61%	
Fee	Fee Collection Rate against thoritical amount			24%	43%	49%	56%	54%	61%			
	(1):2010MUB Statistic											

5.2.6 [Project Purpose] Waste Collection Rate in Ger Area

a. Results of baseline survey

JET and EPWMD conducted the hearing survey to each district WSF and the Khoroo Government for the waste collection cover rate of Ger Area from September, 2008 to August, 2009. The result is as follows.

- 1. Each Khoroo and each district WSF leave the route and the frequency of waste collection to the person who collects waste service fee in the collection vehicle. However, the amount of the waste collection is not understood.
- 2. According to waste fee collection people, as to whether waste is collected or not, basically they collect waste only from the residents who paid waste service fee. However, in order to increase the amount of money as much as possible, they collect waste gratuitously this time on a promise that make a charge into half the sum or it is paid next time.
- 3. It is only the weigh Bridge of disposal site that record the amount of collection from Ger Area.

Accordingly, waste collection rate in Ger area was calculated based on weighbridge data.

- 1. The collection rate was calculated by dividing the amount of waste collected in Ger Area and brought into the NEDS from September, 2008 to August, 2009 by the waste generation amount which was calculated by multiplying number of generation source by population.
- 2. According to this calculation, the average rate of waste collection of the 5 districts except KhUD is as high as 83%.

District			Waste	Generation	Waste	Collection	Waste	Collection
			Amount	(t/year)	Amount	(t/year)	Rate (%)	
KhUD				13,842		2,7718		20%
SKhD				36,709		32,215		88%
BGD				8,871		8,723		98%
ChD				23,604		20,289		86%
BZD				33,682		26,455		79%
SBD				15,611		10,749		69%
average districts	for	5		118,477		98,430		83%

Table 11: Waste Collection Rate in Ger Area

Source: NEDS Weight Bridge data from Sep 2008 to Aug 2009

C/P checked and pointed out that this number is much higher than the actual condition; therefore the weighbridge data was checked at random. Consequently, it turned out to have some problems as follows.

- 1. Once collection vehicle is registered by Weighbridge, even if collection point is changed, it will not reflect the change. Therefore, waste from other areas may be included in the amount totaled as waste from Ger Area.
- 2. Since the collection vehicle collects not only the waste from residents in Ger Area but also business waste at the same time, it is difficult to understand the collection amount of only Ger Area.

Opinion survey to clarify level of waste collection services is conducted in 12 khoroos in 6 districts. (Please refer to the detailed report in Annex 0-6)

480 house holds in 12 khoroos are selected and collected their opinions on waste collection services. Followings are the results of opinion survey. Approaching each khoroo was

⁸ The waste from KhUD was transported to both MDDS and NEDS.

conducted by EPWMD and distribution and collection of questionnaire was conducted by each khoroo staffs. Based on the results, more than 90% of Gar households have a some kind of waste service.

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

Table 12: Are you receiving waste collection services?

Waste collection rate in Ger area was surveyed in 2007 and it was less than 50% at that time. This collection rate is improved tremendously by implementing M/P through the procurement of waste collection trucks by both Japanese Grant Aid and MUB own budget, Improvement of financial system such as establishing WSF, payment to the waste collection service providers based on the transported amount in the weighbridge in NEDS, and competition among waste collection service providers by tendering and so on.

On the other hand, it is anticipated that further improvement of waste collection rate in Ger area is quite impossible since some of the access roads in Ger area is very narrow and steep and practically, it is not accessible and self disposing methods is applied in some remote Ger area.

Proposed indicator is set as follows and approved through No4 JCC meeting.

190 % of the citizens living in Ger area receive waste collection services

b. Measurement of achievement of target index

Received monthly waste from Ger area to NEDS are shown table below. It is clearly stated that receiving amount is much increased in 2011 instated of 2010, waste collection ratio is considering maintained.

- 1. Once collection vehicle is registered by Weighbridge, even if collection point is changed, it will not reflect the change. Therefore, waste from other areas may be included in the amount totaled as waste from Ger Area.
- 2. Since the collection vehicle collects not only the waste from residents in Ger Area but also business waste at the same time, it is difficult to understand the collection amount of only Ger Area.

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

Table 13: Are you receiving waste collection services?

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On the other hand, it is anticipated that further improvement of waste collection rate in Ger area is quite impossible since some of the access roads in Ger area is very narrow and steep and practically, it is not accessible and self disposing methods is applied in some remote Ger area.

Proposed indicator is set as follows and approved through No4 JCC meeting.

[90 % of the citizens living in Ger area receive waste collection services]

c. Measurement of achievement of target index

Received monthly waste from Ger area to NEDS are shown table below. It is clearly stated that receiving amount is much increased in 2011 instated of 2010, waste collection ratio is considering maintained.

Voor	Month	Apart	Ger	Vaar	Month	Apart	Ger
rear		ton/mth	ton/mth	Tear	Wonth	ton/mth	ton/mth
	Jan	8,917	11,274		Jan	10,134	14,989
	Feb	7,539	9,428		Feb	7,886	10,306
	Mar	9,084	11,260		Mar	10,388	14,592
	Apr	9,663	12,512		Apr	12,851	16,563
	May	9,949	13,439		May	12,438	14,639
2010	Jun	9,039	11,302	2011	Jun	11,307	11,354
2010	Jul	9,716	9,144	2011	Jul	11,017	10,507
	Aug	9,252	8,968		Aug	12,105	11,174
	Sep	10,391	9,375		Sep	12,081	11,331
	Oct	7,022	7,697		Oct	12,480	16,174
	Nov	7,932	9,729		Nov	10,537	11,087
	Dec	9,295	11,793		Dec	10,738	11,753

Table 14: Waste Disposal Amount at NEDS from Ger Area



5.2.7 Case of indicator has been changed according to baseline survey result

Indicators of *Output 5* is only one from Output 1 to 6 which has been changed under influence of result of baseline survey. The detail was shown below.

a. [Output 5] Activities related to raising public awareness

The baseline survey related to the public education was conducted for staff in charge of SWM (PSD) in 6 pilot district offices and related ministries.

a.1 Current State of Each District

All 6 pilot district offices have Production & Service Department (the number of the staff is 6 to 8 persons), and one member of the staff takes charge of SWM as a whole including public education. However, as for BZD, WSF takes charge of waste management business, and the PSD staff is only in charge of monitoring and advising for WSF. In all district offices, the budget is not given to the public education on SWM but given to the activities such as cleanup campaign etc. However, as for WSF of BZD, the budget of 3 millions tg was given to the preparation of teaching-materials for public education in 2009.

a.2 Existing Teaching Tools on Waste Education in Each District

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

	KhUD	ChD	BGD	SKhD	BZD	SBD
Flier or PR magazine regarding waste reduction				1	1	1
Plate or signboard to promote "no littering" or "banning on	1	1	1	1	1	1

Table 15: Present condition for preparation of environmental education materials

	KhUD	ChD	BGD	SKhD	BZD	SBD
illegal disposal"						
Campaigns such as "cleanup" and "eco bag"	*	*	~	1	*	~
Environmental events such as recycling fair	~				~	~
Workshop or seminar on waste disposal manner	1	1	1	1	1	1
Guidance tools such as signboard or pamphlet for the promotion of waste separation.					~	~

a.3 Current State of Environmental Education (EE) in School Education

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

	KhUD	ChD	BGD	SKhD	BZD	SBD
Air pollution			1	1	1	
Water pollution			1	1	1	
Waste problem	1					
Deforestation and desertification	1		1		1	
We don't know		1				1

AS for the environmental education on schools, it is important that MUB works in cooperation with JICA education project to prepare training plan and guideline for widening waste education. The JICA project has developed learning material for teachers in Mongolian laungage in cooperation with Minstry of Education.

a.4 Existing Problem in Conducting Public Education

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

	KhUD	ChD	BGD	SKhD	BZD	SBD
Budget	1	1	1	1	1	1
Expertise		1	1			
Education materials						
Public participation			1		1	

Table 17: Existing Problem in conducting public education in each district

According to the results of above baseline survey, cleanup campaigns sere conducting regualry and education tools on waste issue are already prepared and kept in wach district office. It was discussed and concluded that current indicators for evaluating the outcome 5 of PDM are not appropriate. Indicators are proposed and approved by JCC on No2 JCC meeting as follows. Then final indicators on this output has been determined in PDM4 in accordance

with recomandation of mid-term review team.

	Before (PDM1)		After (PDM2)
1.	Prototypes of education materials for citizens are prepared.	1.	Public awareness tool models for waste separation and recycling are prepared.
2.	Public awareness raising campaign has been held ## times in UB City.	2.	After implementation of PP, C/P carries out pubic awareness campaign in khoroo other
3.	People's satisfaction level for the public awareness raising on SWM at pilot project site increase ## %.	3.	than PP site on its own initiative. Awareness of residents on waste separation and discharging manner is improved at the PP sites by ## %.

6 Others

6.1 Public Relations

- 1. News letters were published seven times in English and Mongolian. Contents of each news letter are as follows.
 - News Letter No1: Introduction of the Project
 - News Letter No2: Results of Public Opinion Survey on SWM in UBC
 - News Letter No3: Contents of Pilot Projects and 3R Seminar
 - News Letter No4: Results of the WEEE Survey and Progress of Pilot Projects
 - News Letter No5: Public Event on 3Rs
 - News Letter No6: Results of Separate Collection PP and Workshop on M/P formulation
 - News Letter No7: Revision of SWM M/P of UBC, Contents of 3Rs Tools and Information about New Waste Fee Collection System
- 2. Introduction of the project in Japanese was published in Dec 2009.
- 3. Cooperation on preparing a TV program on SWM: Oct 2010.
- 4. Organization of 3R seminars: 19 Apr 2010 (No1), 25 Nov 2010 (No2) and 24 Nov 2011 (No3).
- 5. Seminar on Hazardous Waste: 3 Nov 2010.
- 6. Public event on 3Rs: from 29 Apr 2011 to a May 2011.
- 7. 3R promotion TV programs and CM
- 8. Establishment of the project web site: http://www.jica.go.jp/project/Mongolia/0800310

6.2 Waste and Fee Collection Organizations by Khoroos

The MUB established Waste Service Funds (DWSF) under the district offices one by one based on the ordinance made by the Mayor in Nov 2006. Following the establishment of the DWSFs, the waste fee collection rights were transferred from the TUKs to the DWSFs. As the TUKs started collect waste based on contracts with the DWSFs and receive payments for their collected waste, the amount of waste to be transported to the final disposal sites increased. However, the TUKs, which lost fee collection rights to the DWSFs, started blaming DWSFs for late transfers of the contract payment and complaining that the amount of the payment was not sufficient for their collected waste. Furthermore, district offices of SBD and SKhD started collecting waste through district-owned companies at the same time with the TUKs. Based on these conditions, the TUKs organized strikes and closed the final disposal site and the MUB had to allow some TUKs to collect waste fees on their own.

In Dec 2009, the Municipal Council approved a resolution indicating that the DWSFs had been established illegally. As a result, the fee collection rights were transferred gradually to the TUKs.

The following table shows waste collection companies and fee collection organizations as of Jul 2012 by districts and khoroos.

Presently, the only DWSF has been operating as it was in Chingeltei district while those of other districts (SBD, SKhD and BZD) changed their names and statuses (SD in SBD, TUT in SKhD and NUG in BZD). However, these new organizations have still been implementing the functions of the former DWSFs.

	Kho		5001	1	2	3	4	5	9	7	8	6	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	143,334	2
012/7/31		on:	ee	UK	<mark>UK</mark>	UK	<u>UK</u>	<mark>UK</mark>	UK	<mark>UK</mark>	UK	<mark>UK</mark>	UK	UK	<mark>UK</mark>	UK	<mark>UK</mark>	<mark>UK</mark>	UK																	1,1	oos intc r
	l	ollectio	aste F	UK T	UK T	UK T	UK T	UK T	UK T	UK T	UK T	UK T	UK T	UK T	UK T	UK T	UK T	UK* T	UK* T																		8 khorc ible fo
	han-Uı	on C	er W	L 0	72 T	393 T	,319 T	,181 T	,826 T	,493 T	,345 T	,369 T	,148 T	,392 T	,797 T	,362 T	,224 T	38 T	,170 T																	(,129	ivide 28 espons
	K	opulatio	rt. G	90,	05	:23	0 7	0 6	0 7	0 5	0 10	0 7	25 5	96 1	52 4	345 3	0 3	62	0 8																	714 71	ed to di NUG 1 vectivel
2(1: Pc	e Apa	K 8,7	K 8,6	K 10,5	K	K	K	K	X	D	D 3,1	D 6,8	K 1,0	K 5	K	K 9,2	D	X	K	×	K		D	D										48,7	n 2011 expecte r BZD
		llection	ste Fe	JK TU	JK TU	JK TU	JK TU	JK TU	JIK TU	JK TU	JK TU	JK PS	JK PS	JK PS	JK TU	JK TU	JK TU	JK TU	JK PS	JK TU	JK TU	JK TU	JK TU	K* PS	K* PS	K* PS											mized i 3ZD is- d 14 fo collecti
	/angol	1 Co	r Wa	50 TL	0 TT	78 TL	30 TL	31 TL	0 TL	108 TL	0 TL	71 Sei	551 TL	348 TU	6 TL	0 TL	0 TL	0 TL	344 TU	0 T	51 TL	0	011 TL	043 TU	375 TU	97 TU			-							178	os orga 2012, H UK an waste c
	Bay	ulation	Ğ	1,	4	52	8	08	6	7 80	5	0 3,7	1 7,5	6 5,8	9	7	09	1	1,3	6	4		8 1,5	0 7,5	0 7,3	0 5,6										33 48,	r khoro kugust BZD T ee and
		Pop	Apart	14,47	7,84	7,56	11,55	8,68	13,83	11,00	10,83	2,31	1,45	75	10,95	4,62	4,76	5,13	72	7,71	8,85	6,14	4,66													143,93	*-New from A 14 for both fe
S	Bayanzurkh	1:	Fee	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG	NUG						(Note):
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Table 18: Comparison of Waste and Fee Collection Organizations by Khoroos (as of Jul 2012)

TsY-Tsuzuki Yume Co.Ltd. (now called as Ulaanbaatar Shinechlel Co.Ltd) GP-Golden Prima Co.Ltd. (now called as Nashi Trade Co.Ltd.) TUT-Waste transportation unit of Songinokhairkhan District Office

6.3 History of Improvement of SWM in UBC

The history of the improvement of SWM in UBC commenced jointly by the MUB and JICA in 2004 is shown in the following chart.



7 Conclusion and Recommendations

7.1 Conclusion and Recommendations

8 years Cooperation(from end of 2004, Development study, Grant aid, and this Technical cooperation project) between UBC and JICA in terms of SWM is going to be ended in Sep 2012. SWM in UBC in these 8years has improved tremendously but there is still room to be improved further. Followings are the recommendation for MUB to achieve fundamental goal of M/P in 2020.

a. Waste Generation Amount

In this technical cooperation project, waste amount and composition survey was conducted in 2010 and the results were compared with the survey results which were conducted in 2006. The estimated unit generation amount (g/person/day) in 2006 is almost same as what surveyed in 2010. But the Population in ger area increased much more than estimation in 2006 which was based on the UBC development master plan in 2002. Since the unit generation amount in ger area is 3 times more than the amount in apartment area, daily waste generation amount is calculated as <u>1,019 ton/day in winter</u>, <u>507 ton/day in summer</u> in 2010. Hence, previous estimated waste generation amount in 2010 is <u>610 ton/day in winter</u>, <u>336 ton/day in summer</u>. As a result, revised waste generation amount in 2020 became <u>1,221 ton/day in winter</u>, <u>942 ton/day in summer</u>.

To grasp waste generation amount is the basis for appropriate SWM and this amount will affect all type of plans such as waste collection plan, site selection plan for new disposal site and so on, Therefore, it is recommended to conduct waste amount and composition survey and calculate waste generation amount periodically.

b. Waste Collection in Ger Area

Public opinion survey was conducted in 2010 for the residents in ger area for the satisfaction level of waste collection services. 90% of the respondents replied that they are receiving waste collection services. Based on this result, waste collection rate in ger area was estimated as 90%.

In Jul 2011, MUB has introduced new waste fee collection system which fee is collected with electricity bill. Then fee collection rate was tremendously improved as over 60% which was 24% before introducing this system.

After introducing this system, many complains from residents in ger area were made to District office regarding waste collection services. They are complaining about frequency of the waste collection services. Waste collection service is not coming to their houses every month instead they are paying fee every month.

It was found that 90% of the residents in ger receiving waste collection service every month is not true and they were keeping wastes inside their premises for few month and discharging these wastes in one month waste collection fee.

There is a fact that waste generation in winter is double the amount in summer. But the waste amount transported in winter and summer to disposal site are same. This fact shows the existing discharge and collection system could balance the waste amounts which need to be transported in winter and summer.

In order to collect wastes regularly even in winter, the required numbers of waste collection trucks will be double compared with those in summer.

Furthermore, the cost for collection of wastes in ger area is much higher than that in apartment area because of efficiency of collection.

MUB has procured 163 numbers of waste collection trucks in early 2012 and capacity of collection has extremely strengthened. In case, these collection trucks are engaged for collection of wastes in ger area, this problem will be solved practically. But the overall costs for collecting wastes from ger area will increase significantly. MUB should prepare countermeasures to cover this cost by several alternatives such as revision of waste collection fee, subsidies from MUB general budget, or introducing tax system to cover all the waste collection costs.

c. Abolition of Waste Service Fund

Mongolian basic law on waste as "Law on Household and Industrial Waste" was revised on May2012 and clause relating to WSF was deleted.

Number of District WSF was reduced after city resolution was announced that the existing of WSF in District level is illegal by City Council Meeting on Dec 2009. As of Jul 2012, only DWSF in Chingeltei still exists.

But there are another organization formulated replacing function of DWSF in each district except Khan Uul District.

The right of collecting waste collection fee remains in district government is essential since this is an important tool to control waste collection companies. Therefore district government is playing an important role to maintain service level of waste collection.

MUB's role in future is to monitor service level of waste collection in each khoroo in each district depend on the waste collection system and waste fee collection system and to recommend which system is good in terms of the level of the services.

d. Selection of Waste Collection Company

Waste collection in UBC was conducted by waste collection department (TUK) in district office directly by 1980s. After that, only operation of TUK was privatized in 2003 and TUK was fully privatized in 2008 including facilities and equipment.

TUKs were fully privatized but they are engaged in waste collection services in 88 khoroos out of 129 khoroos as of July 2012 without detailed contract to specify service levels. Selection of waste collection company is not carried out by bidding process with transparent competition.

Privatized contract of TUKs specifies that rights and obligation of providing waste collection services should remain 10 years after privatizing and this clause might obstruct to introduce bidding system for selecting waste collection companies.

But this privatizing contract will expire in May 2018. This is good timing to introduce

transparent and competitive bidding system for UBC. In order to realize this chance, standard tender document and guideline for introducing tender system was prepared under this project and compiled in the Data Book of Final Completion Report. We recommend MUB to disseminate this system to each district in near future.

e. Operation and Maintenance of Equipment

Many kind of trainings, such as seminar, workshop and field training, were conducted in this project in order to improve the operation and maintenance of the equipment. As a result, those equipment which was procured under grant aid project in Jan 2009 is still operational conditions without any fatal damage as of Jul 2012.

On the other hand, those equipment procured by MUB in 2009, 30 numbers out of 83 numbers are damaged and can not be used for waste collection. Therefore MUB has decided to allocate additional budget to procure another 163 numbers of waste collection trucks in the end of 2011.

In this procurement process, MUB has learnt from previous experience that quality of waste collection trucks is important in long terms.

In order to use these equipments in long term, it is recommended to follow same procedures as what Japanese grant aid equipment is maintained in three year. To make a clear contract with collection companies who will receive these equipment is necessary. This contract should specify roles and responsibilities of maintenance of the equipment, timing for periodic inspection and submission of operation and maintenance report. The operation and maintenance manual including those information was complied in Annex of this report.

It is recommended to maintain those data by MUB and utilize for next procurement of the waste collection trucks.

f. Selection of New Disposal Site

Waste generation in UBC is increased more than what estimated in 2006. Design period of Narangiin Enger Disposal Site (NEDS) is 10 years which ends in 2020 but it might be shorter due to increase of waste generation amount.

It is recommended to conduct waste amount and composition survey, to make waste flow, to analyze weighbridge data, to conduct GPS survey in disposal site, then to estimate the remaining years to use as disposal site. These activities are all conducted during implementation of this project and staff of EPWMD in MUB has knowledge and experiences.

It will take time to select new disposal site based on appropriate procedure. It must be noted that selection procedure for NEDS started early 2005 and operation of sanitary landfilling was started only in 2009 spring.

g. Promotion of 3Rs

According to the waste flow in 2010, recycling rate in UBC is 3.7% in winter and 8.4% in summer. Considering special condition of UBC as there is a lot of ash in winter which can not be recycled, Recycling rate of 8.4% in summer is considerably high percentage. This recycling rate is achieved only by private sectors including waste pickers. But in case MUB try to achieve fundamental goal of M/P of SWM in UBC, promotion of recycling by

government sector will be required.

In order to promote recycling in M/P, it is planned to construct waste separation and RPF production facilities in Narangiin Enger Recycling Complex next to NEDS, to separate recyclable, and to make RPF using those low quality waste plastics and papers which can not be recycled. RPF can be alternative fuel for continuous and high temperature incineration plant such as power generation plant.

Pilot project was implemented in this project and separate collection for feeding separated wastes into sorting facility in NERC is proved to be feasible technically and socially under certain conditions. But the same time, it was proved that operation cost for operating sorting facility and RPF plant can not be covered by selling recyclables and EPF.

Since sorting facility and RPF plant was constructed under foreign aid, it shold be investigated further that MUB introduces separate collection and try to utilize these facilities in order to achieve fundamental goal of M/P in 2020.

ANNEX 1 Master Plan on Solid Waste Management in Ulaanbaatar City

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1 Master Plan on Solid Waste Management in Ulaanbaatar City

The SWM Master Plan for UBC formulated in 2006 was to be implemented through three phases until 2020 - the target year of the plan. As the first phase was completed in 2010, the JET evaluated the performances of Phase-I and revised the quantitative targets set for Phase-II and Phase-III based on the achievements obtained until 2010.

1.1 Fundamental Goal

The fundamental goal of the SWM M/P for UBC is:

"To establish an environmentally sound SWM system in UBC by the year 2020".

The establishment of such a system will:

- Maintain the urban environment and public health in UBC, which is the centre of economic and industrial activities in Mongolia and has 40% of the national population, and contribute to the sound development of urban life.
- Motivate foreign investment and tourism whereby the economic development of Mongolia will be promoted.

The environmentally sound SWM system set as the fundamental goal in the M/P is a system that creates the following situations through promotion of the 3Rs (Reduce, Reuse and Recycle):

- Reducing waste will be encouraged at generation sources such as households and business enterprises;
- Waste generated after the waste reduction attempts will be reused or recycled as much as possible;
- Waste will be collected properly only after the efforts of waste reduction, reuse or recycling are made at generation sources, and recycled/treated, then finally disposed of in a proper manner without negative environmental impacts.
- Such a SWM system will be established by requiring the governmental sector, private sector and general public to bear adequate responsibilities under a transparent and fair rule is achieved.

1.2 Quantitative Targets

The aforementioned goal will be achieved stage by stage through the following phases of the M/P implementation.

•	Phase 1 Short Term Improvement:	from 2006 to 2010 (F/S target year)
•	Phase 2 Medium term Improvement:	from 2011 to 2015
•	Phase 3 Long Term Improvement:	from 2016 to 2020

The achievements of the quantitative targets set for Phase-I are the following:
Items	Before (2006)	Planned (2010)	Actual (2010)	
Waste Collection Rate (%)	100	100	100	
Ger Area	42*1	100	90	
Share of self-disposal and improper disposal in				
generation amount (%)	54.0	1.0		
• Winter	54.2	1.2	4.4	
Summer	20.2	2.0	2.0	
Separate collection rate (%)	0	15	0	
 Covered population (person) 	0 0	83.587	ő	
Share of separate collection in generation	T			
amount (%)*2				
Winter	0	4.9	0	
Summer	0	8.5	0	
Share of intermediate treatment in generation				
amount (%)*3	0		0	
Winter	0	2.2	0	
Share of recycling in generation amount (%)*/	0	5.0	0	
Winter	3.0	48(10)	37(00)	
Summer	6.6	8.4 (1.7)	8.4 (0.0)	
Final Disposal Method		Sanitary Landfill	Sanitary Landfill	
NEDS	Open Dumping	Level 4	Level 4	
MDDS	Open Dumping	Level 2	Level 2*5	
(Note): *1: Equals to fee collection rate identified by the Questionnaire survey to the Khoroo governors in ger area in August 2006				

Table 1.1: M/P Quantitative Targets for Ulaanbaatar SWM

*1: Equals to fee collection rate identified by the Questionnaire survey to the Khoroo governors in ger area in August 2006 *2: Includes separated recyclables and non-recyclables. *3: The rate of recyclables to be processed at the sorting yard and RDF facility. *4: Figures in () are the rate of RPF production. *5: Shows the conditions at MDDS

The revised quantitative targets for Phase-II and Phase-III are as follows:

Items	Phase-I, Actual (2010)	Phase-II, Plan (2015)	Phase-III, Plan (2020)
Waste Collection Rate (%) Apartment Area	100	100	100
Ger Area	90	95	100
Share of self-disposal and improper disposal in			
Winter	1.1	1 0	0
Summer	2.8	1.5	0
Separate collection in apartment area			
 Separate collection rate (%) 	0	16.4	65
Covered population (person)	0	80,000	362,807
Share of separate collection in generation			
Winter	0	27	13.8
Summer	0	3.8	15.2
Share of intermediate treatment in generation			
amount (%)*3			
Winter	0	1.3	6.8
Summer	0	1.9	7.4
Share of recycling in generation amount (%) ⁴	0.7	10	0.5
Winter	3.7	4.9	8.5 10.0
Final Disposal Mothod	0.4 Sopitory Londfill	Sonitory Londfill	Sonitory Londfill
NEDS			
MDDS	Level 2*5	Level 2	Level 2*5

1.3 Strategy

In order to achieve the goal of the M/P, strategies were formulated for each of the implementation phases. The implementation of the strategies set for Phase-I was analyzed as follows:

Table 1.2: Implementation of the Strategies Set for Phase-I

 \bigcirc :very good achievement, \bigcirc :good achievement, \triangle :partially achieved, \times :not achieved

Item		Activity	
Phase-I (2006	-2010)		
	Blog in 2006		Achievements by 2010
	Plan In 2006	Assess	
Technical Perspective	<u>1. Elimination of Improper Disposal:</u> Improper disposal at generation sources, for example illegal dumping and improper self-disposal, will be eliminated by 2010 through an intensive public education campaigns and enforcement of laws and regulations (sufficient provision of the collection service is a prerequisite).	0	 Cleaning campaigns were conducted continuously since 2006. Waste education for students of the 7th grade was conducted at 211 schools in UBC. The program will be organized every year. The MUB made efforts in procuring collection trucks by themselves in order to eliminate the improper disposal by expanding collection service.
	 2. Improvement of Collection System: Necessary funds will be secured including overseas support, existing outdated collection vehicles will be gradually renewed and new vehicles will be purchased which is essential for providing the collection service to all residents. 	Ø	 30 compactor trucks (CT) and 13 dump trucks (DT) were provided in 2008 under the Japanese Grant Aid. 30 Chinese DTs were procured in 2006 using state budget. 70 Chinese DTs were procured in 2009 using state budget. 13 Chinese CTs were procured in 2009 using state budget. 163 collection trucks has been planned to be procured in 2012 using the MUB budget.
	 The use of use clicks will be prohibited, waste discharge rules demonstrated in this study's Pilot Project (P/P) will be spread to all residents in the Apartment Area, waste scattering will be prevented in the town area and the collection rate will be substantially improved. 	Δ	 Dust critics of several apartments were closed during the PP implemented under the JICA's technical cooperation project. Some outside discharge points (ODP) were removed; and instead of them, bell collection system was introduced. However, these improvements are limited to a part of apartment areas.
	 Waste discharge rules will be established in the Ger Area and the waste collection service will be provided to all residents in that area. 	Δ	 Waste collection rate in ger area increased to 90% from 42% of 2006. However, the collection frequency in ger areas is once per month. As there are households that cannot be collected during the winters, it is necessary to improve the quality of collection service in the future.
	Separate discharge of recyclable and non-recyclable waste will begin in 2007 in accordance with the results of the P/P. Separated collection will be carried out in 2010 15% of residents in the Apartment Area.	Δ	 A pilot project on separate discharge was implemented in 2010. As separate collection system was not established, the activity of the PP was stopped. In some apartments, separate discharge of valuables is being implemented by the efforts of entrance watchmen.
	 Necessary funds will be secured, a central workshop will be established and a maintenance system will be put in place. 	0	 The central workshop was constructed by the joint financing from the city budget and the Japanese Grant Aid. Periodic inspection and maintenance is being carried out twice a year targeting the equipment provided by the Japanese Grant Aid.
	Ine current public area cleaning system is conducted focused on manual labor and this will be maintained. The resident education campaign and regulations will be strongly promoted so that waste is not scattered within the city.	0	 Public area cleaning system has been maintained. However, the MUB has planned replacement of labor sweeping method with road sweeping vehicles. Public education such as cleaning campaigns has continuously been implemented.
	 <u>Recycling and Intermediate</u> <u>Treatment:</u> A public sector participated 3Rs system will be commenced by starting source separation in order to re-use and recycle municipal waste and recover resources, while promoting waste reduction at generation sources. 	Δ	 In order to verify the appropriate recycling system for UBC, pilot projects were implemented under JICA technical cooperation project. Based on the results of the PPs, preparatory activities for commencement of a public-participated 3R system are being conducted.

Item		Activity	
Phase-I (2006-2010)			
	Plan in 2006		Achievements by 2010
	 A system will be established to develop and maintain private sector recycling activities. One of the policies for this will be to construct a recycling complex (NERC) adjacent to the Narangiin Enger disposal site (NEDS) and attract private enterprises investment for recycling. 	Assess	 A sorting yard and a RPF plant – a part of the NERC, were constructed in the territory of NEDS. The O & M of these facilities will be transferred to CMPUA.
	 A detailed design (the F/S project of this study) will be carried out for the sorting yard and the RDF production facility. The necessary funds will be secured and the sorting yard (4,620ton/year) and the RDF production facility (3,920ton/year) will be constructed in the NERC. The plant will operate from January 2010. The recycled percentage of the generated waste amount will rise from 3.3% (winter) and 7.4% (summer) in 2006 to 4.8% in winter (RDF shares 1.0%) and 8.4% in summer (RDF shares 1.7%) in 2010. 	Δ	 The sorting yard and the RPF plant were constructed under the assistance by the Government of Korea in 2011 following the preparation of detailed design drawings of the facilities. The production capacity of the plant is 1,500 ton/year. Test-run of the plant will be commenced in May 2012.
	 4. Final Disposal: The P/P that is being carried out at the current Ulaanchuluut Disposal Site (UCDS) will be continued, sanitary landfill will be carried out and organization of waste pickers will be promoted. UCDS will be used until operation commences at NEDS. 	O	 Former UCDS, which had operated until Mar 2009, was closed properly by the initiative of the MUB (CMPUA) in Jul 2009. The closure works included formation of slope, soil coverage and installation of gas removal pipes. In 2011, trees were planted in a part of the area. As organization of waste pickers had been continued, waste pickers were involved in the pilot project of waste sorting. Through this PP, it was verified that the waste pickers were able to be a member of a factory or facility where rules and regulations have to be strictly enforced.
	 Necessary funds will be secured and a detailed design (F/S project of this study) will be conducted for the new Narangiin Enger disposal site (NEDS). NEDS will be constructed and heavy machinery, vehicles and equipment will be purchased. The final disposal site is scheduled to commence operation from the first quarter of 2009. 	Ø	 In 2008, NEDS was constructed and vehicles and heavy equipment for landfill operation were provided under the Japanese Grant Aid. The operation of the disposal site was commenced in Apr 2009 as planned.
	• An improvement plan will be formulated for the other disposal sites and an EIA will be received in 2007. In 2008, the improvement plan will be executed, essential heavy machinery, vehicles and equipment will be secured and semi-sanitary landfill will be implemented.	Ø	 As for the other disposal sites, EIA for MDDS was approved in 2007. Improvement work of MDDS was planned and implemented in 2011. Presently, semi-sanitary landfill is being implemented at this site.
	 Medical Waste and Hazardous Industrial Waste Management: Source separation, source treatment and separated discharge/collection will be ensured for medical waste (infectious/hazardous waste). Medical waste management will be strictly carried out at the disposal site and improper disposal will be eliminated by 2008. General waste (non-infectious/hazardous waste) from medical institutions is continued to be disposed of at municipal landfills. 	Ø	 A private medical waste collection and treatment company was established and commenced its operation in Jan 2010. Incineration facility for medical waste was constructed by the financing of MOH and MUB at NEDS and its O&M was transferred to the private company.

Item		Activity	
Phase-I (2006	-2010)		
	Plan in 2006		Achievements by 2010
	 Through international cooperation, classifications and management criteria will be legally defined for Hazardous industrial waste. In addition, waste generation, treatment and disposal will be studied to grasp the current situation in order to formulate a suitable treatment and disposal plan. Furthermore, in conjunction with medical waste a suitable treatment and disposal plan will be formulated. The possibility of using an existing cement factory as a treatment facility for some of the hazardous industrial waste will be examined. 	Assess	 Feasibility study on hazardous waste management facility was conducted in Jun 2009 by Hungarian consulting firm with the MONET fund. However, the part of the FS on the current condition of generation, treatment and disposal of hazardous waste has not been sufficient for the private companies to invest in construction of this facility.
	 Necessary funds will be secured and construction of a hazardous industrial and medical waste treatment and disposal facility will be promoted. Source treatment and source storage will be fully introduced until the construction of the treatment and disposal facility has been completed. 	Δ	 Although the FS was conducted on hazardous waste management facility, necessary budget for constructing the facility has not been secured yet. As for medical waste, the treatment facility was constructed and has been in operation.
Institutional Perspective	1. Improvement of SWM Governance System: The roles, jurisdiction and responsibilities of Municipality of Ulaanbaatar (MUB), districts and Khoroos will be revised in accordance with the proposed technical system, namely the provision of the collection service to all residents, thorough discharge rules, separate collection, public sector participated 3Rs system, and sanitary landfill, and the current waste administration system will be improved.	0	 1.1. Improvement of SWM system of the MUB: In order to strengthen SWM system of UBC, the MUB disbanded NUUTS company and established CMPUA in Sep 2006. Moreover, it separated the SWM unit of CMPUA and established EPWMD as SWM planning and supervising organization in Jan 2009. 1.2. Improvement of SWM system of districts: District offices supervise public area cleaning and waste collection service in their territories. After the privatization of TUKs (in May 2008), it turned into a system through which public area cleaning and waste collection services are implemented by cleaning and transporting companies (such as CMPUA, district organizations and private companies including TUKs) based on contracts under the supervision by PSDs of district offices.
	2. Strengthening of SWM organizations: The current organization of the city and districts responsible for SWM will be strengthened both quantitatively and qualitatively in order to properly operate and manage the proposed technical system, namely the provision of the collection service to all residents, thorough discharge rules, separate collection, sorting yard/RDF production plant.	Δ	2.1. Capacity development of EPWMD: In order to strengthen the capacity of EPWMD on managing the realization of the technical system proposed in the M/P, JICA has been implementing its technical cooperation project on Strengthening the Capacity for Solid Waste Management in UBC since Oct 2009. The capacity of EPWMD was developed through implementing improvement of residents' waste discharge manner and conducting separate collection on their own in cooperation with the JET during the implementation of the technical cooperation project. Moreover, the capacity of the department was further strengthened through the trainings conducted by JICA and KOICA in Japan and Korea. 2.2. Capacity development of CMPUA: The number of employees of CMPUA increased from 16 to 156 since the date of establishment till Mar 2012. Following the development of the organization, its capacity for SWM, especially that for O&M of final disposal sites, was improved considerably. In addition to this, the capacity of CMPUA for O&M of disposal sites, maintenance of collection and landfill equipment, collection service management was further improved through the implementation of the technical cooperation project. Furthermore, CMPUA's capacity for appropriate SWM was strengthened through the trainings conducted by JICA

Item		Activity	
Phase-I (2006-2010)			
	Plan in 2006		Achievements by 2010
		Assess	and KOICA in Japan and Korea.
			2.3. Capacity development of PSD: All DWSFs except that in ChD were disbanded in accordance with the decision by the City Council on abolition of WSF regulation dated on 23 Dec 2009. However, the management capacities of PSDs - the departments of district offices in charge of SWM – had been developed in 5 districts excluding KhUD through operating WSFs for 3 years up to their abolition. In addition, the capacity of the PSDs for appropriate SWM was improved through the trainings conducted by JICA and KOICA in Japan and Korea.
	3. Promotion of private participation:		3.1. Promotion of private participation:
	The introduction of private companies will be promoted not only for the future cleaning service but also for the proposed new technical system with careful regard to the capability of those private companies. A suitable contracting method will be created with the aim of introducing private companies through international cooperation, etc.	0	 The privatization of TUKs broke down their monopolistic rights and allowed the entry of private companies into the sector. Although it has not been sufficient, private companies other than TUKs started participating in collection service in some khoroos. However, experiences to select collection service providers through a tender have been very limited. 3.2. Private participation in medical waste treatment: Currently, a private company treats and disposes of medical hazardous and infectious waste collected from 800 medical organizations in UBC. The entry of the company into the medical waste treatment was implemented as follows based on PPP (Public-Private-Partnership) principles: Until the end of 2009, the MUB provided with land for construction of the facility. In Sep 2009, the company was selected through a tender for collection and disposal of the medical waste. In Jan 2010, the company started collection, treatment and disposal of medical waste.
	4. Establishment of SWM monitoring and information management systems:		4.1. <u>Guideline for calculation of</u> appropriate waste collection fees:
	Systematic monitoring and an information management system for SWM will be established for both the city and districts. Firstly, the operating costs will be identified in order to assess the cost/benefits, cost/efficiency and cost/effectiveness. In parallel with this, a database will be constructed for all activities relating to SWM and it will be possible to continuously check the quality and costs of both public and private cleaning services.	Ο	In order for the district offices to set the waste collection fee at an appropriate level, Guideline for Calculation of Appropriate Waste Collection Fees was prepared under this technical cooperation project. The guideline allows calculation of unit transportation costs, which vary depending on transportation destances between the districts and the disposal site, diesel and labor costs, for each district; and therefore, it became possible to identify the most appropriate collection fee. Currently, EPWMD is intending to train PSDs of District Offices on utilization of this guideline. 4.2. Weighbridge data management: Since installation of weighbridge at former UCDS, the amount of payments to be paid to transported to the disposal sites by the transported to NEDS to the MUB web site on a daily basis and relevant organizations became able to access the data at once after uploading. At the same time, the accuracy of other data such as collection areas and types of waste was improved. Based on these results, it has become possible to maintain the accuracy of the data on amount of the data on disposed waste in future. 4.3. Environmental monitoring at disposal sites: by the data on disposed waste in future.

Item		Activity	
Phase-I (2006	-2010)		
	Plan in 2006		Achievements by 2010
		Assess	disposal sites to their surrounding environment, a monitoring committee was established in Nov 2010 and conducted environmental monitoring at NEDS and
	5. <u>Commencement of human resource</u> <u>development program</u> . A human resource development program will be developed to train specialists for SWM. The program will include support activities from specialists to laborers, aimed at involving all affiliated persons from management to operations.	0	 MDDS. 5. Commencement of human resource development program: Under the JICA's technical cooperation project, a capacity improvement program was developed for relevant personnel of each sub-system of SWM. 5.1. Collection plan: The specification of required collection service is the one of the most important component of the tender document for selection of transporting organizations. In order to determine the service specifications, it is essential to prepare a collection plan for the collection area. Therefore, a manual for preparation of collection plan was developed under this technical cooperation project. 5.2. Central workshop of CMPUA: The following are the capacity development program for each of the target members. These programs can also be used for transporting companies other than CMPUA. Truck drivers: Manual for preparation of contracts on maintenance of CMPUA's leased cars with utilization organizations. 5.3. Final disposal site: The following are the capacity development programs for each target member. Operators of heavy equipment: Manual for landfill operation and manual for daily inspection; maintenance of CMPUA's leased cars with utilization organizations. 5.3. Final disposal site: The following are the capacity development programs for each target member. Operators of heavy equipment: Manual for landfill operation and manual for daily inspection on heavy equipment; Managers: Guideline for environmental monitoring, manual for weighbridge data management and manual for weighbridge data management and manual for preparation of each of the target members. Trainers: Manual for preparation of each of the target members. General public: Calendar of SWM, pamphlets, a booklet on SWM education, DVD, etc.
	6. Improvement of laws and regulations: The current laws, regulations and ordinances will be revised and strengthened as necessary in order to properly operate the proposed new technical system.	ο	 6.1. <u>National level:</u> The current conditions of improvement of major laws and regulations at national level are the following: Amendment of Law on Household and Industrial Waste: The draft of the amendment, which consolidated the current 3 laws (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), was submitted to the Parliament of Mongolia by the central government and approved as "Law on Waste" in May 2012. Law on eco-tax: EPWMD prepared a proposal for Imposing an Import Tax on Products that cannot be Reused and submitted to the MONET. Based on the proposal, the MONET has been working on a draft of Law on Eco-Tax. Waste Reduction National Program: The MONET has prepared the draft. However, it has not submitted to be made in LHIW.

Item		Activity	
Phase-I (2006	-2010)		
	Plan in 2006	A	Achievements by 2010
	Plan in 2006	Assess	 After the amendment of the law, the MONET will revise the draft and submit it to the relevant organization. Regulation on Certification of Hazardous Waste: The regulation was drafted by the MONET and approved by the central government on 4 Oct 2006. 6.2. City level: The current conditions of improvement of regulations at city level are as follows: Revision of WSF Regulation: A draft was prepared and submitted to City Mayor Board Meeting. However, EPWMD is intending to revise the draft after the expected amendment in LHIW. Revision of Current Fee Tariff: In Jan 2011, the City Mayor ordered to verify the basis for calculation of the current fee system. Based on the order, a guideline for calculation of appropriate waste collection fee was prepared under this technical cooperation project. Regulation on Selection, Evaluation and Transportation: EPWMD is intending to draft the regulation. Regulation on selection, Evaluation and Financing of Waste Collection Organization: EPWMD is intending to draft the regulation. Regulation on waste separation: EPWMD has been drafting the regulation. Guideline to inspect operation of NEDS of waste management division of CMPUA under Mayor's Office of UBC: JET in cooperation with EPWMD drafted the guideline under this technical cooperation project and the draft was approved on 20 Oct 2010. Regulation on collection, sorting, selling and purchase of secondary raw materials: EPWMD has been drafting the regulation. Regulation on Delivery of Construction Waste to Final Disposal Sites: The regulation was drafted by EPWMD and submitted to the City Council through the Mayor. Regulation on Waste Collection Fees from Ger Area Households: The ordinance by City Mayor on collecting waste fees together with electricity payments from ger area households: The ordinance by City Mayor on collecting waste fees together with electricity
	7. Establishment of financial management system:		force since 1 Jul 2011. 7.1. Improvement of waste fee collection and management system:
	A waste service fund will be established for the city and districts and a system will be constructed to appropriately collect and manage the waste fee. The waste service fund will act as a cross-subsidy to provide the service to the Ger Area. A database will be constructed with the city and districts to clearly and fairly manage the waste service fund.	Δ	In appliance with the LHIW, Waste Service Fund (WSF) was established on 30 Nov 2006 resulting in establishment of DWSF-based fee collection and management system. The mission of WSF was to provide collection service to entire city by maintaining ger area collections through implementation of cross-subsidy between ger area and apartment/business areas. However, the DWSFs were abolished with the resolution made by the City Council on 23 Dec 2009. As of Mar 2012, waste collection fees were collected and managed by the following three patterns: (1) Managed by district organizations (WSF in ChD and district-property company in BZD), (2) Managed by DUK (in BGD and KhUD) and (3) Managed by both district organizations and TUKs (in SBD and SKhD). As mentioned here, fee collection and management system differs district by district; and therefore, the cross-subsidy

Item		Activity	
Phase-I (2006	S-2010)		
	Plan in 2006		Achievements by 2010
	Flatt itt 2000	Assess	
	Plan in 2006	Assess	between residential areas, which was the mission of the WSFs, is being implemented in some extent, but not completely. According to the results of the POS conducted among ger residents in Jul 2010, 90% of the residents was covered by collection service (the indicator was 42% in 2006) implicating that the cross-subsidy was being implemented somehow. 7.2. Improvement of fee collection system in ger area: Fee collection rate in ger area increased dramatically after commencement of new fee collection system, through which waste fee is collected together with the electricity payment, in ger area since 1 Jul 2011 in accordance with the ordinance by the City Mayor. Although the fee collection rate in ger area was 23% in Jul 2011, it increased to 61% as of Dec of the same year. 7.3. Improvement in financial management system of waste collection service: Although a database of waste fee management has not been established, fee collecting organizations of districts submit its financial statements to the Treasury Departments of respective districts and the
	8. Establishment of Hazardous Waste		MUB on a quarter-and-annual basis. A relevant organization conducts monitoring on their financial conditions regularly. 8.1. Establishment of medical hazardous
	Management System: In order to establish hazardous waste management system, required policies, laws, regulations and control system will be established.	Ο	 infectious waste management system: The current conditions are the following: Strategic Plan on Improvement of Waste Management of Medical Organizations: The plan has been in force since its approval by the Minister of Health in Sep 2009. Action Plan on Improvement of Waste Management of Medical Organizations: The plan has been in force since its approval by the Minister of Health in Sep 2009. Action Plan on Improvement of Waste Management of Medical Organizations: The plan has been in force since its approval by the Minister of Health in Sep 2009. The medical hazardous infectious waste management system was established through Public-Private Partnership as mentioned before. Establishment of industrial hazardous waste management system: The current conditions are the following: As mentioned in 6.1 above, the MONET has been working on drafts of relevant laws and regulations. Feasibility Study on Hazardous waste management facilities was conducted by a Hungarian consultant firm with the MONET fund. Base house hold hazardous waste management: The major activities are the following: The basic direction of household hazardous waste management was determined under the JICA's technical cooperation project and discussed among relevant parties during a seminar conducted on 3 Oct 2010. Based on the above direction, EPWMD is drafting a regulation on waste separation. The draft provides definitions of household hazardous and household medical waste, determines their types and regulates storage, separation and discharge methods of these wastes.

1.4 Revision of Strategies

Based on the achievement of the M/P as of March 2012, the strategies of the plan were revised as shown in the table below.

Items	Strategies in M/P	Revised M/P
Phase-II (2	2012-2015)	
Technical Perspective	 Expansion of separate collection system: The separate collection system will be extended to cover 40% of the Apartment area by 2015. The classification of separately discharged waste will be revised taking into account demands from the operation of the sorting site/RDF production facility. 	1. Expansion of separate collection system: The separate collection system will be expanded to a level that covers a population of 80,000 in apartment areas by 2015. The classification for waste separation will be revised based on the requirements to be resulted from the operation of the sorting yard/RPF plant.
	2. Strengthening public area cleansing	2. Strengthening public area cleansing system:
	system: Labor costs will rise and if road conditions are improved then the rate of mechanical road cleaning will increase. If employment and road conditions allow it, then the main road cleaning system will be replaced by a mechanical system.	If labor costs rise and road conditions are improved, the rate of mechanical road cleaning will increase. If employment and road conditions allow, the manual cleaning system of the main roads will be replaced by a mechanical system.
	3. Waste reduction:	3. Waste reduction:
	Waste reduction at generation will be further promoted, and a public sector participated 3Rs system will be strengthened to increase the rate of source separation for re-use, recycling and recovery of valuables	Waste reduction at generation sources will be further promoted, and a public sector participated 3Rs system will be strengthened in order to increase the rate of source separation for re-use, recycling and recovery of valuables.
		4. Construction of a new disposal site:
		A new disposal site will be constructed in Tsagaan Davaa, which is located in the north-east of UBC, as a countermeasure against the increased disposal amount and the traffic jam on the main road stretching from the east to the west. One of the expected advantages of the facility will be economization of waste collection and transportation costs. The basic design survey and construction works will be completed in 2012 and the operation will be commenced in 2013. Based on the experience at NEDS, sanitary landfilling will be introduced at the new disposal site
	5. Promotion of recycling:	5. Promotion of recycling:
	The necessary funds will be secured and the capacity of the sorting yard and the RDF production facility will be build up to 18,890 ton/year and 16,060 ton/year respectively. The recycling rate will rise to 9.3% in winter (RDF shares 3.8%) and 13.6% in summer (RDF shares 5.3%) in 2015.	The sorting and production capacities of the RPF plant and the sorting facility of NERC will be increased every year and reach to 750 ton/year by 2015. The recycling rate will reach to 4.5% in winter and 7.7% in summer by 2015.

Table 1.3: The Strategies for	Implementation of SWM M/P
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Items	Strategies in M/P	Revised M/P
	6 . Proper treatment of industrial	6. Proper treatment of industrial hazardous and medical
	hazardous and medical infectious	infectious waste:
	waste: Inappropriate treatment and disposal of hazardous industrial waste and medical waste will be regulated. Treatment and disposal of hazardous industrial waste and medical waste will be carried out at the	 Classifications of industrial hazardous waste and standards for industrial hazardous waste management will be established through international cooperation. Following the task, a survey on current conditions of generation, treatment and disposal activities of these wastes will be conducted in order to formulate appropriate treatment and disposal plans.
	constructed hazardous industrial waste and medical waste treatment facility and disposal site.	 Having secured necessary budgets, construction of a treatment and disposal facility for hazardous waste will be promoted. Until the construction of this facility, a directive on self-treatment and storage at each generation source will be enforced.
		 Inappropriate treatment and disposal of industrial hazardous waste and medical infectious waste will be regulated. Treatment and disposal of industrial hazardous and medical infectious waste will be conducted at the hazardous waste treatment and disposal facility mentioned above.
Institutional	1. Improvement of SWM administration	1. Improvement of SWM administration system:
Perspective	system: The SWM administration system including the roles of the city, districts and Khoroos will be reviewed and improved to respond to changes in demand arising from an increase in the Not in My Back Yard Syndrome (NIMBY).	The SWM administration system including the roles of the city, districts and Khoroos will be reviewed and improved to a level that they will be able to respond to changes in demand arising from an increase in the Not in My Back Yard Syndrome (NIMBY). Especially, the roles of districts, khoroos and khesegs that are in close relationship with businesses and residents - the waste dischargers and the beneficiaries of appropriate SWM – will be clarified and strengthened.
	2. Strengthening of SWM relevant	2. Strengthening of SWM relevant organizations:
	organization: The administrative and management capacities for municipal waste, as well as hazardous and industrial waste, of the organizations responsible for SWM will be strengthened.	 The administrative and management capacities of SWM implementing organizations not only for municipal solid waste, but also hazardous and industrial waste will be strengthened. In order to strengthen the capacities of the MUB for hazardous and industrial waste management, monitoring, directive and management system of EPWMD on waste dischargers will be strengthened. Public cooperation capacity of districts, khoroos and khesegs, who are involved directly in promotion of public awareness – the most important factor in improvement of SWM, will be strengthened.
	3. Promotion of private participation:	3. Promotion of private participation:
	The participation of private companies will be further promoted and more efficient and lower cost SWM will be realized. The government will promote private participation even for the construction of SWM treatment facilities such as the sorting yard/RDF production facility.	 The participation of private companies will be further promoted and more effective and cost-efficient SWM will be realized. For implementation of the task, the following measures will be taken: Each district will organize tenders when selecting private companies as contractors of waste collection service using the prototypes of tender documents and tender implementation procedures prepared under this technical cooperation project. In order for the districts to utilize the above documents, EPWMD will strengthen their directive and training capacities related to collection service management. Based on the experiences in medical hazardous and infectious waste management, participation by private companies in industrial hazardous waste management will be promoted.

Items	Strategies in M/P	Revised M/P
	4. Establishment of SWM monitoring and	4. Establishment of SWM monitoring and information
	information management system:	management system:
	The database for SWM will be maintained and managed. The cost comparison data obtained from the database and other evaluation data will be used to assess the efficiency of the service, appropriate management and decision-making.	 The database for SWM will be maintained and managed. The comparative data of costs to be obtained from the database and results of other evaluations will be used for assessment of service efficiency, implementation of appropriate management and decision-making. Following measures will be taken in order to realize the appropriate management and make decisions. The weighbridge-based disposal amount management system will be introduced into the operation of MDDS and planned TDDS. The weighbridge data of disposal amounts in entire city will be shared among the relevant organizations. The guideline for calculation of appropriate waste collection fees prepared under the technical cooperation project will be utilized by each district, service efficiency of collection companies will be assessed and the collection service will be managed properly.
		develop their directive and training capacities.
	5. Commencement of human resource	5. Commencement of human resource development
	development programs: All staff related to SWM, including employees from private companies, will undertake training and the specialist training program. Occupational qualifications will be created as a means to assess the capabilities of the people responsible for operations of SWM equipment and facilities.	 program: All staff related to SWM, including employees of private companies, will undertake official trainings and capacity development program. Occupational qualifications will be created as a means to assess the capabilities of the people responsible for operations of SWM equipment and facilities. Specifically, following measures will be taken: EPWMD will train not only district officers in charge of SWM, but also those of private companies including TUKs on methodology of planning collection service developed under this technical cooperation project by means of organizing a workshop. Similarly, O&M manuals for collection vehicles developed under this project will be taught to the district officers and technical personnel of TUKs and private companies in cooperation with CMPUA. A workshop will be organized for this purpose. A training completion certificate will be awarded to the participants who completed the trainings during the above workshops providing that they are evaluated as gained a certain level of skills. EPWMD will strengthen the planning, facilitation and training capacities related to organization of this kind of workshops
	6. Improvement of public awareness: A thorough public education and campaign will be carried out to boost public cooperation in order to extend separate collection, recovery of valuables and recycling.	 6. Improvement of public awareness: A thorough public education and campaign will be carried out to boost public cooperation in order to extend separate collection, recovery of valuables and recycling. Specifically, following measures will be taken: Based on the Manual for Preparing Environmental Education Trainers developed under this project, EPWMD will train instructors. In order to realize the task, a workshop will be organized targeting officers of districts, khoroos and khesegs who are in charge of public awareness raising. EPWMD in cooperation with khoroos and PSDs of district offices will raise residents' environmental preservation awareness through these instructors of environmental education. EPWMD will strengthen the planning, facilitation and training capacities related to workshop organization and public awareness raising activities.

Items	Strategies in M/P	Revised M/P
		7. Improvement of laws and regulation:
		 In order to implement the fundamental goal of the M/P – "To establish an environmentally sound SWM system in MUB by the target year 2020", necessary laws, regulations and rules will be established or amended based on the necessities. 7.1. <u>National level:</u> At the national level, following laws and legal documents will be established. Enactment of Law on Waste; Enactment of Law on Eco-Tax; and Approval of Waste Reduction National Program
		 7.2. <u>Municipal level:</u> At the municipal level, the following legal documents will be established or amended. Revision of WSF Regulation; Revision of Current Fee Tariff; Enactment of Regulation of Waste Collection and Transportation; Enactment of Regulation on Selection, Evaluation and Financing of Waste Collection Organizations Enactment of Regulation on Waste Separation Enactment of Regulation on Collection Softing Selling and
		 Purchase of Secondary Raw Materials Enactment of Regulation on Delivery of Construction Waste to Final Disposal Sites
		8. Establishment of waste fee collection and management
		system: After the Law on Waste is amended, an appropriate waste fee collection and management system will be established. The waste fee management system will contain a mechanism to function cross-subsidy including budget allowances from the government in order to secure collection services in ger areas. The MUB and districts will establish a database for realization of transparent and fair waste fee management.
		9 . Establishment of industrial hazardous waste
		management: Based on the experiences in medical hazardous and infectious waste management, industrial hazardous and household hazardous waste management system will be established as follows.
		 9.1. Establishment of industrial hazardous waste management system: The existing report of the FS did not cover the current conditions of generation and treatment of industrial hazardous waste. Therefore, a survey will be conducted to identify the current conditions of industrial hazardous waste treatment activities clearly. Based on the reports of the above survey, necessary treatment system will be established. At the same time with the establishment of the above system, the monitoring, directive and management capacities of EPWMD related to discharging manners will be strengthened. 9.2. Household hazardous waste management: Following the establishment of industrial hazardous waste treatment system, a separate collection and treatment system for household hazardous waste of highest priorities will be established.
Phase-III (2016-2020)	
Technical Perspective	 Expansion of separate collection system: The separate collection system will be expanded and in 2020 it will cover 70% of the Apartment Area population. The separate discharge and collection system will be improved to correspond to changes in social and economic conditions in order to achieve the goal of the Master Plan. 	1. Expansion of separate collection system: The separate collection will be expanded to an extent that covers 65% of the apartment area population by 2020. The separate discharge and collection system will be revised in accordance with changes in social and economic conditions in order to achieve the goal of the Master Plan.

Items	Strategies in M/P	Revised M/P
	2. Strengthening public area cleansing	No change
	system:	
	Employment and road conditions will be	
	appropriate rate of mechanic and manual	
	road cleaning work.	
	3. Promotion of recycling	No change
	will be fully established and the M/P goal	
	will be realized.	
	The necessary funds will be secured and the	The necessary funds will be secured and the capacity of the
	capacity of the sorting yard and the RDF production facility will be build up to 49 400	sorting yard of NERC and the RDF production facility will be increased to 12 600 ton/year (42 ton/day x 300 days) and 3 600
	ton/year and 41,990 ton/year respectively.	ton/year (12 ton/day x 300 days) respectively.
	The recycling rate will rise to 16.9% in winter	The recycling rate will reach to 6.4% in winter (RDF shares will
	(RDF shares 8.9%) and 20.5% in summer (RDF shares 10.5%) in 2020.	be 1.0%) and 8.5% in summer (RDF shares will be 1.3%) in
	4. Construction of a new disposal site:	No change
	It will be possible to use NEDS until 2020.	
	Site selection for the next disposal site	
	after the closure of NEDS, preliminary	
	out. Furthermore, necessary funds will be	
	secured and a detailed design will be	
	carried out for the next disposal site. The next disposal site will be constructed and	
	heavy machinery, vehicles and equipment	
	will be purchased.	
	5. Proper treatment of industrial hazardous and medical infectious	No change
	waste:	
	Inappropriate treatment and disposal of	
	waste will be regulated. Treatment and	
	disposal will be carried out at the	
	constructed hazardous industrial waste	
	site.	
Institutional	1. Improvement of SWM administration	No change
perspective	system:	
	recycling oriented society for SWM will be	
	completely established.	
	2. Promotion of private participation:	No change
	Private companies will fully participate in the	
	construction of facilities such as the sorting	
	yard/RDF production facility, and hazardous	
	waste and medical waste treatment/disposal	
	control and monitor the activities of the	
	private companies.	
	3. Establishment of SWM monitoring and information management system:	No change
	The database for SWM will be fully	
	functioning and it will be possible to instantly	
	elicit data essential for operation, policy	
	policies and financial management.	
	4. Improvement of public awareness:	No change
	Continuous public education and campaign	
	will be carried out and resident	
	recycling oriented society.	

Items	Strategies in M/P	Revised M/P						
	5. Improvement of waste fee collection	6. Establishment of waste collection service financial						
	and management system:	<u>system:</u>						
	By 2020 the waste fund will cover 100% of	Financial sources will be secured and a shared financial system						
	the SWM costs.	accepted by relevant organizations will be established in ord						
		to provide collection service for the entire ger areas.						

1.5 Waste Flow of UBC in 2010

1.5.1 Conditions in 2010

a. Population

The statistics of the total population in the target area (6 central districts of UBC) as of the end of 2010 were compiled in the table below. According to the table, the total population reached to 1,099,775 people while those in apartment and ger areas were 424,210 people and 675,556 people respectively.

						As of	31 Dec 2010	
	Districts	Тс	otal	Apartme	ent Area	Gei	Ger Area	
	Districts	HHs	Population	HHs	Population	HHs	Population	
	Central 6 Disticts:							
1	Bayangol	47,043	185,104	35,080	137,684	11,963	47,420	
2	Bayanzurkh	70,063	265,997	23,980	90,441	46,083	175,556	
3	Songinokhairkhan	58,214	252,264	16,391	65,324	41,823	186,940	
4	Sukhbaatar	36,165	136,917	16,152	59,763	20,013	77,154	
5	Khan-Uul	30,678	112,055	12,177	42,360	18,501	69,695	
6	Chingeltei	35,033	147,438	7,928	28,647	27,105	118,791	
	UBC Total	277,196	1,099,775	111,708	424,219	165,488	675,556	
	Share in UBC	100.0%	100.0%	40.3%	38.6%	59.7%	61.4%	

Table 1.4: Population of UBC in 2010

*Source: Municipal Statistics Department, www.ubstat.mn, browsed on 16 Nov 2011

b. Generation Rates of MSW (Household Waste)

The generation rates of MSW were identified in 2010 through the waste amount survey at generation sources conducted under the technical cooperation project (a part of the results belongs to 2011).

The summary results of the survey are the following:

	Category	Unit	Winter				Summer	
			2005	2010 (Forecast)	2010 (Results)	2005	2010 (Forecast)	2010 (Results)
р	Apartment	g/person/day	256	297	312	228	264	276
ehol	Ger (general)	g/person/day	163	188	164	202	234	220
sno	Ger (ash)	g/person/day	788	788	870	0	0	0
Н	Ger total	g/person/day	951	976	1034	202	234	220

Table 1.5: Generation Rates of MSW (Household waste)

*Source: Results of Waste Amount Survey in 2010 and 2011

**Source: JICA/Kokusai Kogyo Co., Ltd, The Study on SWM Plan for UBC in Mongolia, 2007

c. Generation Amount of MSW (Household Waste)

The generation amount of MSW (household waste) in 2010 was calculated by multiplying the above rates with the number of generation sources (population) and compiled in column "2010 (Results)" of the table below.

In order to identify the difference, the generation amount in 2005 and the value of forecast estimated for the year 2010 during the Development Study were compared in the table.

		1						
			Winter			Summer		
	Category	Unit	2005	2010	2010	200F	2010	2010
			2005	(Forecast)	(Results)	2005	(Forecast)	(Results)
	Apartment	ton/day	115.4	181.9	132.4	102.7	161.7	117.1
р	Ger (general)	ton/day	67.8	70.6	110.8	84.0	87.8	148.6
eho	Ger (ash)	ton/day	327.8	295.8	587.7	-	-	-
sno	Ger total	ton/day	395.6	366.4	698.5	84.0	87.8	148.6
 -	Total	ton/day	511.0	548.3	830.9	186.7	249.5	265.7

Table 1.6: Generation Amount of MSW (Household waste)

d. Waste Flow in 2010 (Actual)

d.1 Generation Amount of MSW

The daily generation amount of MSW in 2010 was calculated in the table below.

Generation Source		Number of Linit		Generati (g/c	Generation Ratio (g/day)		Daily Generation Amount (ton/day)	
Generation	300106	Source		Unit Generation Ratio (g/day) Daily Gereration Ratio (g/day) Amount (to g/day) Cereval and the format of the forma	Summer season			
Jouropold	Apart	424,219	g/person/day	297	264	132.4	117.1	
Nasta	Ger	675,556	g/person/day	976	234	698.5	148.6	
Masie	Total	1,099,775	g/person/day	ı T		830.9	265.7	
Business Activit	ies *1	[]	,	ı T		176.4	221.5	
Public Area Cleaning Waste		3,925,001	g/m2/day	3	5.1	11.8	20.0	
	1019.0	507.2						

Table 1.7: Generation Amount of MSW

*1 The amount was calculated by subtracting the generation amount of household waste from the amount of waste recorded as "Apartment area waste" at the weighbridge (instead of multiplying generation rates of business waste with relevant numbers of generation sources).

*2 The generation rate adopted for the estimation was that forecasted during the Development Study (However, the latest statistical data was used for the number of generation sources).

d.2 Waste Flow in 2010

The waste flows in UBC for winter and summer seasons in 2010 are shown in the following figures.



Figure 1.1: Waste Flow in Winter Season in 2010



Figure 1.2: Waste Flow in Summer Season in 2010

d.3 Estimation Method for the Waste Flow in 2010

	Components	Estimation Method and Data Sources
(1-1)	MSW Generation	From "Table 1.7: Generation Amount of MSW"
(1-2)	Household Waste (Apartment Area)	(1-1) = (1-2) + (1-3) + (1-4) + (1-5)
(1-3)	Household Waste (Ger Area)	
(1-4)	Waste from Business Activities	
(1-5)	Public Area Cleaning Waste	
(2-1)	Illegal Dumping	Based on the Report on Cleaning Campaigns in 2010 (Source: EPWMD)
(2-2)	Storage in Ger area	Winter : $(2-2) = (1-1) - (2-1) - (2-3) - (3-1)$
		Summer $(2-2) = (2-2)$ of Winter
(2-3)	Mixed Collection	Winter $(2-3) = (6) - (5) - (4) + (3-2)$
		Summer $(2-3) = (1-1) + (2-2) - (2-1) - (3-1)$
(3-1)	Recycling	Based on the results of questionnaire survey taken from recycle
		shops operating in the PP target khoroos.
		Apartment area: 26g/person in winter, 27g/person in summer
		Ger area: 14 g/person in winter, 22 g/person in summer
(3-2)	Recycling Activity	Based on the results of Time & Motion Surveys.
		Apartment area: 1.3% in the generation amount (business waste
		included)
		Ger area: 2.0% in the generation amount (ash excluded).
(3-3)	Recycling (landfill site)	The weighbridge data on recyclables purchased by recyclers and
		transported out of NEDS (source: CMPUA)
		Winter: 1.3% in incoming amount; Summer: 1.0% in incoming
		amount
(3-4)	Recycling	(3-4) = (3-1) + (3-2) + (3-3)
(4)	Collection of Illegal Dumped Waste	Report of cleaning campaigns organized in 2010 (source: EPWMD)
(5)	Other than MSW	Weighbridge data of NEDS
		The amount of waste transported by individuals and companies
(other than those permitted by district offices.
(6)	Incoming Amount	Weighbridge data of NEDS /0.91
(7)	Final Disposal Amount	(7) = (6) - (3-3)
(8)	Collection of illegal industrial, construction waste (Summer)	Summer $(8) = (6) - (5) - (4) - (2-3) + (3-2)$

Table	1.8:	The	Estimation	Method	for the	Waste	Flow	Chart
i ubio		1110	Loundation	mounda	101 010	11000	1 10 11	onare

1.6 Future Waste Flow

1.6.1 Planning Framework

a. Population Forecast

a.1 Population Forecast of the Previous M/P (2006)

The future population applied in the previous M/P was the future population projected by the National Statistical Office of Mongolia based on the results of population census conducted in 2000^1 .

As for the population ratio of apartment and ger areas, the values of forecasted ratios in the

¹ Population Projections of Mongolia, National Statistical Office of Mongolia, 2002

UBC Development Master Plan were adopted. According to this plan, the ratio of apartment and ger area populations was forecasted as 6:4 for the year 2010. The plan also forecasted that the share of apartment area population would reach to 82% in the total population by 2020.

Residential areas	2010		2	2015	2020		
	Ratio	Population	Ratio	Population	Ratio	Population	
	(%)	persons	(%)	persons	(%)	persons	
Apartment	62	612,362	72	796,180	82	995,970	
Ger	38	375,318	38	309,625	18	218,628	
Target area	100	987,680	110	1,105,805	100	1,214,598	

Table 1.9: Forecasted Population in the Previous M/P

*1 Population Projections of Mongolia, National Statistical Office of Mongolia, 2002

*2 UBC Development Master Plan

a.2 Revised Projections

The future population to be applied in the revision of the M/P was revised as follows considering the results of the comparison of the previous projections for and actual population of the year 2010.

The growth rate of the actual total population was more than that of the previous forecasted population. According to the statistics, the total population of the target area was 1,099,775 people in 2010 approaching the previous value forecasted for the year 2015. Therefore, the population for the year 2020 was considered, during the revision of the SWM M/P, as the same with that projected in the City Master Plan and Urban Development Program of UBC by JICA (1,437,800 people). Although the population ratio of apartment and ger areas for the year 2010 had been projected to be 6:4 in the UBC Development Master Plan, the actual ratio in 2010 was 4:6, contrary to the projection. Therefore, the annual growth rate of actual population in apartment areas for the period from 2006 to 2010 was calculated and used in estimation for the future apartment population until 2020. The future ger area population was calculated by subtracting the estimated apartment populations from the total population projected for the target area.

Table 1.10: Summar	v of the Revised	Population	Forecast
	, or the received	i opalation	1 0100000

Residential areas	2010 ((Actual*1)	2	2015		2020			
	Ratio	Ratio Population		tio Population		Population			
	(%)	persons	(%) persons		(%)	persons			
Apartment	38.6	424,219	38.4	486,605 *3	38.8	558,165*3			
Ger	61.4	675,556	61.6	782,183	61.2	879,635			
Target area	100	1,099,775	100.0	1,268,788	100	1,437,800 *2			

*1 Municipal Statistics Department, www.ubstat.mn, browsed on 16 Nov 2011

*2 JICA, "The Study on City Master Plan and Urban Development Program of UBC" Final Report, 2009

*3 Estimated based on population growth rate of apartment area from 2004 to 2010.

b. Economic Growth Rate of UBC (GRDP² Growth Rate)

During the formulation of the SWM M/P in 2006, the annual economic growth rate until 2020 was considered to be 5.5%. However, the results of relevant surveys conducted under this project (please refer to Annex-1 of the Progress Report #5) revealed that the actual annual average economic growth rate of UBC had been 8.1% between 2006 and 2010. In addition, the annual average economic growth rate (GRDP growth rate) of UBC until 2020 was forecasted as 7.5% in City Master Plan and Urban Development Program of UBC. Based on the findings, the value for the economic growth rate (GRDP growth rate) to be applied in the revision of the SWM M/P was considered as 7.5%, the same with that of the City Master Plan and Urban Development Program of UBC.

c. Financial Conditions

The costs of waste collection service were considered to be financed from the fees to be collected from residents and business entities while the operation costs of disposal sites were considered to be paid from the Municipal Budget.

1.6.2 Future Generation Amount of Waste

a. Forecasted Generation Rates

The generation rates of the future MSW were estimated based on the following assumptions:

- The generation rate of household waste was considered to increase by 4.1% which was estimated by multiplying the annual economic growth rate (7.5%) with the coefficient of relation (0.55) between economic growth rate and waste generation rate calculated from the statistical data of Japan (7.5 x 0.55 = 4.1).
- However, the generation rate of ash in ger area was assumed to decrease annually and fall to 50% of that of 2010 by the year 2020.
- The generation rate of public area cleansing waste was assumed to remain as it was.

The generation rates of future MSW in UBC estimated based on the above assumptions are the following.

				Winter		Summer				
	Category	Unit	Unit 2015 2020 (Forecast) (Forecast)		2010	2015 (Forecast)	2020 (Forecast)			
σ	Apartment	g/person/day	312	381	466	276	324	396		
ehol	Ger (general)	g/person/day	164	201	246	220	258	315		
ons	Ger (ash)	g/person/day	870	653	435	-	-	-		
	Ger total	g/person/day	1,034	854	681	220	258	315		
Public Area Cleaning Waste		g/m2/day	3	3	3	5.1	5.1	5.1		

Table 1.11: Forecasted Generation Rates of MSW

b. Forecasted Generation Sources

² GRDP – Gross Regional Domestic Product

The number of future generation sources were estimated based on the following assumptions:

- The generation sources of household waste would increase in proportion to the population growth.
- The target area of public area cleansing was assumed to be extended following total population growth (130.7%) between 2010 and 2020 (forecasted population for 2020/the actual population of 2010).

c. Forecasted Generation Amount of MSW

Based on the formulas and assumptions explained so far, the future generation amounts of MSW in UBC were estimated.

				Winter			Summer	
	Category	Unit	2010	2015 (Forecast)	2020 (Forecast)	2010	2015 (Forecast)	2020 (Forecast)
	Apartment	ton/day	132.4	185.4	260.1	117.1	157.7	221.0
plode	Ger (general)	ton/day	110.8	157.2	216.4	148.6	201.8	277.1
use	Ger (ash)	ton/day	587.7	510.4	382.6		- '	-
윈	Ger total	ton/day	698.5	667.6	599.0	148.6	201.8	277.1
	HH Total	ton/day	830.9	853.0	859.1	265.7	359.5	498.1
Bus Act	iness vities *1	ton/day	176.4	247.0	346.7	221.5	298.4	418.0
Pub Cle *2	ilic Area aning Waste	ton/day	11.8	13.6	15.4	20.0	23.1	26.2
Tot	al	ton/day	1,019.1	1,113.6	1,221.2	507.2	681.0	942.3

Table 1.12: Forecasted Future Generation Amount

d. Forecasted Generation Amount of Waste other than MSW

The future generation amount of waste other than MSW (i.e. industrial waste, medical waste and construction waste) was estimated based on the following assumptions.

- The growth rate of the other waste (other than MSW, mainly consists of industrial waste, medical waste and other general waste) to be transported to the disposal sites by individuals and companies other than officially permitted waste collection companies was assumed to increase in proportion to the growth rate of apartment waste from the year 2010.
- The amount of illegally dumped waste was planned to be "0" by the year 2020; and therefore, it was decreased annually from the amount of 2010.
- The amount of waste to be stored at ger households during the winter ("Storage in Ger Area") was planned to be eliminated by the year 2020; and therefore, it was decreased annually from the amount of 2010.

Relevant projections and the targets were compiled in the table below.

	Unit		Winter		Summer				
Category		2010	2015 (Forecast)	2020 (Forecast)	2010	2015 (Forecast)	2020 (Forecast)		
Other than MSW	ton/day	123.9	173.5	243.4	156.7	211.1	295.8		

Table 1.13: The Forecasted Amount of Waste Other than MSW

Table 1.14: The Targets of 2020

			Winter		Summer					
Category	Unit	2010	2015 (Target)	2020 (Target)	2010	2015 (Target)	2020 (Target)			
Storage in Ger area	ton/day	231.5	110.5	0.0	-	-	-			
Illegal Dumping	ton/day	44.9	21.4	0.0	14.4	9.8	0.0			

1.6.3 Forecasted Future Waste Flow (without Promotion of 3Rs)

Before estimation of the future waste flow for the M/P, the waste flow for the year 2020 expected under such conditions where only private sectors conduct recycling based on the market principles instead of public-sector-operated waste treatment or recycling facilities was forecasted.



Figure 1.3: Expected Waste Flow for Winter Season (2020)



Figure 1.4: Expected Waste Flow for Summer Season (2020)

1.7 Solid Waste Management Master Plan for UBC

The SWM M/P for UBC for the years of 2015 and 2020 was revised based on the previously mentioned quantitative targets and the strategies and compiled in the table below.

Phase Components	Bef (20	ore 06)	Phase- (20	l: Actual 010)	Phase II: R (20	Revised Plan 015)	Phase-III: (2	Revised Plan 020)
	winter	summer	winter	summer	winter	summer	winter	summer
1. Generation of MSW								
Population (6 District)	Apart Area: Ger Area: Total:	481,037 409,772 890,809	Apart Area: Ger Area: Total:	424,219 675,556 1,099,775	Apart Area: Ger Area: Total:	486,605 782,183 1,286,788	Apart Area: Ger Area: Total:	558,165 879,635 1,437,800
Generation of MSW (ton/day) Total: • Apart Area*1: • Ger Area:	565.8 174.0 391.8	263.9 178.7 85.2	1,019.0 320.5 698.45	507.3 358.7 148.6	1,283.7 446.0 837.7	681.0 479.2 201.8	1,603.9 622.2 981.7	942.3 665.2 277.1
Waste Composition of Apartment Area: (%) • Recyclable • Non-Recyclable	43.9 56.1	42.7 57.3	44.2 55.8	42.6 57.4	45.1 54.9	43.6 56.4	45.8 54.2	44.6 55.4
Waste Composition of Ger Area: (%) • Recyclable • Non-Recyclable	6.6 93.4	42.8 57.2	7.0 93.0	43.4 56.6	8.2 91.8	44.2 45.8	9.5 90.5	45.2 54.8
2. Collection and Transportation	n							
Collection Cover Rate in Population (%) • Apart Area: • Ger Area:		100 42		100 90.7		100 100		100 100
Improper Disposal Rate in Generation Amount (%) • Apart Area: • Ger Area:	0 27.0	0 6.5	0 4.4	0 2.0	0 2.1	0 1.4	0 0	0
Separate Collection Rate in Population (%) • Apart Area: • Ger Area:	0	0 0	0 0	0 0	16.4 0	16.4 0	65 0	65 0
Amount of Separately Collected Waste (ton/day) • Apart Area: • Ger Area::	0 0	0 0	0 0	0	30.5 0	25.9 0	169.1 0	143.7 0

Phase	Bef	ore	Phase	-I: Actual	Phase II:	Revised Plan	Phase-III	: Revised Plan		
Components	20) winter	summer	∠) winter	summer	winter	summer	winter	summer		
Collection Frequency • Apart Area:	* Range from to once a r	everyday nonth	* Twice a we non-recyc week for r	eek for lable, once a recyclable	*Twice a v non-recycl week for r	veek for able once a ecyclable	*Twice a v non-recyc week for r	veek for lable once a ecyclable		
Ger Area:	* Once a mor average	ntn on	* Once a mo	onth.	* I wice a n	nonth	*Twice a month			
Collection System	Apart Area Point collect Bell collecti Dust chute Public conta Curb side c <u>Ger Area</u> Door to doo	tion on collection ainer coll. ollection or coll.	<u>Apart Area</u> Point (Entr Curb side <u>Ger Area</u> Door to do	rance) coll. collection por	Apart Area Point (Er Curb side <u>Ger Area</u> Door to c Public co	trance) Coll. e collection loor ntainer coll.	Apart Area Point (Er Curb side Ger Area Door to c Public co	a htrance) Coll. e collection door ontainer coll.		
Collection Vehicle (Unit) CT: Compactor truck DT: Dump truck SL: Skip loader truck	CT : DT: SL:	38 98 12	CT (15,8,6,4 DT (6 ton):	4m3): 61 96	*2 CT (15,8,6 DT (6,10tc AR:	6,4m3): 99 on): 100 19	*2 CT (15,8,6 DT (6,10m AR:	5,4m3): 99 13): 100 19		
AR: Arm roller Nos of Collection Worker	Total:	148 444		471		635		635		
Transportation System Executing Body	Direct haulac • 7 TUK • Khoroo (v	ge very few)	Direct haula MUB/CM 7 TUK EU,TUT Private (age IPUA ,DWSF	Direct hau • MUB/C • 7 TUK • SD,TU Private Co	lage MPUA T	Direct hau MUB/C 7 TUK SD,TU Private	lage MPUA T		
Unit Cost (MNT/ton)*3	13,5	514 in 2004	• Filvate (4,400-27,500		20,700-39,500	• Flivate	29,700-56,700		
3. Public Area Cleaning							I			
Method	Mainly manu	al labour	Mainly man	ual labour	Mainly ma	nual labour	Machinery	and manual		
Service Area (m²) Executing Body	Budget of dis	3,430,451 strict by TUK	Budget of d Service dor	4,273,645 istrict	Budget of Service do	5,145,677 district	Budget of Service do	6,003,289 district one by private		
Number of Cleaning Workers		382	contractor	296	contractor	474	contractor	520		
Unit Cost (MNT/m ²)*4		18		50		72		103		
4. Recycling and Intermediate	Treatment				-					
Sorting Yard Location Incoming Amount (ton/year) Recover Amount (ton/year)*5		None 0 0		None 0 0		NERC 3,076 2,493		NERC 18,164 13,796		
RPF Production Facility Location RDF Amount (ton/year)		None		None		NERC		NERC		
Unit Cost (MNT/ton)		0 None		0 None		474 56,611		3,594 84,778		
Recycling Amount at Generation Source (ton/day)	16.5	17.2	10.0	26.0	30.0	2/ 1	10.1	29.2		
Recycling Rate in Total	10.5	17.5	19.9	20.0	30.0	54.1	42.1	50.2		
Recycling System	3.0% No governm initiated recy mainly done sector	6.6% ent ycling but by private	2.0% No governi recycling b done by pri	5.1% nent initiated ut mainly vate sector	4.9% Governme recycling be establis	8.3% ent initiated system will shed.	8.5% Governme recycling expanded	10.0% ent initiated system will be		
5. Final Disposal Operation Method	Open dumpir	ng	NEDS: San (SLF) Level Other 2 site 2	iitary Landfill 4 s: SLF Level	NEDS: Sa (SLF) Leve Other 3 Level 2	initary Landfill el 4 sites: SLF	NEDS: Sa (SLF) Lev Other 3 si 2	anitary Landfill el 4 tes: SLF Level		
Location	UCDS MDDS NDS	KH21DS	NEDS MDDS NDS		NEDS MDDS NDS	TDDS	NEDS MDDS NDS	TDDS		
Distance from City Center (km)	UCDS: 1 MDDS: 2 NDS: 3 KH21DS: 6	3 3 8 0	NEDS: MDDS: NDS:	14 23 38	NEDS: MDDS: NDS: TDDS:	14 23 38 9	NEDS: MDDS: NDS: TDDS:	14 23 38 9		
Executing Body	UCDS: N MDDS: N NDS: N KH21DS: Kh	luuts luuts laD oroo 21	NEDS: MDDS: NDS:	CMPUA CMPUA NaD	NEDS: MDDS: NDS: TDDS:	CMPUA CMPUA NaD CMPUA	NEDS: MDDS: NDS: TDDS:	CMPUA CMPUA NaD CMPUA		
Disposal Amount (ton/day) *6	UCDS: 3 MDDS: NDS: KH21DS:	40 (485) 19 (26) 11 (16) 4 (6)	NEDS: MDDS: NDS:	767 (814) 76 (81) 23 (17)	NEDS: MDDS: NDS: TDDS:	566 (489) 67 (86) 26 (22) 444(383)	NEDS: MDDS: NDS: TDDS:	697 (583) 123 (104) 30 (29) 541 (457)		

Components	Before (2006)	Phase-I: Actual	Phase II: Revised Plan (2015)	Phase-III: Revised Plan (2020)
Components	winter summer	winter summer	winter summer	winter summer
Nos of Worker	UCDS: 9	NEDS: 31	NEDS: 25	NEDS: 35
	MDDS: 1	MDDS: 6	MDDS: 8	MDDS: 10
	NDS: None KH21DS: None	NDS: 1	NDS: 1 TDDS: 15	NDS: 1 TDDS: 20
Unit Cost (MNT/ton)*4	UCDS: 703 in 2004	NEDS: 2,080	NEDS: 2,500	NEDS: 3,000
	MDDS: NA	MDDS: 2,080	MDDS: 2,500	MDDS: 3,000
	NDS: NA KH21DS: NA	NDS: 970*7	TDDS: 2,500	TDDS: 3,000
Tipping Fee (MNT/ton)	UCDS: 100MNT/m ³	NEDS: 2,080	NEDS: 2,500	NEDS: 3,000
	MDDS: 100MNT/m ³	MDDS: 2,080	MDDS: 2,500	MDDS: 3,000 NDS: 2,080
	KH21DS: -	NDS: 970*7	TDDS: 2,500	TDDS: 3,000
Main Landfill Equipment	UCDS: Bulldozer 2,	NEDS: Bulldozer 3,	NEDS: Bulldozer 3,	NEDS: Bulldozer 3
	Dump truck 2	tank truck 1, Dump	tank truck 1, Dump	tank truck 1, Dump
	MDDS: None	truck 2	truck 2	truck 2
	NDS: None	NDDS: Buildozer 1	NDDS: Buildozer 1	NDDS: Buildozer 1
			TDDS: Wheel Shovel 1,	TDDS: Wheel Shovel 1,
			Excavatori, DT2	Excavator1, DT2
6. Repair and Maintenance	1	1	1	1
Preventive Maintenance and Small-scale Repair	By driver of TUK	By Central Workshop of CMPUA	By Central Workshop of CMPUA	By Central Workshop of
Large-scale Repair	By driver of TUK	By private workshop	By private workshop	By private workshop
Executing Body	ТИК	СМРИА	СМРИА	CMPUA
	-			
Number of technical staff	A few staff in each TUK	Director: 1	Director: 1	Director: 1
		Manager: 1 Engineer: 1	Manager: 1 Engineer: 2	Manager: 1 Engineer: 2
		Mechanic, etc.: 7	Mechanic, etc.: 10	Mechanic, etc.: 10
7 Financial Matters on SWM	waluding Dublic Area Cleaning	Store Keeper etc: 13	Store Keeper etc: 20	Store Keeper etc: 20
7 Financial Matters on SWIVE		M + M + M + M + M + M + M + M + M + M +		
Unit Cost (MNT/ton)				
Unit Cost (MNT/ton)	13,384	15,810	17,589	18,514
Unit Cost (MNT/ton) Revenue Source (million MNT)	13,384 * Collection service fee: 1.506	15,810 * Collection service fee: 3,941	* Collection service fee: 4.633	18,514 * Collection service fee: 5,583
Unit Cost (MNT/ton) Revenue Source (million MNT)	13,384 * Collection service fee: 1,506 * District budget: 0	15,810 * Collection service fee: 3.941 * District budget: 0	* Collection service fee: 4,633 * District budget: 0	18,514 * Collection service fee: 5.583 * District budget: 0
Unit Cost (MNT/ton) Revenue Source (million MNT)	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Timing for 18	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415	to belongs to 2004) 17,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393
Unit Cost (MNT/ton) Revenue Source (million MNT)	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7	17,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 * Tipping fee: 153*7 * RDF: 26	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176
Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403	17,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 * Tipping fee: 153*7 * RDF: 26 5,759	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305
Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8 Fee Collection Rate	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403	17,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 * Tipping fee: 153*7 * RDF: 26 5,759	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305
Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8 Fee Collection Rate • Household (Apart): • Household (Ger):	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553 86 %	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403 90 %	17,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 * Tipping fee: 153*7 * RDF: 26 5,759 97 %	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305 97 %
Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8 Fee Collection Rate • Household (Apart): • Household (Ger): • Business:	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553 86 % 12 % 14	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403 90 % 23 %	17,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 * Tipping fee: 153*7 * RDF: 26 5,759 5,759 97 % 60 % 100 % 100 %	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305 97 % 80 %
Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8 Fee Collection Rate • Household (Apart): • Household (Ger): • Business: Percentage of Collected Fore into Total Revenue	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553 86 % 12 % NA	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403 90 % 23 % NA	17,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 * Tipping fee: 153*7 * RDF: 26 5,759 97 % 60 % 100 %	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305 97 % 80 % 100%
Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8 Fee Collection Rate • Household (Apart): • Household (Ger): • Business: Percentage of Collected Fees in the Total Revenue Percentage of Intermediate	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553 86 % 12 % NA 97.0 %	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403 90 % 23 % NA 90%	17,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 * Tipping fee: 153*7 * RDF: 26 5,759 5,759 97 % 60 % 100 % 91%	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305 97 % 80 % 100% 92 %
Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8 Fee Collection Rate • Household (Apart): • Household (Ger): • Business: Percentage of Collected Fees in the Total Revenue Percentage of Intermediate Treatment Cost in the Total Revenue	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553 86 % 12 % NA 97.0 % 0 %	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403 90 % 23 % NA 90% 0 %	I7,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 * Tipping fee: 153*7 * RDF: 26 5,759 5,759 97 % 60 % 100 % 91% 0.5 % 9.5 %	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305 97 % 80 % 100% 92 % 2.4 %
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Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8 Fee Collection Rate • Household (Apart): • Household (Ger): • Business: Percentage of Collected Fees in the Total Revenue Percentage of Intermediate Treatment Cost in the Total Revenue Percentage of Final Disposal Cost in the Total Revenue Total Revenue per Capita (MNT/vear)	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553 86 % 12 % NA 97.0 % 0 % 3.0 % 1.742	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403 90 % 23 % NA 90% 0 % 9.4 %	17,589 * Collection service fce: 4,633 * District budget: 0 * MUB budget: 947 * Tipping fee: 153*7 * RDF: 26 5,759 5,759 97 % 60 % 100 % 91% 0.5 % 16.4 %	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305 97 % 80 % 100% 92 % 2.4 % 19.0 %
Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8 Fee Collection Rate • Household (Apart): • Household (Ger): • Business: Percentage of Collected Fees in the Total Revenue Percentage of Intermediate Treatment Cost in the Total Revenue Percentage of Final Disposal Cost in the Total Revenue Total Revenue per Capita (MNT/year) Budget of MUB (million MNT) *0	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553 86 % 12 % NA 97.0 % 0 % 3.0 % 1,743	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403 90 % 23 % NA 90% 0 % 9.4 % 4,003	I7,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 947 * Tipping fee: 153*7 * RDF: 26 5,759 5,759 97 % 60 % 100 % 91% 0.5 % 16.4 % 4,475 4,475	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305 97 % 80 % 100% 92 % 2.4 % 19.0 % 5,080
Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8 Fee Collection Rate • Household (Apart): • Household (Ger): • Business: Percentage of Collected Fees in the Total Revenue Percentage of Intermediate Treatment Cost in the Total Revenue Percentage of Final Disposal Cost in the Total Revenue Total Revenue per Capita (MNT/year) Budget of MUB (million MNT) *9 Percentage of SWM Budget	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553 86 % 12 % NA 97.0 % 0 % 3.0 % 1,743 13,100 0.21 % *6	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403 90 % 23 % NA 90% 0 % 9.4 % 4,003 81,630 5.4%	17,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 * Tipping fee: 153*7 * RDF: 26 5,759 5,759 97 % 60 % 100 % 91% 0.5 % 16.4 % 4,475 117,190 4.9% 4.9%	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305 97 % 80 % 100% 92 % 2.4 % 19.0 % 5,080 168,242 4,3%
Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8 Fee Collection Rate • Household (Apart): • Household (Ger): • Business: Percentage of Collected Fees in the Total Revenue Percentage of Intermediate Treatment Cost in the Total Revenue Percentage of Final Disposal Cost in the Total Revenue Total Revenue per Capita (MNT/year) Budget of MUB (million MNT) *9 Percentage of SWM Budget in the MUB Budget	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553 86 % 12 % NA 97.0 % 0 % 3.0 % 1,743 13,100 0.21 % *6	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403 90 % 23 % NA 90% 0 % 9.4 % 4,003 81,630 5.4%	17,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 * Tipping fee: 153*7 * RDF: 26 5,759 5,759 97 % 60 % 100 % 91% 0.5 % 16.4 % 4,475 117,190 4.9% 4.9%	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305 97 % 80 % 100% 92 % 2.4 % 19.0 % 5,080 168,242 4.3%
Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8 Fee Collection Rate • Household (Apart): • Household (Apart): • Business: Percentage of Collected Fees in the Total Revenue Percentage of Intermediate Treatment Cost in the Total Revenue Percentage of Final Disposal Cost in the Total Revenue Total Revenue per Capita (MNT/year) Budget of MUB (million MNT) *9 Percentage of SWM Budget in the MUB Budget	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553 86 % 12 % NA 97.0 % 0 % 3.0 % 1,743 13,100 0.21 % *6 t 0.21 % *6	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403 90 % 23 % NA 90% 0 % 9.4 % 4,003 81,630 5.4%	I7,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 947 * Tipping fee: 153*7 * RDF: 26 5,759 5,759 97 % 60 % 100 % 91% 0.5 % 16.4 % 4,475 117,190 4.9% 4.9%	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305 97 % 80 % 100% 92 % 2.4 % 19.0 % 5,080 168,242 4.3%
Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8 Fee Collection Rate • Household (Apart): • Household (Ger): • Business: Percentage of Collected Fees in the Total Revenue Percentage of Intermediate Treatment Cost in the Total Revenue Percentage of Final Disposal Cost in the Total Revenue Total Revenue per Capita (MNT/year) Budget of MUB (million MNT) *9 Percentage of SWM Budget in the MUB Budget 8. Medical Waste Managemen Generation Amount (ton/day)	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553 86 % 12 % NA 97.0 % 0 % 3.0 % 1,743 13,100 0.21 % *6 t General Waste: 15.2 Medical Waste: 15.2	I5,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403 90 % 23 % NA 90% 0 % 9.4 % 4,003 81,630 5.4% General Waste: 16.9 Medical Waste: 1.8	I7,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 947 * Tipping fee: 153*7 * RDF: 26 5,759 5,759 97 % 60 % 100 % 91% 0.5 % 16.4 % 4,475 117,190 4.9% 4.9%	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305 97 % 80 % 100% 92 % 2.4 % 19.0 % 5,080 168,242 4.3% General Waste: 20.8 Medical Waste: 2.2
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Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8 Fee Collection Rate • Household (Apart): • Household (Ger): • Business: Percentage of Collected Fees in the Total Revenue Percentage of Intermediate Treatment Cost in the Total Revenue Percentage of Final Disposal Cost in the Total Revenue Percentage of Final Disposal Cost in the Total Revenue Total Revenue per Capita (MNT/year) Budget of MUB (million MNT) *9 Percentage of SWM Budget in the MUB Budget 8. Medical Waste Managemen Generation Amount (ton/day) Treatment at generation	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553 1,553 86 % 12 % NA 97.0 % 0 % 0 % 3.0 % 1,743 13,100 0.21 % *6 t General Waste: 15.2 Medical Waste: 16 General Waste: Collection by TUK Medical Waste: Partly incinerated at Partly	15,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403 90 % 23 % NA 90 % 23 % NA 90% 0 % 23 % 94 4,003 81,630 5.4% General Waste: 16.9 General Waste: 16.9 Collection by a private company Medical Waste:	I7,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 * Tipping fee: 153*7 * RDF: 26 5,759 5,759 97 % 60 % 100 % 91% 0.5 % 16.4 % 4,475 117,190 4.9% 4.9% General Waste: 18.9 General Waste: 2.0 General Waste: 2.0	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305 97 % 80 % 100% 92 % 2.4 % 19.0 % 5,080 168,242 4.3% General Waste: 2.2 Collection by a private company Waste:
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Unit Cost (MNT/ton) Revenue Source (million MNT) Total Revenue (million MNT) *8 Fee Collection Rate • Household (Apart): • Household (Ger): • Business: Percentage of Collected Fees in the Total Revenue Percentage of Intermediate Treatment Cost in the Total Revenue Percentage of Final Disposal Cost in the Total Revenue Total Revenue per Capita (MNT/year) Budget of MUB (million MNT) *9 Percentage of SWM Budget in the MUB Budget 8. Medical Waste Managemen Generation Amount (ton/day) Treatment at generation	13,384 * Collection service fee: 1,506 * District budget: 0 * MUB budget: 28 * Tipping fee: 18 1,553 86 % 12 % NA 97.0 % 0 % 3.0 % 1,743 13,100 0.21 % *6 t General Waste: 15.2 General Waste: 16 General Waste: Partly Collection by TUK Medical Waste: Collection by TUK Medical Waste: Partly incinerated at generation sources Secondate	IS,810 * Collection service fee: 3.941 * District budget: 0 * MUB budget: 415 * Tipping fee: 47*7 4,403 90 % 23 % NA 90% 0 % 90% 0 % 90% 0 % 90% 0 % 90% 0 % 90% 0 % 91,4 % 4,003 81,630 5.4% General Waste: 1.8 General Waste: Collection by a private company Medical Waste: Treatment at generation sources or entrustment of treatment.	17,589 * Collection service fee: 4,633 * District budget: 0 * MUB budget: 947 * Tipping fee: 153*7 * RDF: 26 5,759 97 % 60 % 100 % 91% 0.5 % 16.4 % 4,475 117,190 4.9% General Waste: Collection by a private company Medical Waste: 2.0 General Waste: 18.9 Medical Waste: 2.0 General Waste: 18.9 Medical Waste: 18.9 Medical Waste: 100 % Treatment at generation or entrustment of treatment of treatment 1	18,514 * Collection service fee: 5.583 * District budget: 0 * MUB budget: 1,393 * Tipping fee: 153*7 * RDF: 176 7,305 97 % 80 % 100% 92 % 2.4 % 19.0 % 5,080 168,242 4.3%

Phase	Before	Phase-I: Actual	Phase II: Revised Plan	Phase-III: Revised Plan
Components	winter summer	winter summer	winter summer	winter summer
Final Disposal Executing Body of Final Disposal Site	General Waste: Open dumping <u>Medical Waste</u> : Untreated waste at generation is burnt at disposal site Nuuts	General Waste: Sanitary landfill Medical Waste: Untreated waste is prohibited to dispose of at landfill sites CMPUA	General Waste: Sanitary landfill <u>Medical Waste</u> : Untreated waste is prohibited to dispose of at landfill sites. CMPUA	General Waste: Sanitary landfill Medical Waste: Untreated waste is prohibited to dispose of at landfill sites. CMPUA
9. Industrial Waste		•		
Generation Amount (ton/day)	<u>Non-HIW</u> : 67.8 <u>HIW</u> : 0.1 *10	<u>Non-HIW</u> : 83.9 <u>HIW</u> :: 0.1 *10	<u>Non-HIW</u> : 109.6 <u>HIW</u> : 0.1 *7	<u>Non-HIW</u> : 143.4 <u>HIW</u> : 0.1 *7
Treatment and Final Disposal	<u>Non-HIW</u> : Final disposal at municipal landfills <u>HIW:</u> Unknown	Non-HIW: Final disposal at municipal landfills HIW: Storage at generation sources until a Storage at generation and disposal fill and Gradient and and disposal facility is	Non-HIW: Final disposal at municipal landfills <u>HIW:</u> Treatment and disposal at the HW treatment and disposal facility	Non-HIW: Final disposal at municipal landfills <u>HIW:</u> Treatment and disposal at the HW treatment and disposal facility
Executing Body	<u>Non-HIW:</u> Nuuts <u>HIW:</u> Unknown	Non-HIW: CMPUA HIW: Discharger until a HW treatment and disposal facility is constructed.	Non-HIW: CMPUA HIW: Operator of HW treatment and disposal facility (private company)	Non-HIW: CMPUA HIW: Operator of HW treatment and disposal facility (private company)
10. Construction Waste				
Generation Amount (ton/day) Final Disposal	60.6 1 123.0 Most of the illegally dumped waste (80% according to the estimate by the Team) was construction waste and was not disposed of properly at the municipal landfill sites.	75.0 1 152.2 Control system for construction waste will be established by enforcing submission of waste management plans on construction companies together with their applications for permission of construction works and monitoring the actual amounts of construction waste transported by the companies to the municipal landfill sites. The results of the monitoring will be compared to the amounts planned in their submitted documents.	98.0 1 198.9 Control system for construction waste will be established by enforcing submission of waste management plans on construction companies together with their applications for permission of construction works and monitoring the actual amounts of construction waste transported by the companies to the municipal landfill sites. The results of the monitoring will be compared to the amounts planned in their submitted documents.	128.0 260.0 Strengthening enforcement of laws and regulations against illegal dumping.

(Note)

*1: Waste generated by businesses and public area cleansing activities is included in the generation amount of apartment area.

*2: The collection vehicles procured by the MUB and the MONET in 2012 and those provided under the Japanese Grant Aid in 2009 was assumed to operate during this period.

*3: The unit cost in 2010 was estimated based on the Guideline for Calculation of Appropriate Waste Collection Fees.

- *4: The unit cost in 2015 and 2020 were assumed to increase in accordance with the GDP growth rate (7.5%).
- *5: The amount of valuables included cardboards.
- *6: The figures outside the () belongs to the winter and those inside the () are for the summer. It was assumed that the amounts of waste to be transported to NEDS, MDDS and TDDS would be 51%, 9% and 40% respectively.
 *7. The write set of UCDS in 2006 may applied.
- *7: The unit cost of UCDS in 2006 was applied.

*8: As the budget from the Districts includes costs not only for public area cleaning, but also those for sludge collection, city decoration, etc., it is difficult to identify the budget for public area cleansing. Therefore, the budget from the Districts was not considered.

*9: The figures in 2015 and 2020 were calculated based on the assumption that the 2010 budget would increase annually in accordance with GDP growth rate (7.5%).

- *10: This figure should be re-examined.
- *11: Unit cost in the table did not include depreciation cost of facilities and equipment.

1.8 Forecasted Future Waste Flow (with Promotion of 3Rs)

The future waste flows for the years 2015 and 2020 expected under the conditions of the above M/P, in which public sector operates recycling facilities constructed at NEDS, were forecasted.

The preconditions such as the introduction period and scope of separate collection related to the forecast were presented in "1.9 Implementation Plan of the M/P".



Figure 1.5: Waste Flow in Winter Season in 2015



Figure 1.6: Waste Flow in Summer Season in 2015



Figure 1.7: Waste Flow in Winter Season in 2020



Figure 1.8: Waste Flow in Summer Season in 2020

1.9 Implementation Plan of the M/P

Schedule for implementation of the major projects planned in the revised M/P is as follows:

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Development Stu	dy															
Basic Design Sur	vey															
Technical Coope	ration Project															
	Design															
	Construction of facility				נ											
NEDS	Procurement of equipment															
	Operation			I												
	Design															
TDDS	Construction of facility															
TDDS -	Procurement of equipment															
	Operation															
Expansion of	Planning and design															
collection	Procurement of collection ve	hicles														
service	Implementation of collection															
Procurement of collection vehicles by the MUB	Procurement of collection vehicles															
	Design															
Sorting facility of	Construction of sorting yard															
Sorting facility of NERC, R RDF plant Ir	RDF plant															
	Introduction of separate colle	ection														
	Production of RPF															

Table 1.16: Implementation Plan and Progress of M/P

1.10 Financial Analysis of the M/P

The financial analysis of the M/P covered the operation of the sorting facility of NERC and the RPF plant.

1.10.1 Financial Analysis of the Sorting Facility and the RPF Plant

The MUB constructed a sorting facility and RPF plant³ in 2011 by the assistance of the Government of Korea. The preconditions set for the financial analysis of this facility are the following:

- 1. A test-run of the sorting facility and the RPF plant will be completed in 2012 and the actual operation of the facilities will commence in 2013.
- 2. The waste to be treated at these facilities will be separated at generation sources in apartment areas and transported by separate collection.

³ The total amount of the assistance is 3 million US\$.

- 3. The treatment and production capacities of the facilities are based on Construction of Municipal Solid Waste Recycling Facility for Ulaanbaatar City4 dated on 12 April 2011.
- 4. The nominal capacities: The sorting facility-10 ton/hr; RPF plant-1 ton/hr
- 5. Daily operation hour-5 hrs/day; operation days-300 days/year
- 6. The amount of valuables and their market prices to be sorted at the sorting facility were considered to be the same with those identified during the Pilot Project on Waste Sorting conducted under the JICA's technical cooperation project in 2011.
- 7. The scope of the separate collection areas and the degree of residents' cooperation will be increased to a level that the RPF plant operates at its full capacity from 2013 through 2016.
- 8. The scope of the separate collection areas and the degree of residents' cooperation will be increased to a level that the sorting facility operates at its full capacity from 2017 through 2020.

In 2016, the production capacity of the RPF plant will be increased by installing additional equipment.

1.10.2 The Amount of Separated Waste to Be Delivered to the Sorting Facility and the RPF Plant

The initial target population of the separate collection was planned to be 6,000 people with reference to the PP conducted in 2011 and it will be increased gradually from 2013 through 2020. At the same time, the degree of residents' cooperation on waste separation was planned to be improved gradually until 2016 from the 12% - the degree of cooperation identified during the PP in 2011 - and reach 80% by 2020. Based on the above conditions, the amounts of valuables, RPFs production and the residues to be generated at the sorting facility and RPF plant from 2013 to 2020 were estimated and shown in the table below:

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Apartment population	436,021	448,151	460,619	473,434	486,605	500,142	514,057	528,358	543,057	558,165
Target population of Separate Collection (SC)	6,000		20,000	40,000	80,000	160,000	207,165	256,782	308,999	362,807
Share of target population (%)			4.3%	8.4%	16.4%	32.0%	40.3%	48.6%	56.9%	65.0%
Expected amount of SC (ton/day)	0.86		2.87	5.75	11.49	22.98	29.75	36.88	44.38	52.11
Degree of cooperation (%)	12%		24%	36%	48%	60%	65.0%	70.0%	75.0%	80%
Amount of waste to be delivered to the sorting facility	0.10		0.69	2.07	5.52	13.79	19.34	25.82	33.29	41.69
Amount of RPFs (ton/day)	0.03		0.20	0.59	1.58	3.96	5.56	7.42	9.56	11.98
Amount of valuables (ton/day)	0.05		0.34	1.03	2.74	6.85	9.60	12.82	16.52	20.70
Residue (ton/day)	0.02		0.15	0.45	1.19	2.98	4.18	5.58	7.20	9.01

Table 1.17: Amounts of Valuables and RPF Production

⁴ The FS report submitted by Hyosung Ebara Engineering Co., Ltd, the contractor of the KOICA project.

The operation costs of the sorting facility and RPF plant were estimated based on the amount of separate collection shown in the table above.

1.10.3 The Operation Cost of the Sorting Facility and RPF Plant

The preconditions set for estimation of the operation costs are the following:

- 1. The costs of electricity, fuel and water to be used in the facility are those reported in the F/S by KOICA and assumed to be in proportion to the RPF production amount.
- 2. Similarly, the labor cost was assumed to be in proportion to the RPF production amount and set on daily-basis.
- 3. The heavy equipment was assumed to be the same with those provided under the Grant Aid and depreciation cost was not considered.

		Amount (1000Tg/Year)							
		2013	2014	2015	2016	2017	2018	2019	2020
А	Variable Cost								
1	Electricity	4,500	9,001	22,502	54,004	76,505	101,257	130,509	162,012
2	Fuel	2,040	4,080	10,200	24,480	34,680	45,900	59,160	73,440
3	Water	9	18	44	106	150	199	256	318
	Sub total	6,549	13,098	32,746	78,590	111,336	147,356	189,926	235,770
В	Labour Cost								
1	Labor cost	5,000	10,000	25,000	60,000	85,000	112,500	145,000	180,000
2	Other Expense	250	500	1,250	3,000	4,250	5,625	7,250	9,000
	Sub total	5,250	10,500	26,250	63,000	89,250	118,125	152,250	189,000
	Total	11,799	23,598	58,996	141,590	200,586	265,481	342,176	424,770
С	Maintenance Cost	1,180	2,360	5,900	14,159	20,059	26,548	34,218	42,477
D	Residue Transportation	225	675	1,785	4,470	6,270	8,370	10,800	13,515
	Grand Total	13,205	26,634	66.681	160,219	226,915	300,400	387,194	480,762

Table 1.18: The Estimated Operation Costs of the Sorting Facility and RPF Plant

1.10.4 Sales Revenues of Valuables and RPFs

The following preconditions were set in relation to the estimation of the sales revenues:

- 1. The amounts of valuables to be sorted at the facility were based on the results of the PP on waste sorting conducted in 2011 under the JICA project.
- 2. The purchase prices of valuables were considered constant and as same as those as of summer in 2011 and assumed they would not change until 2020.
- 3. The selling price of RPF was assumed to be 20,000 Tg/ton the average procurement price of coal by the power plants in UBC in 2011.

	Mahaablaa		Amount (1000Tg/Year)								
	valuables	2013	2014	2015	2016	2017	2018	2019	2020		
А	1. Pet-bottle	233	705	1,874	4,685	6,566	8,769	11,300	14,159		
	2. Colored plastic conteil	275	834	2,219	5,549	7,776	10,384	13,381	16,767		
	3. Glass Bottle	62	188	501	1,251	1,754	2,342	3,018	3,782		
	4. Iron	31	93	247	617	864	1,154	1,487	1,863		
	5. Paper	1,395	4,227	11,245	28,112	39,398	52,613	67,798	84,953		
	6. Bone	0	0	0	0	0	0	0	0		
	7. Plastic Bag	102	309	822	2,055	2,880	3,846	4,956	6,210		
	8. Metal	386	1,168	3,107	7,768	10,886	14,538	18,734	23,474		
	9. Cardboard	1,340	4,061	10,802	27,005	37,846	50,540	65,127	81,606		
	Sub total	3,824	11,584	30,817	77,042	107,971	144,187	185,800	232,813		
В	RPF	1,200	3,540	9,480	23,760	33,360	44,520	57,360	71,880		
	Total Income	5,024	15,124	40,297	100,802	141,331	188,707	243,160	304,693		

Table	1 19	Estimated	Sales	Revenues	of '	Valuables	and	RPF
rabic	1.10.	Lounated	Oales	I C V C H U C S	UI.	valuables	anu	1 1 1

1.10.5 Necessary Budget

According to the above estimations, UBC needs to secure the budget estimated in the table below to operate the sorting and RPF production facility.

Table 1.20: Necessary Budget for Operation of the Sorting and PRF Production Facility

		Amount (1000 Tg/Year)						
	2013	2014	2015	2016	2017	2018	2019	2020
Necessary budget for UBC	8,181	11,510	26,384	59,417	85,584	111,693	144,034	176,069

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2 Operation and Maintenance manual of Equipments

2.1 Daily Inspection of Collection Vehicles

2.1.1 Driver's Note



Driver's Note

AMA	
	(CM
AND THE REAL	
A CHARLON	

City Maintenance Public Utilities Agency PUA)



Japan International Cooperation Agency (JICA)

DRIVER'S NOTE

Proper care and operation will not only extend the service life of our vehicle, but also improve oil and fuel economy.

1. DRIVING PRECAUTIONS FOR ALL VEHICLES

- 1. Avoid over-running the engine. When descending a slope pay close attention to prevent the engine from over-running, particularly when making a downshift as the engine becomes liable to over-run.
- 2. Do not keep the steering wheel in a fully turned position for a long period of time. This can heat the oil in the power steering oil pump, causing in poor lubrication, damage to the oil tank and hose, and deterioration of the seal. This can result in damage to the power steering hose and other components, and the steering wheel could suddenly become heavy or accidents such as fire could occur.



- 3. If abnormal noise or smell becomes noticeable while driving, stop the engine and check to locate the cause of the trouble.
- 4. If the indicator lights or instruments give an indication of abnormal condition while driving, stop the engine and check to locate the cause of the trouble.
- 5. The vehicle should be completely stopped before shifting from forward gear to reverse or from reverse to forward.
- 6. When descending a slope, shift to lower gear to gain retardation effect of the engine. The exhaust brake system is designed to increase the effectiveness of engine braking. Use the exhaust brake system as an auxiliary brake when the vehicle is running down on a slope or at a high speed. Do not travel in neutral because this will reduce the braking force and increase fuel consumption, and also shorten the life of the brakes, transmission, and other parts.



2. DRIVING FOR ECONOMY FOR ALL VEHICLES Observe the following precautions to achieve maximum fuel economy and to extend tire life. 1. Continue warning up the engine only to the point at which the water temperature gauge needle begins to move. 2. Avoid racing the engine as doing so not only wastes fuel but also harms the engine. 3. Avoid sudden starts, sudden acceleration, and sudden braking. 4. When accelerating, do not wind the engine our before changing gears; instead, change gears before engine speed reaches a high RPM. 5. Always drive with the coolant temperature kept within normal range. 6. Always keep the air pressure in tires correctly adjusted. 7. Do not drive with POT switch ON position. 8. Do not drive with Exhaust brake position ON, when it is not necessary. 9. Do not drive with Differential lock switch position ON, when it is not necessary. (MITSUBISHI ONLY) 10. Try to drive at moderate and constant speeds. Unnecessary acceleration and deceleration causes fuel waste.

- 11. Try to load cargo in a way that minimizes wind resistance.
- 12. Be sure to perform daily inspection and periodic inspections and service.

3. Cold starting The ambient temperature is below 0°C

ISUZU

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

NOTE

Operation of glow plug circuit must be discontinued when the control resistor becomes red hot. Standard preheating time is 15 or 20 seconds.

2. Start the engine by turning the key to the "START" position with the clutch and accelerator pedals depressed fully.

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. Also, fire may occur due to over heating. Repeat the steps 1 and above after 20 to 30 seconds break.





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.
- 5. Depress both the clutch and accelerator pedals. At this time, pump the accelerator pedal several times.
- 6. Turn the starter key to the S position to start the engine. After the engine has been started, continue to warm it up until the water temperature gauge needle start to move.

CAUTION

- 1. Once the engine has been warmed up, be sure to turn off the cold start switch before driving the vehicle.
- 2. The engine preheating system consumes a large amount of electricity. If it is used repeatedly at short intervals, the battery can be completely discharged.


- If you keep pressed the air heater switch for over 60 seconds but the air heater indicator does not become red or the engine is difficult to start even after you have confirmed that the indicator is glowing red, the fuse in the engine preheating circuit is probably blown.
- 2. Check relay fuse on the heater relay

WARNING

- 1. Use MITSUBISHI genuine fuses of the specified amperage. A fire could result if a fuse of incorrect amperage is used.
- 2. An electrical potential is always present at one of the heater relay terminals. For safety, be sure to disconnect the battery (-) terminal before replacing the heater relay fuse.





4. AVOID PREMATURE WEAR CLUTCH DISK FOR ALL VEHICLES

1. Do not drive with your foot resting on the clutch pedal as it produces a partly disengaged condition, causing premature wear of clutch facing.



- 2. When climbing a slope, shift to lower gear to relieve the engine from overload before it begins td strain.
- 3. When the vehicle is stacking in the mud place, Do not race the tire.

5. OTHER PRECAUTIONS DIVICES FOR ALL VEHICLES

Differential Lock

Differential lock button

The differential lock button is used to eliminate speed differences between the two rear axles. It is useful on muddy, snowy, frozen, and other slippery surfaces where the driving wheels could lose traction.

- 1. Before driving on a potentially slippery surface, stop the vehicle and push the button to turn ON the differential lock function. Then, proceed at low speed. If the differential lock function is left OFF and the driving wheels slip, stop the vehicle and push the button.
- 2. Once the vehicle is free of the slippery area, push the button to turn OFF the differential lock function.
- 3. The indicator lamp illuminates in the meter cluster when the differential lock function is turned ON.



CAUTION

In the event that the driving wheels start to slip the vehicle will become un-drivable. If this happens, immediately stop the vehicle and turn On the differential lock function. Do not allow the wheels to spin for a long time since the differential could burn out.

Keep the differential lock function switched OFF during normal vehicle operation. If it is left switched ON, the tires may wear prematurely.

Hydraulic oil heater

- 1. Do not use when the ambient temperature is below 0°C
- 2. Do not forget turn off the switch when the ambient temperature has become warm.





MITSUBISHI

2.1.2 Daily Inspection of ISUZU Trucks

a. Check List for Daily Inspection

Place	Check item	No.	Contents	Check
Front	Front	1	Condition of lighting device	
		2	Condition of number plate, wiper and side	
		3	Level of clutch oil and wind washer	
	Bottom	4	Engine oil leakage	
.eft .eft .eft .eft .eft .eft		5	Brake oil leakage	
		6	Radiator water leakage	
		7	Power steering oil leakage	
		8	Hydraulic oil leakage	
		9	Diesel leakage	
Left	Left	10	Condition of front left tire	
		11	Condition of front left leaf spring	
		12	Level of hydraulic oil	
		13	Condition of air cleaner indicator	
		14	Condition of fuel sedimenter	
		15	Transmission oil leakage	
		16	Condition of compactor hydraulic cylinder	
		17	Condition of rear left tire	
		18	Condition of rear left leaf spring	
Back	Back	19	Condition of lighting divice	
		20	Condition of number plate	
	Bottom	21	Differential oil leakage	
Right	Right	22	Condition of compactor hydraulic cylinder	
		23	Condition of rear right tire	
		24	Condition of rear right leaf spring	
		25	Battery condition	
		26	Level and leakage of brake oil	
		27	Draining air tanks	
		28	Level of engine oil	
		29	Level of coolant water	
		30	Clutch release cylinder leakage	
		31	Condition of front right tire	
		32	Condition of front right leaf spring	
Inside	Driving space	33	Condition of driving space	
Front	Front and above the cab	34	Sufficient place	
Left	After lifting the cabin	35	Condition of lever lock pin	
	Inside of engine room	36	Coolant water leakage	
		37	Oil leakage (Engine oil, Power steering oil)	
		38	Condition of fan belt	
		39	Level of power steering oil	
	After lowering the cabin	40	Condition of lever lock pin	
General	Condition	41	General condition of vehicle	

ISUZU Driver's check list for daily inspection



b. Manual for Implementation of Daily Inspection







c. Lubrication Chart

Every 4,000 km (2,500 miles) or every month



- Steering shaft universal joint and sliding sleeve
- ② Drag link
- (Except maintenance free type)
- (3) Front spring pin
- (4) Kingpin
- (5) Propeller shaft center bearing
- 6 Front shackle pin
- ⑦ Propeller shaft universal joint

- (8) Propeller shaft sliding yoke
- (9) Rear spring pin
- 10 6H Water pump
- 1) Clutch shift block
- (2) Rear shackle pin or
 - Rear spring sliding pad

LUBRICATION CHART (FRR/FSR/FTR/FVR/GVR/MV models)



O CHECK or SUPPLY (E) ENGINE OIL G ... GEAR OIL

- (B).... BRAKE FLUID
 - (A) AUTOMATIC TRANSMISSION FLUID
- (M MULTIPURPOSE TYPE GREASE (C) ... CAB TILT PUMP OIL
- . MULTIPURPOSE TYPE or WHEEL BEARING GREASE



* Items with an asterisk, check oil and fluid level daily.

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2.1.3 Daily Inspection of MITSUBISHI Trucks

a. Check List for Daily Inspection

Place	Check item	No.	Contents	Check
Front	Front	1	Condition of lighting device	
		2	Condition of number plate, wiper and side	
		3	Level of clutch oil and coolant water	
		4	Level of wind washer	
	Bottom	5	Engine oil leakage	
		6	Brake oil leakage	
		7	Radiator water leakage	
		8	Power steering oil leakage	
		9	Hydraulic oil leakage	
		10	Diesel leakage	
Left	Left	11	Condition of front left tire	
		12	Condition of front left leaf spring	
		13	Level of hydraulic oil	
		14	Condition of fuel sedimenter	
		15	Transmission oil leakage	
		16	Condition of compactor hydraulic cylinder	
		17	Condition of rear left tire	
		18	Condition of rear left leaf spring	
Back	Back	19	Condition of lighting divice	
		20	Condition of number plate	
	Bottom	21	Differential oil leakage	
Right	Right	22	Condition of compactor hydraulic cylinder	
		23	Condition of rear right tire	
		24	Condition of rear right leaf spring	
		25	Level and leakage of brake oil	
		26	Draining air tanks	
		27	Battery condition	
		28	Level of engine oil	
		29	Clutch release cylinder leakage	
		30	Condition of front right tire	
		31	Condition of front right leaf spring	
Inside	Driving space	32	Condition of driving space	
Front	Front and above the cab	33	Sufficient place	
Right	After lifting the cabin	34	Condition of lever lock pin	
	Inside of engine room	35	Coolant water leakage	
		36	Oil leakage (Engine oil, Power steering oil)	
		37	Condition of fan belt	
		38	Level of power steering oil	
	After lowering the cabin	39	Condition of lever lock pin	
General	Condition	40	General condition of vehicle	

Left (1)	11. Condition of front left tire 12. Condition of front left leaf spring	Left (2)	13. Level of hydraulic oil	Left (3)	14. Condition of fuel sedimenter	Left (4)	15. Condition of fuel sedimenter
	Front (1) 1. Condition of lighting device 2. Condition of number plate, wiper and side mirror	T+ (0)	Front (2) 3. Level of clutch oil and coolant water	Front (3)	4. Level of wind washer	Front-Bottom	 Engine oil leakage Brake oil leakage Radiator water leakage Power steering oil leakage Hydraulic oil leakage Hydraulic oil leakage 10. Diesel leakage

b. Manual for Implementation of Daily Inspection







c. Lubrication Chart





- ① Transmission control upper cross shaft
- ② Transmission control front shaft
- ③ Transmission control rear vertical shaft
- ④ Front spring front ends (left and right)
- ⑤ Front spring rear ends (left and right)
- @ Rear spring front ends (left and right) <vehicles without air suspension>
- ⑦ Rear spring rear ends (left and right) <vehicles without air suspension>
- ③ Steering shaft
- (9) Front axle kingpins (left and right)
- Propeller shaft universal joint
- D Propeller shaft slip joint
- 12 Propeller shaft center bearing
- Irunnion plain bearings (left and right) <FV and FS>
- * Clutch fork shafts (left and right)
- * Clutch shifter
- Front slack adjusters and brake cam shafts (left and right) <Full air brake vehicles (except wedge-type wheel brake vehicles)>
- ⑦ Rear slack adjusters and brake cam shafts (left and right) <Full air brake vehicles (except wedge-type wheel brake vehicles)>
- Steering linkage (front of connecting rod) <FS>
- ③ Steering linkage (rear of connecting rod) <FS>
- Transmission control universal joint, rear shaft <vehicles with Fuller transmission>

The points marked * should be greased every 25,000 km (15,000 miles).

2.2 Period Inspection for Collection Vehicles

2.2.1 Check list for Periodic Inspection

Periodic service inspection sheet

Res.No	Dri	ver name	Mechanic name	k	Kmin		Date in	Date out				
✔ OK	Х	Change	T Tighten	(С	Clean up]					
A Adjust		Repair	Over haul		L Lubricant							
Driving room				L	Engine mounting bolt (tightening)							
Engine general (star	t, running sound,	smoking)		Clutch release cylinder (leakage, working condition)							
Steering (play, v	vork	ing condition)		Ļ		Transmission (ar	nount, leakage)					
Brake pedal (pla	ıy, w	orking condition))	L		Transmission mo	ounting (tightening)					
Accelerator (pla	ıy, w	orking condition))	L		Parking brake (v	vorking condition, dan	nage, wear-out)				
Parking brake (olay,	working condition	n)		_	Propeller shaft (tightening, damage)					
Clutch pedal (pla	ay, w	vorking condition)	L		Universal joint (t	ightening, damage)					
Lightening (wor	king	condition)				Fuel tank (leakag	ge, damage)					
Wiper (working	con	dition)		L		Fuel sedimenter	(water level, leakage	(damage)				
Engine room				L		Exhaust pipe (da	mage, working condi	tion)				
Engine oil (amou	unt, l	eakage)		L		Exhaust Brake (damage, working con	dition)				
Radiator (leakag	ge)					Exhaust muffler	(damage, working co	ndition)				
Fan belt (damag	e, lo	osening)		L		Differential (amo	ount, leakage)					
Fan (damage, lo	osen	ing)			Leaf spring rear (bend, damage, tightening)							
Fuel filter Eleme	ent (leakage)		Shock absorber rear (leakage, damage)								
Feed pump (leal	kage	, working condition	on)	Rear Brake hose, pipe (leakage, damage)								
Oil filter Elemen	ıt (le	akage)		Brake lining rear (leakage, damage, wear-out)								
Air cleaner Eler	nent	(blocking)		Frame, body (tightening, damage)								
Pit				Each bolt (tightening)								
Steering gear bo	ox bo	lt (tightening, da	mage)	H	ły	draulic						
Each Ball joint d	lust l	poots (leakage, da	image)	L		Hydraulic oil (an	nount, leakage)					
Steering rod (tig	hten	ing, damage)		Hydraulic pump, cylinder(leakage,working condition)								
Leaf spring from	t (be	end, damage, tight	ening)	Outside								
Shock absorber	fron	t (leakage, dama	ge)	L		Brake oil (amou	nt, leakage)					
Front Brake hos	e, pi	pe (leakage, dam	nage)	Brake air tank, piping (leakage, working condition)								
Brake lining fro	nt (leakage, damage,	wear-out)	L		Brake air tank D	Prain (leakage, workin	g condition)				
Radiator and co	olant	(leakage)		L		Power steering ((amount, leakage)					
Fan belt (damag	e, lo	osening)		L		Battery (amount	, looseing)					
Fan (damage, lo	osen	ing)				Wheel alignment	t (damage, working co	ondition)				
Engine oil (leaka	(ge					Front wheel bear	ring (play, working co	ndition)				
Fuel (leakage)						Rear wheel bear	ring (play, working co	ndition)				
Injector pump (l	eaka	.ge)				Tire (depth of di	tch, damage)					
Generator (dam	age,	working condition	ı)			Wheel nut bolt (damage, loosening)					
Starter (damage	, wo	rkingcondition)		C		Bumper, Mirror	(tightening, damage)					
Contents and Span	e pa	arts		Frame, body (tightening, damage)								
<u> </u>												

Date

Signature of responsible person

2.2.2 Inspection and Replacement Schedule

a. ISUZU (by utilization period)

Period or mileage	Conduct	Inspection items	Conducted person
Every day bofore driving	Check	Follow the check sheet	Driver
Every 1 week	Drain	Condensate from water separator	Driver
Every 6 months	Check	Coolanat	Mechanic
(Every April)		Clutch fluid	Mechanic
		Transmission gear oil	Mechanic
		Gear oil of power take off	Mechanic
		Differential gear oil	Mechanic
		Power steering fluid	Mechanic
		Brake fluid	Mechanic
	Grease	Every grease fitting	Mechanic
		Door hinges	Mechanic
		Parking brake cam lever	Mechanic
	Change	Engine oil	Mechanic
		Engine oil filter element	Mechanic
	Clean	Air cleaner element	Mechanic
Every 12 months	Change	Transmission gear oil	Mechanic
(Every October)		Gear oil of power take off	Mechanic
		Differential gear oil	Mechanic
		Wheel hub bearing grease	Mechanic
	Change	Clutch fluid	Mechanic
		Brake fluid	Mechanic
Every 24 months	Change	Power steering fluid	Mechanic
	Change	Coolant (Long life coolant)	Mechanic
	Replace	Fuel filter element	Mechanic
		Air cleaner element	Mechanic

Inspection / Replacement schedule for Isuzu truck

b. ISUZU (by mileage)

Period or mileage	Conduct	Inspection items	Conducted person
Every day bofore driving	Check	Follow the check sheet	Driver
Every 1 week	Drain	Condensate from water separator	Driver
4,000 km	Check	Coolanat	Driver
		Clutch fluid	Driver
		Transmission gear oil	Driver
		Gear oil of power take off	Driver
		Differential gear oil	Driver
		Power steering fluid	Driver
		Brake fluid	Driver
	Grease	Every grease fitting	Driver
		Door hinges	Driver
		Parking brake cam lever	Driver
8,000 km	Change	Engine oil	Mechanic
		Engine oil filter element	Mechanic
12,000 km	Clean	Air cleaner element	Driver
48,000 km	Replace	Fuel filter element	Mechanic
		Air cleaner element	Mechanic
	Change	Transmission gear oil	Mechanic
		Gear oil of power take off	Mechanic
		Differential gear oil	Mechanic
		Wheel hub bearing grease	Mechanic
	Change	Power steering fluid	Mechanic
	Change	Clutch fluid	Mechanic
		Brake fluid	Mechanic
	Change	Coolanat	Mechanic

Inspection / Replacement schedule for Isuzu truck

c. MITSUBISHI (by utilization period)

Period or mileage	Conduct	Inspection items	Conducted person
Every day before driving	Check	Follow the check sheet	Driver
Every 1 week	Drain	Condensate from water separator	Driver
Every 6 months	Check	Coolant	Mechanic
(Every April)		Clutch fluid	Mechanic
		Transmission gear oil	Mechanic
		Gear oil of power take off	Mechanic
		Differential gear oil	Mechanic
		Power steering fluid	Mechanic
		Brake fluid	Mechanic
	Grease	Every grease fitting	Mechanic
		Door hinges	Mechanic
		Parking brake cam lever	Mechanic
	Clean	Air cleaner element	Mechanic
	Change	Engine oil	Mechanic
		Engine oil filter element	Mechanic
Every 12 months	Clean	Fuel feed pump gauze filter	Mechanic
(Every October)	Grease	Clutch fork shaft	Mechanic
		Clutch shaft	Mechanic
		Cab mount side cushion	Mechanic
	Change	Transmission gear oil	Mechanic
		Gear oil of power take off	Mechanic
		Differential gear oil	Mechanic
		Wheel hub bearing grease	Mechanic
	Change	Clutch fluid	Mechanic
		Brake fluid	Mechanic
Every 24 months	Change	Power steering fluid	Mechanic
	Change	Coolant (Long life coolant)	Mechanic
	Replace	Fuel filter element	Mechanic
		Air cleaner element	Mechanic

Inspection / Replacement schedule for Mitsubishi truck

d. MITSUBISHI (by mileage)

Period or mileage	Conduct	Inspection items	Conducted person
Every day bofore driving	Check	Follow the check sheet	Driver
Every 1 week	Drain	Condensate from water separator	Driver
5,000 km	Check	Coolanat	Driver
		Clutch fluid	Driver
		Transmission gear oil	Driver
		Gear oil of power take off	Driver
		Differential gear oil	Driver
		Power steering fluid	Driver
		Brake fluid	Driver
	Grease	Every grease fitting	Driver
		Door hinges	Driver
		Parking brake cam lever	Driver
Every 6 months	Change	Coolanat	Mechanic
10,000 km	Clean	Air cleaner element	Driver
12,000 km	Change	Engine oil	Mechanic
		Engine oil filter element	Mechanic
15,000 km	Clean	Fuel feed pump gauze filter	Mechanic
25,000 km	Grease	Clutch fork shaft	Driver
		Clutch shaft	Driver
		Cab mount side cushion	Driver
50,000 km	Replace	Fuel filter element	Mechanic
		Air cleaner element	Mechanic
	Change	Transmission gear oil	Mechanic
		Gear oil of power take off	Mechanic
		Differential gear oil	Mechanic
		Wheel hub bearing grease	Mechanic
100,000 km	Change	Power steering fluid	Mechanic
Every 12 months	Change	Clutch fluid	Mechanic
		Brake fluid	Mechanic

Inspection / Replacement schedule for Mitsubishi truck

2.2.3 Schedule of Periodic Inspection and Necessary Budget

Payment	No. of trucks	Monthly accumulated money									
200,000	29	5,800,000									
Date	Accumulate d money	Expenditure	Table	Balance	Engine oil	Engine oil, filter	Fuel filter	Air filter	Gear oil	LLC, Brake, Hydraulic	Power ST
12/2010	5,800,000			5,800,000							
1/2011	5,800,000			11,600,000							
2/2011	5,800,000			17,400,000							
3/2011	5,800,000			23,200,000							
4/2011	5,800,000	35,580,850	А	-6,580,850	0	0	-	-	0	0	-
5/2011	5,800,000			-780,850							
6/2011	5,800,000			5,019,150							
7/2011	5,800,000	3,846,150	В	6,973,000	0	-	-	-	-	-	-
8/2011	5,800,000			12,773,000							
9/2011	5,800,000			18,573,000							
10/2011	5,800,000	16,789,850	С	7,583,150	0	0	0	0	-	-	0
11/2011	5,800,000			13,383,150							
12/2011	5,800,000			19,183,150							
1/2012	5,800,000	3,846,150	В	21,137,000	0	-	-	-	-	-	-
2/2012	5,800,000			26,937,000							
3/2012	5,800,000			32,737,000							
4/2012	5,800,000	11,158,200	D	27,378,800	0	0	-	-	0	-	-
5/2012	5,800,000			33,178,800							
6/2012	5,800,000			38,978,800							
7/2012	5,800,000	4,195,800	Е	40,583,000	0	-	-	-	-	-	-
8/2012	5,800,000			46,383,000							
9/2012	5,800,000			52,183,000							
10/2012	5,800,000	17,542,200	F	40,440,800	0	0	0	0	-	-	-
11/2012	5,800,000			46,240,800							
12/2012	5,800,000			52,040,800							
1/2013	5,800,000	4,195,800	Е	53,645,000	0	-	-	-	-	-	-
2/2013	5,800,000			59,445,000							
3/2013	5,800,000			65,245,000							
4/2013	5,800,000	38,770,600	G	32,274,400	0	0	0	0	0	0	-
5/2013	5,800,000			38,074,400							
6/2013	5,800,000			43,874,400							
7/2013	5,800,000	4,195,800	Е	45,478,600	0	-	-	-	-	-	-
8/2013	5,800,000			51,278,600							
9/2013	5,800,000			57,078,600							
10/2013	5,800,000	17,542,200	F	45,336,400	0	0	0	0	-	-	-
11/2013	5,800,000			51,136,400							
12/2013	5,800,000			56,936,400							

2.3 Manuals for Body Repair of Collection Vehicles

2.3.1 Body Reinforcement Manual for Mitsubishi Trucks

1. Reinforcement for crooked body

Material: Steel pipe, $2pcs \quad \phi = 70$ -80mm t = 4 - 5mm l = 60mm (approximately)



2. Welding for top of body

Material: Reinforcement patches, 2pcs = 4 - 5mm

- 1) Remove the welding beat
- 2) Welding again
- 3) Welding reinforce patches



3. Welding for corner of body

Material: Reinforcement patches, 2pcs L type angle t = 3 - 4mm l= 80mm

- 1) Remove the welding beat
- 2) Welding again
- 3) Welding reinforce patches



4. Ejection cylinder

Material:

Square pipe, 1pcs 80mm x 80mm t = 6mm 1= 600mm (approximately) Reinforcement patches, 110mm x 110mm t = 4.5mm





2.3.2 Manual for Disassembling and Re-assembling Hydraulic Cylinders

Cleansing the cylinders

The exteriors of the cylinders with oil leaks are thickly coated in dust. If the oil seals are replaced in this condition, they will be covered in dust, which will then lower their durability and induce oil leaks and pressure decreases. Therefore, the vehicle needs cleaning, especially in and around the cylinder, using a car washer.



The position of the press plate

Because the press cylinder is attached to the press plate which pressurizes the collected waste, the press plate moves when the press cylinder is detached from the vehicle. If the press plate is set in a high position, it could slide down when the press cylinder is detached, increasing

the danger of accidents. In order to conduct the operation safely, the press plate should be set in its lowest position beforehand, when detaching the press cylinder.



Dismantling the cylinder

A piece of cloth to protect the cylinder rod must be used when detaching the piston from the interior of the cylinder. Any damages to the rods may result in cylinder oil leakage. In addition, when renewing the cylinder piston and the cylinder head which are attached to the cylinder rod, the cylinder must be placed on soft materials such as cloth, so that its delicate parts such as the seal will not be damaged.



Renewing the seal of the cylinder head

When renewing the seal which is attached inside the cylinder head, the cylinder head must first be detached from the cylinder rod. When replacing the seal, it must be placed in the right direction and grease must be applied. The dust seal, which protects the parts against dust and water from the outside, must also be renewed. When inserting the dust seal, the seal's metal parts must be tapped equally.



Attaching the cylinder rod

When attaching the cylinder rod to the cylinder, care must be taken to avoid getting the seal into contact with the screw heads inside the cylinder.

Attaching the cylinder to the vehicle

When attaching the cylinder to the vehicle, the grease applied press cylinder pin must be attached before the oil pressure pump of the cylinder.

Checking the operation of the cylinder

After refilling the hydraulic cylinder with the amount that leaked out during the renewal operation, the cylinder's movement must be tested. The cylinder must be confirmed free of any oil leaks and malfunctions. After confirming this, the oil leaks around the cylinder must be washed off with a car washer.



Applying grease to the press cylinder pin

Operation completed

Required tools

Snap ring prier Hexagon wrench 3mm Box wrench 42mm Minus driver small General tools (spanners, crowbar, hammer, etc.) Grease Cloth for cleaning and protection

Notes

In order to avoid accidents, care must be taken when handling the cylinder as it is heavy with sharp edges in its interior.

In order to protect the cylinder from getting dust , water and rust in its interior, all mechanic equipments, work stand, etc as well as the cylinder itself must be cleaned before dismantling and assembling the cylinder.

2.4 Operation and Maintenance Reports of Collection Vehicles

2.4.1 Format for Daily Operation Report

				Vehicle No.				Dr	iver name		
		Mileage (km)		Working Day off or N			No. of	Weight of	Amout of		
	Date	Start	End	Daily km	hours	Repairing	trips	waste	refuel	Collection place	Type of waste
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
27											
28											
29											
30											
31											
	۱۲	Nonthly total	1	km	hs		times	ton	liter		

Please specify "Day off" or "Repair" when trucks is not working.

2.4.2 Format for Daily Maintenance Report

D/	AILY MAINTENANC	E REPORT	Vehicle No.			Driver name				
		Contents No.	1 2 3 4	Service (Periodic, Grease, Cleaning) Engline (Radiator, Water pump, Belt) Fuel (Fuel pump Nozzle) Electric (Starter, Alternator)	6 7 8 9	Clutch, T/M, Prope Suspention (Spring Brake (Front, Rear, F Tire (Clip bolt, nut), F				
				5	Hy draulic (Pump, cylinder)	10	Others			
	Date	Mileage (km)	Contents of ma	iintenano	ce	Content s No.	Working hours	No. of w orking persons	Cost of repairing	
1										
2										
3										
4										
5										
6										
7										
8										
9						1				
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
Γ	Monthly total hours persons									



2.4.3 Format for Monthly Operation and Maintenance Report

MONTHLY OPERATION AND MAINTENANCE REPORT

Guideline for Preparation of Operation and Maintenance Reports a.

GUIDE LINE for MONTHLY OPERATION AND MAINTENANCE REPORT

	Abbreviations		1	Periodic service (April, October service)	8	Steering (Steering linkage, Ball joint)
Company name			2	General service (Grease, Oil change, Cleaning)	9	Body (Cabin, Frame, Compactor, Dump)
		Contents of	3	Engine (Radiator, Water pump, Belts, Oil filter)	10	Brake (Front, Rear, Parking)
Monthly term *1: 21/4/2011 ~ 20/5/2011		maintenance	4	Fuel (Fuel pump Nozzle, Filter)	11	Wheel (Clip bolt, nut, Hub)
		*4	5	Electric (Starter, Alternator, Lights, Wiring)	12	Puncture and Tire (Tube)
Submission date *2:			6	Chassis (Clutch, T/M, Propeller, Diff)	13	Hydraulic (Pump, cylinder)
			7	Suspention (Spring, Absorber)	14	Others

Contact person *3: XXX

			Mileage*5				Operat	tion	Maintenance														
No.	Vehicle No.	Mileage (Rigining of a	Mileage (End	Monthly		Days*(3	Amout of refuel					Tir	nes o	of ma	inter	ance	*7					Cast of spara parts*9
		mouth) km	km	mileage(km)	Work	Off	Repair	(L)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Cost of spare parts o
1	72xx-UBE	34,567	35,678	1,111	25	3	2	300	1	13		1	2				1		20				10,000
		† Don	ot fill in the unit	like km				† Do not fill in the unit like liter															Do not fill in the unit like To

^{*1} Your operation term, e.g. 21/4/2011 ~ 20/5/2011

- *2 report is submitted within five days after it ends for the turm.
- *3 The person who make this monthly report, e.g. Workshop chief or Accountant
 *4 1. Periodic service = Conducted by CMPUA, e.g. April and October periodic service.
- 2. General service = Conducted by your workshop, e.g. Grease up, Oil change, Air cleaner cleaning.
- 3. Engine sevice, e.g. Radiator, Water pump, Oil coller, Cylinder head, Fun belt repairing
- Fuel service, e.g. Fuel pump, Nozzle, Fuel filter Fuel pipe ripairing.
 Electric service, e.g. Starter, Alternator, Lights, Wiring repairing. Battery charge or replacement
- 6. Chassis parts service, e.g. Clutch, Transsmission, Propeller shaft, Differential repairing
- Suspention service, e.g. Leaf spring, Shok absorber repairing
 Steering service, e.g. Steering linkage, Ball joint Steering wheel
- 9. Body service, e.g. Welding or Steet metal works for Cabin, Frame, Compactor, Dump. Grass replacement.
- 10. Brake service, e.g. Front, Rear, Parking brake.
- 11. Wheel service, e.g. Clip bolt, nut, Hub repairing
- 12. Puncture and Tire service, e.g. Tire, Tube replacement. (1wheel plural punctures = 1puncture)
- 13. Hydraulic service, e.g. Pump, cylinder overhaul, High pressure hose, pipe replacement
- 14. Others *5 Mileage
- You check each trucks mileage only one time at end of month (turm), then you can enter that mileage for begining of a month (turm) on next monthly sheet.
- *6 Working days Based on vehicle working days NOT Drivers working days
- *7 Times of maintenace = Maintenance times per month
- *8 Cost of spare parts = Total cost of spare parts. Not including labor charge (drivers labor charge)

Spreadsheet for Processing Operation and Maintenance Data

Operation & Maintenance report evaluation sheet

Month

b.

				Mileage			0	peration									Mai	inten	ance											
N₽	Organization	Vehicle No.	Mileage (Ricipion of a	Mileage (Fod of o	Monthly		Days		Amount of	Fuel price					Time	es of r	naint	enan	се				Spare parts	1	2	3	4	5	6	7
			mouth)	mouth)	mileage(km)	Work	Off	repair	Fuel	1300	1	2	3	4 :	5 6	6 7	8	9	10	11	12	13 14	cost	A / E	100/1	G / A	(F + G) / A	B / 30days	C / 30days	D / 30days
					Α	в	С	D	Е	F													G							
	CMPUA	7203	26,534	27,793	1,259	26	4	0	225	292,500	1	4	0 0) 2	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 4	5 2	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	3	3 0	0	0	0	0	0	2 (o o	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	6 0	2	0	2	0	2	8 3	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 1	33	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

F Fuel cost =

A / E		= kn	n / liter	Fu	el efficiency
-------	--	------	-----------	----	---------------

100/1 2 = 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/30davs = Repairing retio

2.5 Check Sheet and Operation Schedule for Inspection after Daily Operation

2.5.1 Operation Schedule for Inspection after Daily Operation

Time schedule 1	
-----------------	--

Worker	Truck					Ti	me					
VVOIKei	TTUCK	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	
Popair map A	Truck 1											Total work hour for a vehicle - 3 hours (Washing-1 hour, Inspection-2 hours)
	Truck 3											2 repairmen conduct periodic inspection.
Panair man P	Truck 2											
Repair man b	Truck 4											
			Washin	g		Inspect	ion					

Time schedule 2

Time Schedule 2												_
Verker Truck Time												
WOIKEI	TTUCK	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	
	Truck 1											Total work hour for a vehicle - 2.5 hours
Repair man A	Truck 3											2 repairmen conduct periodic inspection.
	Truck 5											
Bonoir mon B	Truck 2											
керан тап в	Truck 4											
			Washin	g		Inspect	tion					-

Time schedule 3												
Workor	Truck					Т	ime]
WOIKEI	TTUCK	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	
Repair map A	Truck 1											Total work hour for a vehicle - 3 hours (washing-1 hour, inspection-2hours)
Repair man A	Truck 4											3 repairmen conduct periodic inspection.
Popair map B	Truck 2											
Repair man B	Truck 5											
Bapair map C	Truck 3											
Repair man C	Truck 6											
			Washin	g		Inspect	tion					-

_____ .

a. Check Sheet and Schedule

a.1 Truck No1

CMPUA Periodic inspection schedule

Truck No.

Date

Timo	Description of works	C	Check				
nine		Repairman	Mechanic				
9:00-10:00	Washing						
10:00-10:30	Inspection (Driver's seat)						
	Parking brake (play, working condition)						
	Clutch pedal (play, working condition)						
	Lightening (working condition)						
	Inspection (Engine room)						
	Engine oil and oil filter (Change)						
	Fan belt (damage, loosening)						
	Fuel filter Element (Change)						
	Air cleaner Element (blocking, cleaning)						
10:30-11:00	Inspection (Underbody)						
	Transmission oil (amount, condition, change)						
	Differential oil (amount, condition, change)						
	Greasing (Propeller shaft, Spling pin)						
11:00-11:30	Inspection (Jack up)						
	Brake (adjustment)						
	Wheel bearing play (adjustment)						
11:30-11:50	Inspection (Outside)						
	Hydraulic oil (amount, leakage)						
	Hydraulic pump, cylinder(leakage,working condition)						
	Brake oil (amount, leakage)						
	Battery (amount, looseing)						
	Tire (depth of ditch, damage)						
	Wheel nut bolt (damage, loosening)						
	Frame, body (tightening, damage)						
11:50-12:00	Final inspection						

a.2 Truck No2

CMPUA Periodic inspection schedule

Truck No.

Date

Timo	Description of works	Cł	neck
Time		Repairman	Mechanic
10:00-11:00	Washing		
11:00-11:30	Inspection (Driver's seat)		
	Parking brake (play, working condition)		
	Clutch pedal (play, working condition)		
	Lightening (working condition)		
	Inspection (Engine room)		
	Engine oil and oil filter (Change)		
	Fan belt (damage, loosening)		
	Fuel filter Element (Change)		
	Air cleaner Element (blocking, cleaning)		
11:30-12:00	Inspection (Underbody)		
	Transmission oil (amount, condition, change)		
	Differential oil (amount, condition, change)		
	Greasing (Propeller shaft, Spling pin)		
12:00-12:30	Inspection (Jack up)		
	Brake (adjustment)		
	Wheel bearing play (adjustment)		
12:30-12:50	Inspection (Outside)		
	Hydraulic oil (amount, leakage)		
	Hydraulic pump, cylinder(leakage,working condition)		
	Brake oil (amount, leakage)		
	Battery (amount, looseing)		
	Tire (depth of ditch, damage)		
	Wheel nut bolt (damage, loosening)		
	Frame, body (tightening, damage)		
12:50-13:00	Final inspection		
a.3 Truck No3

CMPUA Periodic inspection schedule

Truck No.

Date

Timo	Department of works	Check		
IIIIIe		Repairman	Mechanic	
13:00-14:00	Washing			
14:00-14:30	Inspection (Driver's seat)			
	Parking brake (play, working condition)			
	Clutch pedal (play, working condition)			
	Lightening (working condition)			
	Inspection (Engine room)			
	Engine oil and oil filter (Change)			
	Fan belt (damage, loosening)			
	Fuel filter Element (Change)			
	Air cleaner Element (blocking, cleaning)			
14:30-15:00	Inspection (Underbody)			
	Transmission oil (amount, condition, change)			
	Differential oil (amount, condition, change)			
	Greasing (Propeller shaft, Spling pin)			
15:00-15:30	Inspection (Jack up)			
	Brake (adjustment)			
	Wheel bearing play (adjustment)			
15:30-15:50	Inspection (Outside)			
	Hydraulic oil (amount, leakage)			
	Hydraulic pump, cylinder(leakage,working condition)			
	Brake oil (amount, leakage)			
	Battery (amount, looseing)			
	Tire (depth of ditch, damage)			
	Wheel nut bolt (damage, loosening)			
	Frame, body (tightening, damage)			
15:50-16:00	Final inspection			

a.4 Truck No4

CMPUA Periodic inspection schedule

Truck No.

Date

Timo	Description of works	C	Check		
lille		Repairman	Mechanic		
14:00-15:00	Washing				
15:00-15:30	Inspection (Driver's seat)				
	Parking brake (play, working condition)				
	Clutch pedal (play, working condition)				
	Lightening (working condition)				
	Inspection (Engine room)				
	Engine oil and oil filter (Change)				
	Fan belt (damage, loosening)				
	Fuel filter Element (Change)				
	Air cleaner Element (blocking, cleaning)				
15:30-16:00	Inspection (Underbody)				
	Transmission oil (amount, condition, change)				
	Differential oil (amount, condition, change)				
	Greasing (Propeller shaft, Spling pin)				
16:00-16:30	Inspection (Jack up)				
	Brake (adjustment)				
	Wheel bearing play (adjustment)				
16:30-16:50	Inspection (Outside)				
	Hydraulic oil (amount, leakage)				
	Hydraulic pump, cylinder(leakage,working condition)				
	Brake oil (amount, leakage)				
	Battery (amount, looseing)				
	Tire (depth of ditch, damage)				
	Wheel nut bolt (damage, loosening)				
	Frame, body (tightening, damage)				
16:50-17:00	Final inspection				

2.6 Operation and Maintenance Tools for Heavy Equipment

2.6.1 Check Sheet for Daily Inspection of Bulldozer and Excavator

D65E Daily working before operation check sheet

Date	Hrs In	
Drivers name	Hrs Out	\checkmark : OK L : Replenishment \triangle : Report to w/shop
Res. No.		Remarks : for more detail

	Check item	Check	Remarks		Check item	Check	Remarks
Engine	Oil			Final	Oil		
	Oil leakage			Drive	Oil leakage		
	Coolant			Track shoe	Roller		
	Fan Belt				Shoe bolts		
	Fuel leaking				Tension		
	Inj.pump leaking				Idler		
	Air element			Brade	Cutting edge		
	Power train case oil				Damage		
Battery	Battery fluid			Hydr.	hydraulic oil		
	Battery terminal				Leakage		
	Battery cable			Lubricating	Grease up		
Electrical	Condition, wireing			Operaton	Movement		

PC200 Daily working before operation check sheet

Date		Hrs In	
Drivers name	2	Hrs Out	\checkmark : OK L : Replenishment \triangle : Report to w/shop
Res. No.			Remarks : for more detail

	Check item	Check	Remarks		Check item	Check	Remarks
Engine	Oil			Final	Oil		
	Oil leakage			Drive	Oil leakage		
	Coolant			Track shoe	Roller		
	Fan Belt			1	Shoe bolts		
	Fuel leaking			1	Tension		
	Inj.pump leaking			1	Idler		
	Air element			Bucket	Teeth		
	Power train case oil			1	Damage		
Battery	Battery fluid			Hydr.	hydraulic oil		
-	Battery terminal			1	Leakage		
	Battery cable			Lubricating	Grease up		
Electrical	Condition, wireing			Operaton	Movement		

2.6.2 Periodic Inspection of Heavy Equipment

Service point	Note			
Initial maintenance				
1. New belts	Check the tension of a new fan/alternator or air			
First 10 hours of operation.	conditioning bolt			
2. Transmission fluid	Check the fluid level of transmission.			
First 20 hours of operation.				
3. Rear axle oil	Check the fluid level of transmission			
First 20 hours of operation.				
4. Hydraulic filter	Replace the Hydraulic filter			
First 100 hours of operation.				
5. Transmission fluid filter	Replace the Transmission fluid filter			
First 100 hours of operation.				
When Required				
1. Replace Air filter	If warning lamp On			
	The air filter restriction lamp must be reset manually once			
	it has illuminated. Push the reset button located behind the			
	filter housing.			
2. Replace Hydraulic filter	1. If warning lamp On			
3. Tire pressure and condition	1. Check the air pressure and condition of the tire every			
	100 hours of operation.			
	1. Front tire 3.6 bar			
	Rear tire 2.2 bar			
10 hours maintenance (Daily)				
1. Engine oil	1. Check the engine oil level			
2. Belt tension	1. Check the tension of a new fan/alternator or air			
	conditioning bolt			
3. Loader grease fittings	1. Lubricate the Loader grease fittings, Back hoe grease			
4. Back hoe grease fittings	fittings and Extendahoe dipper slides every 10 hours of			
5. Extendance dipper slides	operation of each day. If you operate in severe condition,			
Every 50 hours maintenance	Tublicate more often. Clean the fittings before fublicating.			
Livery 50 nours maintenance	Lubricete the King pip and Front cule pivot			
2. Hydraulia acuptor look pin	Lubricate the huderulie courter lock rin			
2. Hydraulic couplet lock plit	Lubricate the hydrautic couplet lock pill.			
4 Extendebee dipper glides	Eutoneate the dinner and cost the slides with grosse			
4. Extendance dipper sides	Extend the dipper and coat the sindes with grease.			
6 Coolant reservoir fluid	Check the decrease reservoir fluid level			
7 Hydroulic fluid	Check the fluid level of the hydroulie system			
From 100 hours maintenance	Check the fluid level of the hydraulic system.			
1 Extendaboe foot pedal	Remove plastic plug from backhoe control tower for			
2 Backhoe swing nedal niveta	access to the grease fitting for the extendable dipper foot			
2. Dackhoe swing peda pivots	nedal and backhoe swing nedal nivots			
Every 250 hours maintenance	podur and oueknoe swing pedar prvots			
1 Battery	Clean the surface of batteries			
2. Belt tension	Check the belt tension			
3 Rear axle oil level	Check the fluid level			
4 Breather cleaning	Clean the breather for rear avle			
5 Fuel tank	Drain the fuel filter for water or sodiment. If water was			
	found in the main fuel filter.			

a. Check Sheet for Periodic Inspection of CASE Machine

6. Transmission fluid level	Check the fluid level.
7. Rear axle drive shaft	Lubricate the grease fittings point
8. Rear axle breather	Clean the breather for rear axle.
Every 500 hours maintenance	
1. Engine oil and oil filter	Change the engine oil and replace the filter after 500 hours
	of operation or once a year, whichever occurs first.
	Oil capacity 12 liter
2. Fuel filter	Replace the filter every 500 hours of operation or if you
	have a loss of engine power.
Every 1,000 hours maintenance	
1. Front axle bearings	Clean and lubricate Front axle hub bearing grease.
2. Front axle hub seal	Replace the front axle hub seal.
3. Hydraulic fluid filter	Replace the filter after every 1000 hours of operation or if
	the warning lamp for the hydraulic oil filter is illuminated.
4. Hydraulic fluid	Change the hydraulic fluid
	55 liter
5. Battery	Check the fluid of the battery. If the fluid level is low, add
	distilled water to each cell until the fluid level is 1/8 inch
	(3.2mm) below the split ring at the bottom of each cell
	opening.
	If the temperature is 0°C or below and you have added
	water to the batteries, do the following: Connect a battery
	charger to the batteries or run the engine for approximately
	two hours. This procedure is necessary to mix the water
	with the electrolyte.
6. Rear axle oil	Change the rear axle oil.
	Center bowl : 14.2 liter
	Each wheel end : 1.5 liter
7. Transmission fluid and fluid	Change the transmission fluid, replace the transmission
filter	filter, and clean the breather.
	Capacity : 18.5 liter
8. Engine valve clearances	Adjust the engine valve clearance.
9. Air filter	Replace the primary and secondary filter after 1,000 hours
	of operation, after one year or if the air restriction lamp
E	illuminates.
Every 2,000 nours maintenance	
1. Engine coolant	Change the engine coolant.
	Capacity : 1 / liter

b. Check Sheet for Periodic Inspection of Bulldozer

Service point	ote	
Check before starting	Check coolant level, add coolant.	
	Checking with machine monitor.	
	Check speed range display lamp.	
	Check fuel level, add fuel.	
	Check oil level in engine oil pan,	add oil.
	Check oil level in power train cas	e, add oil.
	Check brake pedal travel.	
	Check dust indicator.	
	Check electric wiring.	
	Check that lamps light up.	
	Check horn sound.	
	Check of operation of backup ala	rm

When Required						
1. CHECK, CLEAN AND REPLACE AIR CLEANER ELEMENT	× × ×	 Whenever the red piston in dust indicator appears, clean the air cleaner element. Do not clean the air cleaner element before the dust indicator becomes red, the performance of the air cleaner is diminished and the cleaning effect is lowered. In addition, dust sticking to the element falls into the inner element each time the element is cleaned. Replace both inner and outer elements when the monitor lamp fl soon after installing the cleaned outer element even though it has not been cleaned 5 times. After replaced elements, press the button of dust indicator to return the red piston to its original position. 				
2. CHECK AND TIGHTEN TRACK SHOE BOLTS	✓	If the machine is used with track shoe bolts loose, they will break, so tighten any loose bolts immediately.				
3. CHECK AND ADJUST TRACK TENSION	✓ ✓	Measure the maximum deflection between the top surface of the track and the bottom surface of the wooden block. Standard deflection : 20-30 mm				
A CHECK ELECTRICAL INTAKE A		Aujust track tension using with grease gun.				
4. UNEUN ELEUIKIUAL INIAKE A		IEATER Deverse or replace the and hits and outting advect				
BITS AND CUTTING EDGED	~	before it is worn out to the blade end. If the cutting edge and the end bit on both sides are worn out, replace with new ones.				
	~	If it has been worn out up to the fitting surface, repair the fitting surface and then reverse or replace.				
6. CLEAN CHECK RADIATOR FINS	5					
7. CHECK AND ADJUST AIR CONI	DITIC	DNER				
8. GREASE DOOR HINGE						
9. CHECK DOOR LOCK STRIKER						
10. REPLACE DOOR DAMPER						
11. CHECK DOOR LATCH						
12. CHECK WINDOW WASHER FLUID LEVEL, ADD FLUID	√	If there is air in the window washer fluid, check the level of the fluid in window washer tank. Add automobile window washer fluid if necessary. When adding fluid, be careful not to let any dust get in.				
13. REPLACE WIPER BLADE	13. REPLACE WIPER BLADE					
14. WASHING WASHABLE FLOOR						
15. CHECK IDLER OIL LEVEL, ADD OIL	~	If the oil level in the idler is low, noise will be generated and there will be seizure, so check the oil level and add oil.				
16. ADJUST IDLER CLEARANCE	√	Since the idlers are forced to move forward and backward by an external force guide plates will be worn out.				
	Ý	idlers from side to side or inclination of the idlers, and running off of track links from the				

	1			
		idlers or unevenly worn idler and links may		
17 DIFEDING AID FROM		Planding and form and indexe		
I/. BLEEDING AIR FROM	v	Bleeding air from cylinders.		
HYDRAULIC SYSTEM		Run the engine at a low idling and extend ant		
		retract the cylinders 4 to 5 times to a point 100		
19 METHOD FOR DELEASING	./	The hydroulie circuit is church under another		
INTERNAL DESSUE IN	v	The hydraulic circuit is always under pressure,		
HVDDAULIC CIDCUIT		so release the pressure finite the circuit before		
		pressure is not released high pressure oil will		
		spurt out and may cause serious personal injury		
Every 50 Hours Service		spurt out and may cause serious personal injury.		
1 DRAIN WATER SEDIMENT FRO)M F	UEL TANK		
Every 250 Hours Service	7111			
1 LUBRICATING	\checkmark	If any abnormal nose is generated at the greasing		
		point carry out greasing regardless of the		
		maintenance interval		
	\checkmark	When operating the machine for the first 50		
		hours, carry out the greasing every 10 hours		
	\checkmark	After carrying out digging work in water, always		
		greasing the pins that were under water.		
2. GREASE EQUALIZER BAR SIDE	E PIN			
3. GREASE EQUALIZER BAR CEN	TER	PIN		
4. CHECK OIL LEVEL IN FINAL DI	RIVE	E CASE, ADD OIL		
5. CHECK OIL LEVEL IN HYDRAU	LIC	TANK, ADD OIL		
7. CHECK LEVEL OF BATTERY EI	LECT	ROLYTE		
8. DRAIN WATER, SEDIMENT FRO	OM F	UEL FILTER		
9. CHECK FAN BELT TENSION,	\checkmark	Press the belt at a point midway between the		
ADJUST		drive pulley and compressor pulley with a finger		
		force of approx. 6kgf and check that the		
		deflection is 6-10 mm.		
10. CHECK, CLEAN ADDITIONAL	FUE	L STRAINER		
11. REPLACE POWER TRAIN OIL I	FILT	ER ELEMENT		
12. CHECK BRAKE PERFORMANC	Ъ			
13. CLEAN AIR CONDITIONER AII	R FII	LTER (FRESH/RECIRC FILTER)		
Every 500 Hours Service				
1. REPLACE FUEL FILTER CARTR	IDGI	E		
2. CHANGE OIL IN ENGINE OIL	√	Refill capacity : 38 liters		
PAN, REPLACE ENGINE OIL				
FILTER CARTRIDGE				
Every 1000 Hours Service				
1. CHANGE OIL IN POWER TRAIN	CAS	SE, CLEAN STRAINERS		
2. CHECK UIL LEVEL IN	v	Refill capacity : 1.7 liters		
DAMPER CASE, ADD UIL		Dafill compaity + 27 liters		
DRIVE CASE	v	Kerni capacity . 27 mers		
A CLEAN RPEATHED				
5 GREASE UNIVERSAL IOINT				
6 CHECK ALL TIGHTENING DAP		FTURBOCHARGER		
7 CHECK PLAY OF TURROCHAR	GEB	ROTOR		
8 CHECK FOR LOOSE RODS MOUNT ROLTS				
0. CHECK FOR LOOSE KOIS MOUNT BOLIS				
1. CHANGE OIL IN HYDRAULIC	✓	Refill capacity : 55 liters		
	1			

ELEMENT					
2. REPLACE HYDRAULIC TANK B	REATHER ELEMENT				
3. CLEAN ENGINE BREATHER ELI	3. CLEAN ENGINE BREATHER ELEMENT				
4. CHANGE OIL IN DAMPER CASE	4. CHANGE OIL IN DAMPER CASE				
5. CLEAN, CHECK TURBOCHARGER					
6. CHECK VIBRATION DAMPER					
7. CHECK ALTERNATOR, STARTING MOTOR					
8. CHECK ENGINE VALVE CLEARANCE, ADJUST					
Every 4,000 Hours Service					
1. CHECK WATER PUMP					

c. Check Sheet for Periodic Inspection of Excavator

Service point	Not	te		
Check before starting	✓	Check coolant level, add coolant.		
	\checkmark	Check oil level in engine oil pan, add oil.		
	\checkmark	Check fuel level, add fuel.		
	\checkmark	Drain water, sediment from fuel tank.		
	\checkmark	Check for water and sediment in water separator,		
		drain water		
	\checkmark	Check oil level in hydraulic tenk, add oil.		
	\checkmark	Check brake pedal travel.		
	\checkmark	Check dust indicator.		
	\checkmark	Check electric wiring.		
	\checkmark	Check that lamps light up.		
	\checkmark	Check horn sound.		
Initial maintenance	-			
1. FUEL FILTER	~	Replace the Fuel filter		
Only after the first 250 hours.	,			
2. ENGINE VALVE CLEARANCE	~	Adjust the engine valve clearance.		
Only after the first 1,000 hours.				
When Required				
1. CHECK, CLEAN AND	~	If air cleaner clogging monitor of the monitor		
REPLACE AIR CLEANER		panel flashes, clean the air element.		
ELEMENT	\checkmark	Never remove the inner element. Only outer		
		element allows cleaning.		
	\checkmark	Replace both inner and outer elements when the		
		monitor lamp flashed soon after installing the		
		cleaned outer element even though it has not		
		been cleaned 5 times.		
2. CHECK AND TIGHTEN TRACK	\checkmark	If the machine is used with track shoe bolts		
SHOE BOLTS		loose, they will break, so tighten any loose bolts		
		immediately.		
3. CHECK AND ADJUST TRACK	\checkmark	Measure the maximum deflection between the		
TENSION		top surface of the track and the bottom surface		
	,	of the wooden block.		
	✓	Standard deflection : 10-30 mm		
	✓	Adjust track tension using with grease gun.		
4. CHECK ELECTRICAL INTAKE AIR HEATER				
5. REPLACE BUCKET TEETH	✓	Replace the teeth before the wear reach the		
		adapter.		
6. ADJUST BUCKET CLEARANCE				
7. CHECK WINDOW WASHER	✓	If there is air in the window washer fluid, check		

FLUID LEVEL, ADD FLUID	the level of the fluid in window washer tank.				
	Add automobile window washer fluid if				
	necessary. When adding fluid, be careful not to				
	let any dust get in.				
8. CHECK AND ADJUST AIR CONI	JITIONER				
9. WASHING WASHABLE FLOOR	Almong and blocks under the treat to around the				
IU. METHOD OF SETTING	Always put blocks under the track to prevent the				
MACHINE ANGLE	into the ground				
11 BLEEDING AIR FROM	$\mathbf{v} = \mathbf{R}$				
HYDRALILIC SYSTEM	Loosen air bleeding plug and check if oil oozes				
	out				
	✓ Bleeding air from cylinders.				
	Run the engine at a low idling and extend ant				
	retract the cylinders 4 to 5 times to a point 100				
	mm from the end of the stroke.				
	✓ Bleeding air from swing arm.				
	Run the engine at a low idling, loosen hose at				
	port and check that oil oozes out from port hose.				
	\checkmark Bleeding air from travel motor.				
	Run the engine at a low idling, loosen air bleed				
	plug. If oil spills out tighten the plug.				
12. METHOD FOR RELEASING	\checkmark The hydraulic circuit is always under pressure,				
INTERNAL PRESSURE IN	so release the pressure inside the circuit before				
HIDRAULIC CIRCUIT	pressure is not released high pressure oil will				
	spurt out and may cause serious personal injury				
Every 100 Hours Service	spurt out and may cause serious personal injury.				
1 LUBRICATING	\checkmark If any abnormal nose is generated at the greasing				
	point, carry out greasing regardless of the				
	maintenance interval				
	\checkmark When operating the machine for the first 50				
	hours, carry out the greasing every 10 hours.				
	\checkmark After carrying out digging work in water, always				
	greasing the pins that were under water.				
Every 250 Hours Service					
1. CHECK OIL LEVEL IN MACHIN	ERY CASE, ADD OIL				
2. CHECK OIL LEVEL IN FINAL DE	RIVE CASE, ADD OIL				
3. CHECK LEVEL OF BATTERY EL	ECIKOLYIE				
4. CHECK, ADJUST TENSION OF	• Press the belt at a point midway between the				
COMPRESSOR BELT	force of approx 6kgf and shock that the				
CONITINESSON DEL I	deflection is 5-8 mm				
Every 500 Hours Service					
1. LUBRICATE SWING CIRCLE (21	PLACES)				
2. CHANGE OIL IN ENGINE OIL	\checkmark Refill capacity : 24 liters				
PAN, REPLACE ENGINE OIL	1 2 2 2 2 2				
FILTER CARTRIDGE					
3. REPLACE FUEL FILTER CARTR	IDGE				
4. CHECK LEVEL OF GREASE IN S	WING PINION, ADD GREASE				
5. CLEAN AND INSPECT RADIATOR FINS, OIL COOLER FINS AND CONDENSER					
FINS					
6. CLEAN AIR CONDITIONER FRE	6. CLEAN AIR CONDITIONER FRESH/RECIRC FILTERS				
7. REPLACE BREATHER ELEMENT IN HYDRAULIC TANK					

Every 1000 Hours Service					
1. REPLACE HYDRAULIC FILTER ELEMENT					
2. CHANGE OIL IN SWING MACHINERY CASE					
3. CHECK OIL LEVEL IN DAMPER	CASE, ADD OIL				
4. CHECK ALL TIGHTENING PART	TS OF TURBOCHARGER				
5. CHECK PLAY OF TURBOCHARC	GER ROTOR				
6. REPLACE CORROSION RESISTO	DR CARTRIDGE				
7. CHECK FAN BELT TENSION AND REPLACE FAN BELT					
Every 2000 Hour Service					
1. CHANGE OIL IN FINAL DRIVE	✓ Refill capacity : 4.5 liters				
CASE					
2. CLEAN HYDRAULIC TANK STRAINER					
3. CLEAN, CHECK TURBOCHARG	ER				
4. CHECK ALTERNATOR, STARTING MOTOR					
5. CHECK ENGINE VALVE CLEARANCE, ADJUST					
6. CHECK VIBRATION DAMPER					
Every 4,000 Hours Service					
1. CHECK WATER PUMP					
Every 5,000 Hours Service					
1. CHANGE OIL IN HYDRAULIC	✓ Refill capacity : 143 liters				
TANK					

2.6.3 Inspection / Replacement Schedules of Heavy Equipment

a. Inspection / Replacement Schedule of Bulldozer

Inspection / Replacement so			
Period or mileage	Conduct	Inspection items	Conducted person
Every day bofore operating	Check	Oil level in engine oil	Driver
		Dust indicator (Air Cleaner element)	Driver
		Water sidiment from fuel filter	Driver
		Coolant level	Driver
		Oil level in power train case	Driver
		Brake pedal play	Driver
		Machine monitor	Driver
When required	Check	Track teision	Driver
		ldler oil level	Driver
	Check & tirgten	Track shoe bolts	Driver
Every 50 HRS	Drain	Water, sediment from fuel tank	Driver
Every 250 HRS	Grease up	Lubricate joints	Driver
	Check	Oil level in final drive case	Driver
		Oil level in hydraulic tank	Driver
		Battery condition	Driver
		Alternator belt tension	Driver
		Brake performance	Driver
	Check & drain	Water separator	Driver
	Check & clean	Additional fuel strainer	Driver
	Change	Power train oil filter element	Mechanic
Every 500 HRS	Change	Fuel filter cartridge	Mechanic
		Engine oil filter	Mechanic
		Engini oil	Mechanic
Every 1,000 HRS	Change	Power train oil strainer	Mechanic
		Power train oil	Mechanic
		Oil in finaldraive case	Mechanic
	Check	Oil level in damper case	Mechanic
	Grease up	Universal joint	Mechanic
Every 2,000 HRS	Change	Hydraulic oil	Mechanic
		Hydraulic oil filter element	Mechanic
		Oil in damper case	Mechanic

b. Inspection / Replacement Schedule of Excavator

Inspection / Replacement so			
Period or mileage	Conduct	Inspection items	Conducted person
Every day bofore operating	Check	Coolant level	Driver
		Oil level in engine oil	Driver
		Fuel level	Driver
		Hydraulic oil level	Driver
		Dust indicator (Air Cleaner element)	Driver
		Battery condition	Driver
		Lubricate joints	Driver
		Water sidiment from fuel filter	Driver
		Safty loch level, Lock position	Driver
		Position of work equipment	Driver
When required	Check & tirgten	Track shoe bolts	Driver
	Check	Track teision	Driver
	Replace	Backet teeth	Driver
		Air cleaner element	Driver
		Cooling system	Driver
		Brleed air from hydraulic system	Driver
Every 100 HRS	Grease up	Lubricate joints	Driver
	Drain	Water and sediment from fuel tank	Driver
	Check	Oil level in swing machinery	Driver
Every 250 HRS	Grease up	Lubricate swing circle	Driver
	Check	Fanbelt tension	Driver
		Oil level in final drive case	Driver
		Battery level	Driver
		Engine oil and filter	Driver
		hydraulic filter	Driver
		Oil level in machinery case	Driver
		Oil level in final drive case	Driver
		Battery electrolyte level	Driver
		Belt tension	Driver
Every 500 HRS	Change	Engine oil filter	Mechanic
		Engini oil	Mechanic
		Fuel filter	Mechanic
		Hydraulic oil filter element	Mechanic
		Corrosion resister	Mechanic
	Grease up	Lubricate swing circle	Mechanic
		Swing pinion grease level	Mechanic
	Check	Radiator fins and condition	Mechanic
Every 1,000 HRS	Change	Oil in swing machinery case	Mechanic
		Oil in damber case	Mechanic
		Oil in final drive case	Mechanic
	Clean	Hydraulic tank strainer	Mechanic
Every 4,000 HRS	Check	Water pump	Mechanic
Every 5,000 HRS	Change	Hydraulic tank strainer	Mechanic