4 Capacity Development

4.1 Seminars

4.1.1 First Seminar

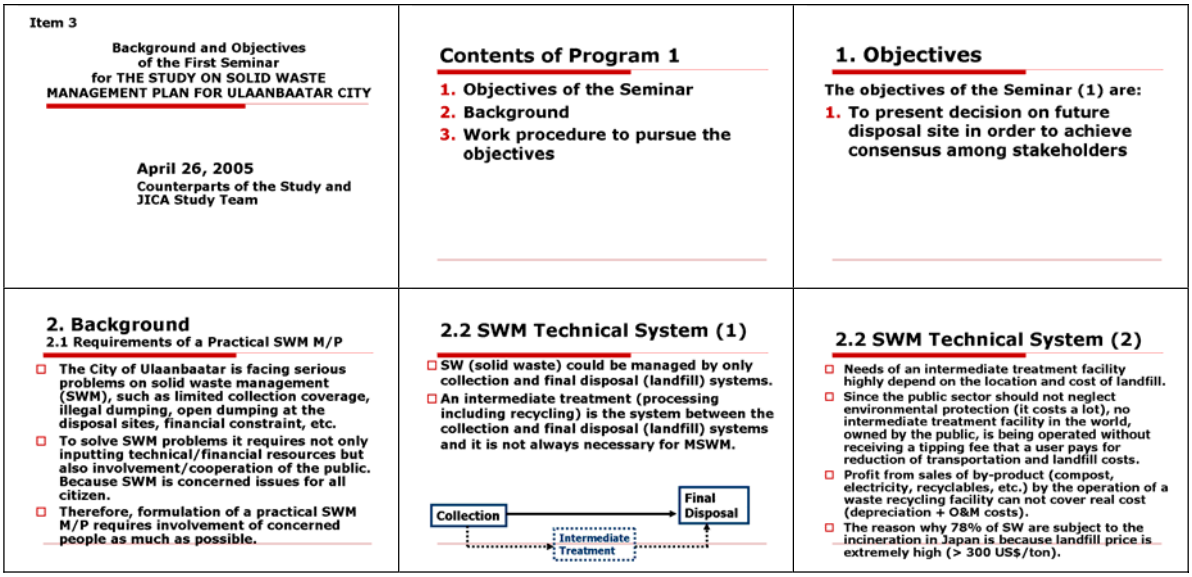
FIRST SEMINAR OF THE STUDY ON SOLID WASTE MANAGEMENT PLAN

a. Program

Venue: ULAANBAATAR HOTEL
Date: APRIL 26, 2005

Topic	Expositor	Time
1. Opening Address by Mongolian Side	MUB or MONE	9:00 – 9:15
2. Opening Address by the Japanese Side	JICA	9.15 – 9:30
3. Explanation of background and objectives of the first seminar	C/P and Study Team	9.30 – 10:00
4. Explanation of sanitary landfill and pilot project for the improvement of UCDS	C/P and Study Team	10:00 – 10:40
Coffee break		10:40 – 11:00
5. Explanation of six (6) candidates as future disposal site(s), selection process and decision	C/P and Study Team	11:00 – 11:50
6. Question and answer	Participants, C/P and Study Team	11:50 – 12:40
7. Closing Speech by Mongolian Side	MUB or MONE	12:40 – 13:00
Lunch		13:00 – 14:00

b. Presentation Materials



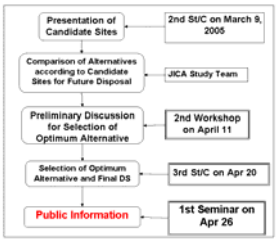
2.3 Formulation of M/P and Alternative Study (1)

- One of the most important issues of the formulation of a SWM M/P is to find out an optimum technical system that creates environmentally sound, socially acceptable & cost minimum SWM.
- To find out the optimum technical system requires an alternative study, i.e. system comparison study.
- A technical system alternative consists of collection, transportation, intermediate treatment and final disposal systems.
- The needs of intermediate treatment facilities will be examined after the selection of proper landfill site(s). Because needs of them highly depend on the location and cost of landfill, and if alternatives include them, it may bring confusion for comparison of each alternative.

2.3 Formulation of M/P and Alternative Study (2)

- Since any SWM technical system needs at least one final disposal site (landfill). For the alternative study candidates of future final disposal site(s) are the critical issue.
- It is essential for the formulation of a practical M/P to obtain consensus among the stakeholders regarding the location of new (future) final disposal sites.
- The Mongolian counterparts (C/P) and JICA Study Team, therefore, agreed to conduct a site selection procedure as open to the public as shown in the next screen.

2.3 Formulation of M/P and Alternative Study (3)



Thank you very much for your attention

Item 4

Explanation of Sanitary Landfilling and Pilot Project for the Improvement of UCDS

April 26, 2005
Counterparts of the Study and JICA Study Team

Contents

1. Importance of Sanitary Landfilling
2. Improvement of UCDS

1. Importance of Sanitary Landfilling

1. In all future final disposal site(s) the sanitary landfill operation shall be applied.
2. The sanitary landfill operation will minimize adverse impacts and will not cause fires, scattering wastes, etc.
3. For the demonstration of the sanitary landfill to all citizens UBC and JICA study team will improve the current Ulaan Chuluut Disposal Site (UCDS) as much as possible by conducting a pilot project from coming July, 2005.

Sanitary Landfill Pilot Project (PP) in Sri Lank: Before PP

Sanitary Landfill PP in Sri Lank: Improvement in Operation

What Municipality shall do during the operation:

Daily Soil Cover

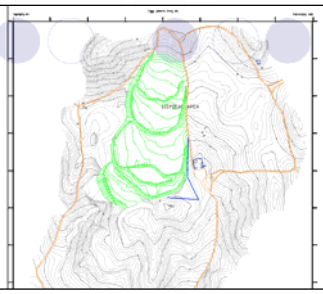
Sanitary Landfill PP in Sri Lank: After PP

Improvement of UCDS

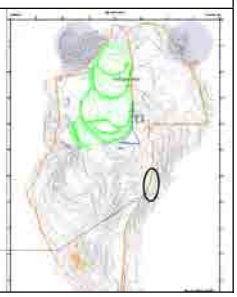
1. Installation of Weighbridge and Control Building
2. Facility Construction
3. Sanitary Landfilling

Scope of Work for Improvement of UCDS

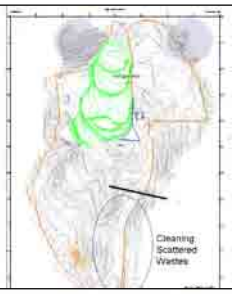
1. UB City
   - Cleaning Wastes scattering along access road and surround UCDS
   - Cut and Fill, Slope Trimming and Soil Cover
   - Sanitary Landfilling
2. JICA
   - Enclosing Bank, Enclosing Dam
   - Leachate Regulation Pond
   - On site road
   - Fence and Gate
   - Gas Extraction Pipe



1st Step



2nd Step



3 rd Step

4th Step

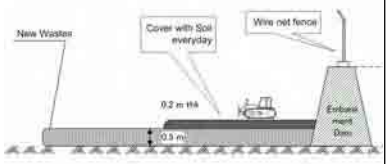
Example (Before Improvement)

Cut and Fill

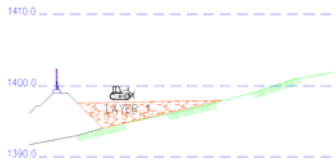
Soil Cover

After Improvement

Sanitary
Landfilling



Layer1 Sanitary Landfilling



Cross Section

Final Shape of
Sanitary
Landfilling

Schedule of Improvement of UCDS

Thank you very much for your attention

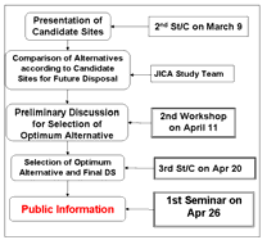
Item 5

Explanation of six(6) candidates as future disposal site (s), selection process and decision

Apr 26, 2005
Counterparts of the Study and JICA Study Team

Contents

1 Procedure of the Site Selection



2.1 Explanation of six (6) candidate sites

- Six candidate sites are presented in the second workshop and discussed among participants.
- Participants consist of ;
  - Ministries: MOE, MOH, MOI, MOIT,
  - UB City : Mayor's Office, Governor's Office, specialized inspection agency
  - District Office:
  - Nuuts company, TUKs
  - Khoroo Governers, residents,
  - NGOs

2.2 Location of Candidates for Future Disposal Site(s) and Transfer Station

2.3 Presentation of Alternatives: Examination of Alternatives

Alternative (Site)	System
Alt 1 NEDS	6 Districts ⇨ NEDS Nalaikh District ⇨ NCMDS
Alt 2 XMKDS	6 Districts ⇨ XMKDS Nalaikh District ⇨ NCMDS
Alt 3 MDDS	6 Districts ⇨ MDDS Nalaikh District ⇨ NCMDS
Alt 4 TDDS	6 Districts ⇨ TDDS Nalaikh District ⇨ NCMDS
Alt 5 BKDS	6 Districts ⇨ T/S ⇨ BKDS Nalaikh District ⇨ BKDS
Alt 6 BCMDS	6 Districts ⇨ T/S ⇨ Railway ⇨ T/S ⇨ BCMDS Nalaikh District ⇨ NCMDS

2.4 Environmental issues

1. Current photo of each site
2. In order to evaluate environmental aspects of the candidate sites a preliminary environmental study was conducted by the National University based on the following survey:
   - Field reconnaissance to the six candidate sites; and
   - Literature study including collection of available data such as topographic maps, geological profile, etc.
3. Environmental evaluation was made on social aspects, natural environment and pollution

NEDS (Narangiin Enger Disposal Site): A large and deep valley in SKH District

XMKDS (XMK Disposal Site): Soil Borrow Pit

MDDS (Morin Daava Disposal Site): A shallow valley

TDDS (Tsagaan Davaa Disposal Site): A large and deep valley

BKDS (Bayangiin Khonkhor Disposal Site): A very shallow valley

BCMDS (Baganuur Coal Mining Disposal Site): A coal mining pits

NCMDS (Nalaikh Coal Mining Disposal Site): A coal mining pits in Nalaikh District Only use for disposal of waste generated in Nalaikh District

Social aspects (1)

Items	NEDS	XMKDS	MDDS
1. Location	SKH District, Khoroo 4: Area 25,442 ha, Population 8,160	SKH District, Khoroo 7: Area 292ha, Population 11,179	KHU District, Khoroo 12: Area 10,740 ha, Population 4,719
2. Inhabitants	2 families and 7 persons in total live in the site.	Densely populated area within 1 km and closest 50 m.	No population within 2 km.
3. Economic Activities	No specific activities except for grazing.	A factory with license mines soil for the production of bricks, etc. A number of individuals also mine clay.	No specific activities except for grazing.
4. Traffic and Public Facilities (PF)	Medium to heavy traffic volume of 9km of 13km access from the City. A hospital locates in the center of Khoroo.	Large traffic volume of 10km of 13km access from the City. A high school, a kindergarten and a hospital locate in the center of Khoroo.	Large traffic volume of 19km of 23km access from the City. It may affect traffic to Airport. A secondary school, a kindergarten and a hospital locate in the center of Khoroo.
5. Cultural Property (CP)	No CP within 4 km	No CP within 4 km	No CP within 4 km
6. Public Health Condition	Possibility of some specific diseases caused by the UCDS	No specific disease	Possibility of some specific diseases caused by the MDDC.

Social aspects (2)

Items	TDDS	BKDS	BCMDS
1. Location	Area 25,442 ha, Population 22,963	District, Khoroo 1: Area 5,700ha, Population 5,807	BKDistrict, Khoroo 2: Area 10,000ha, Population 1,008
2. Inhabitants	No population within 1 km.	No population within 1 km except workers in the Anti-air Strike Base	No population within 2 km.
3. Economic Activities	3 brick manufacturing factories with license of mining clay locate between 1.2 and 1.9 km from the site.	Department for Protection from Air Strike in 600 m.	The site locates inside of currently operating coal mine. Coordination of mining work is critical.
4. Traffic and Public Facilities	Medium to heavy traffic volume of 6km of 10km access from the City. A hospital locates in the center of Khoroo.	Medium to light traffic No PF within 3.2 km	By road 130 km from the center of UBC. By rail 150 km and 5 - 6 hours. 4 schools and a hospital locates in the center of District.
5. Cultural Property (CP)	No CP within 4 km	No CP within 4 km	No CP within 4 km.
6. Public Health Condition	Possibility of some specific diseases caused by the previous Dari Ekh DS.	No specific disease.	Foot and mouth disease through cattle.

Natural environment (1)

Items	NEDS	XMKDS	MDDS
7. Topography and Geology	A mountain valley. Mainly consists of clayey soils.	Originally gentle hill changed to a big hole by soil mining. Mainly consists of clayey soils.	A small shallow valley. Mainly consists of sandy soils.
8. Groundwater	4 wells in 2.9 -3 km south of the site do not satisfy the sanitary requirement.	Because of clayey soil layer movement of groundwater might be less.	Direction of flow is from south to north, the Tuul river.
9. Hydrological Situation	Nearest river is 6km west.	2.8 km from Bayankhoshuu river.	4km from Tuul river of which water used by people for drinking.
10. Fauna and Flora	No important or rare species registered.	Hard to grow and live due to mining	Important or rare species have not been found within 4-5 km radius.
11. Meteorology	Need to protect the site from strong wind.	Less impacts by wind due to a deep hole.	Less impacts by wind due to dominant wind direction.
12. Landscape	Though no specific property, it may affect natural view.	Less impacts on landscape because of current land condition, a big hole.	Less impacts on landscape because of existence of current MDDS

Natural environment (2)

Items	TDDS	BKDS	BCMDS
7. Topography and Geology	A mountain valley. Mainly consists of clayey soils. Geological profile alluvial sandy-clay and clayey coarse breccia deposit.	Gentle concave land covered with dark brown soil.	Originally gentle valley changed to big holes by coal mining. Alkaline soil containing heavy metals like lead and copper.
8. Groundwater	Part of the Selbe river basin. But no data available.	Part of the Tuul river basin. But no data available.	Coal mining affects groundwater systems seriously.
9. Hydrological Situation	Land surface erosion observed. 6 km from Selbe river.	6km from Nalaikh river and 7km from Tuul river.	In the center of coal mine, there is a Nuurent spring.
10. Fauna and Flora	No important or rare species registered.	No important or rare species registered.	Hard to grow and live due to mining.
11. Meteorology	Need to consider measures to protect the site from flood by thawing and heavy rainfall.	70% of a year considered as windy days. Need to protect the site from strong wind.	Less impacts by wind due to a deep hole.
12. Landscape	Though no specific property, it may affect natural view.	Though no specific property, it may affect natural view.	No impacts on landscape because of current land condition, a big hole by coal mining.

Pollution (1)

Items	NEDS	XMKDS	MDDS
13. Air Pollution	Impacts of odor and dust will not be serious because of less populated area.	Odor and dust will affect populated area.	Impacts of odor and dust will not be serious because of wind direction.
14. Water Pollution	Possibility of polluting wells which locate south of the site because flow direction is north to south.	Possibility of polluting wells nearby the site.	Possibility of polluting surface and ground water because the site mainly consists of sandy soil.
15. Noise and Vibration	No serious impact due to less populated area	Noise and vibration will affect populated area.	No serious impact due to less populated area
16. Others	The rapid expansion of Ger areas may close to the site in near future.	Location of the site will violate the Law of "Household and Industrial Waste"	Impacts to the Biocombinate shall be examined.

Pollution (2)

Items	TDDS	BKDS	BCMDS
13. Air Pollution	Less impacts of odor except for workers of 3 brick manufacturing factories	Less impacts of odor except for workers of anti-air strike base	Less impacts of odor except for workers in the coal mine.
14. Water Pollution	Possibility of polluting surface and ground water which locate east side or down stream of the site.	Possibility of polluting surface and ground water.	High possibility of pollution due to relatively rich in surface and ground water which are connected each other through hydraulic system.
15. Noise and Vibration	Less impacts except for workers of 3 brick manufacturing factories	Less impacts except for workers of anti-air strike base	Less impacts than mining operation.
16. Others	The rapid expansion of Ger areas may close to the site in near future. Location of the site may violate the Law of "Household and Industrial Waste"	Difficult to get permission from the anti-air strike base	Location of the site will violate the Law of "Household and Industrial Waste" Require to coordinate with railway and mining operation.

2.5 financial issues

- Summary of Financial Analysis

1. Average Monthly Fee per person
2. Initial Investment Cost

Note : service life of XMKDS is only few years.

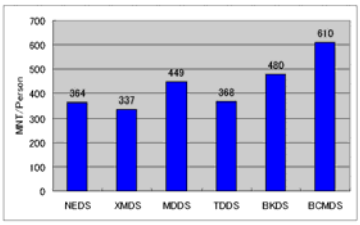
Summary of financial analysis (1)

Items	Unit	NEDS	XHKDS	MDDS
1. Collection and Transportation Cost	MNT/ton	15,364	13,727	19,323
2. Final Disposal Cost	MNT/ton	3,125	3,396	3,507
3. 1+2	MNT/ton	18,489	17,123	22,830
4. Administration Cost	MNT/ton	1,849	1,712	2,283
5. Total Cost	MNT/ton	20,338	18,835	25,113
6. Waste Generation per Person in 2010	kg/day	0.596	0.596	0.596
7. Average Collection Fee per Person	MNT/month	364	337	449
8. Average Collection Fee per Household	MNT/month	1,636	1,515	2,021
9. Initial Investment	Million MNT	7,035	6,234	8,719
10.Total Annual Cost in 2010	Million MNT	4,874	4,595	5,961

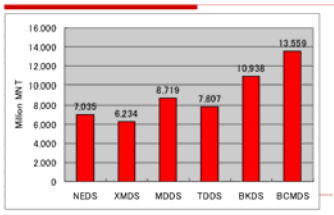
Summary of financial analysis (2)

Items	Unit	TDDS	BKDS	BCMDS
1. Collection and Transportation Cost	MNT/ton	15,123	21,058	27,767
2. Final Disposal Cost	MNT/ton	3,576	3,326	3,260
3. 1+2	MNT/ton	18,699	24,384	31,027
4. Administration Cost	MNT/ton	1,870	2,438	3,103
5. SWM Unit Cost	MNT/ton	20,569	26,822	34,130
6. Waste Generation per Person in 2010	kg/day	0.596	0.596	0.596
7. Average Collection Fee per Person	MNT/month	368	480	610
8. Average Collection Fee per Household	MNT/month	1,655	2,158	2,746
9. Initial Investment	Million MNT	7,807	10,938	13,559
10.Total Annual Cost in 2010	Million MNT	4,997	6,299	7,857

Average Monthly SW Fee per person



Initial Investment Cost



3 Recommendations of the second workshop

- **Difficult to come to a single decision because Workshop was complex:**
  1. **6 alternative sites & 33 criteria for each**
  2. **55 Workshop participants**

3.1 parallel approaches:

- **Workshop participants divided into 4 groups with mixed interests for group discussion and conclusion**
- **Rational approach of Difference Analysis with Group input**

3.2 Groups asked to select the 5 most important criteria Summarized as:

- **General Site Conditions**
- **Costs**
- **Social Impacts**
- **Pollution Impacts**
- **Life of the Site**

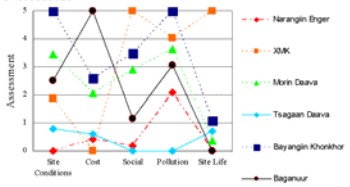
3.3 Conclusion of Group Presentations and Evaluations

Group	First Choice	Second Choice
A	Narangiin Enger	No preference expressed
B	Narangiin Enger	Tsagaan Davaa
C	Narangiin Enger	Tsagaan Davaa
D	Narangiin Enger	Tsagaan Davaa

3.4 Difference Analysis

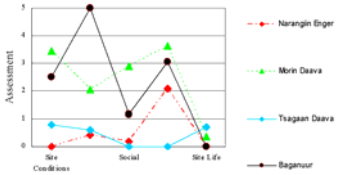
- **Criteria Assessment:**
  1. **General Site Conditions – Group assessment on scale of 0 for the best to 5 for the worst**
  2. **Costs – best indicator Total Annual Cost in 2010**
  3. **Social Impacts – Group assessment on scale of 0 for the best to 5 for the worst**
  4. **Pollution Impacts – Group assessment on scale of 0 for the best to 5 for the worst**
  5. **Life of the Site – assessed by Study Team**

3.5 Average of assessments for the 6 sites and 5 criteria.



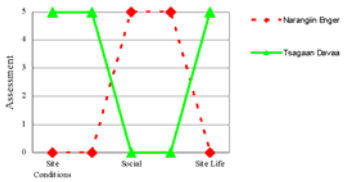
Bayangiin Khonkhor can be discounted since 3 sites are assessed as being better for all variables. XMK has a very short life – not a long-term solution.

3.6 Assessment of Four Sites



Site lives range from 14 to 16 years - within the margin of error of site investigations. Therefore Baganuur and Morin Davaa can be dismissed because the other two sites are clearly superior to them on all other criteria.

3.7 Assessment of Two Sites



Narangiin Enger preferred for Site Conditions, Cost and Site Life. Tsagaan Davaa preferred for Social and Pollution.

- **Comparing Social: no one lives within 1km of Tsagaan Davaa but there are 3 brick factories between 1.2 and 1.9 km. 7 people live at the Narangiin Enger site, where grazing is the only economic activity. Thus Social differences are small and are certainly not strongly in favor of Tsagaan Davaa.**
- **Cost difference is MNT123 mill for 2010 increasing each year to a total of MNT1.5 bill of Net Present Value when discounted over a 15 year life of the sites at 8%.**
- **Narangiin Enger probably has a longer site life, and its general Site Conditions are regarded as being superior to those of Tsagaan Davaa. The cost advantage outweighs any Pollution disadvantage.**
- **Thus for Difference Analysis, Narangiin Enger should be preferred over Tsagaan Davaa.**

Workshop Decision

- **Group discussions and Difference Analysis came to the same conclusion**
- **At the end of the Workshop participants confirmed that Narangiin Enger and Tsagaan Davaa should be recommended for consideration by the Steering Committee.**

4. Recommendation on Third St/C meeting

After the various discussion and site visit to the Narangiin Enger and Tsagaan Davaa sites, Member of Steering Committee reached the decision that future disposal site should be;

Narangiin Enger

Thank you very much for your attention

c. Q & A

Q1: Mr. Byambatogtokh, World Vision Representative

I realized that the Pilot project which was presented was implemented in Sri Lanka, so in

which other countries have similar pilot projects been implemented? As I have seen on the presentation the landfill area will be higher than the ground level due to the daily soil covering operation, thus will it have an environmentally adverse effect upon the completion of the Landfill area or not? Khoroo No.20 of Songinokhairkhan district has a serious problem of bad smell due to the Waste Water Treatment Facility and this bad smell can exist even in Khoroo No 6, 1 and 2. The reason why there is a bad smell of Waste Water Treatment Facility currently is because of the poor design of the Russians and they did not consider about the bad smell which can be emitted nearby area likewise, when you establish the Landfill area can you also consider about bad smell that can be emitted at the Final Disposal Site. In accordance with City Development Plan of Ulaanbaatar, it is expected that the boundary of Ulaanbaatar city will be expanded to Songinokhairkhan District thus, is the Narangiin Enger really the right place to establish the Final Disposal Site?

A1: Mr. Shimura

We had already implemented similar pilot projects same in about 10 countries. However, the weather condition of Sri Lanka was completely different to Mongolia. For instance, the annual precipitation in Sri Lanka was 4000 mm whilst the precipitation in Mongolia is 300-400 mm. Therefore, in Sri Lanka we faced the difficulties that can contaminate the ground water as it is rainy country. In other words, after the rain falls in the disposal site there is a high risk of contaminating the water as it is absorbed into the soil. In consequence of this, it was required to establish a Leachate Facility at the Final Disposal Site. By taking this action we have limited the downstream water that can contaminate the ground water and also constructed a cut off drain to divert the rain water and flood. Different countries have different problems, although there was a water contaminating problem in Sri Lanka, in Mongolia there are problems of smoke caused by fire at the disposal site and wastes disposed at the site can be scattered by wind everywhere depending on weather conditions. According to our estimation, there is unlikely to be a problem of leachate that will be generated at Ulaanchuluut Disposal Site, however there is no guarantee that leachate would not be a problem at this Disposal Site therefore, we will construct a Leachate Facility. We will also provide fencing around the Disposal Site and the embankment will be constructed in a valley. After compacting the wastes at the disposal site the daily operation of soil covering will be done. A hazardous gas releasing facility will be installed at Ulaanchuluut Disposal Site. For the pilot project implemented in Sri Lanka we have estimated to use that disposal site for 10 to 50 years moreover permanent monitoring is undertaken after the pilot project was implemented. But for Mongolia, the most considerable question is the hazardous gas (methane gas) that generates at disposal site. The fire catches hold at the disposal site due to the wastes continuously discharging methane gas. It is clear that we cannot eliminate the methane gas completely therefore we are intend to install a Gas Realeasing Facility at Ulaanchuluut Disposal Site.

Q2: Mr. Ganbold, Governor of Khoroo No.4, Songinokhairkhan District:

As I have participated in the 1st and 2nd workshops and am also attending this seminar I'm quite familiar with this study work and additionally our khoroo closely cooperates with the JICA Study Team and the Governor's Office of Ulaanbaatar city. The study of this Solid Waste Management work is useful and efficient work for the citizens of the Capital City. As you know well, 6 districts of Ulaanbaatar city dispose the wastes at Ulaanchuluut Disposal Site thus during the implementation of pilot project the access road will be constructed from the main asphalt road to the disposal site - do you think if we can have some traffic policeman to control the waste collection truck movement?

Mr. Delgerbayar, Officer of Public Service Department responded that we will provide documents to waste collection truck drivers, so that we will be able to know from which khoroo and what kinds of wastes had been collected. After the wastes have been collected the Khoroo Governor should make a final record prior to delivery of the wastes to the disposal site. Such documentation is required in order to calculate the trip numbers so that we can calculate the driver's salary. Also drivers will compulsory come to the control building to weigh their wastes and also a camera might be installed at the control building. Thus wastes which have been disposed illegally will be decreased.

A2: Mr. Shimura:
Regarding the methane gas removal system, there is a perforated tube inserted into the buried waste. Through this tube the methane gas can be removed. The methane gas is generated by kitchen waste, but in UB the kitchen waste is only 13% of all waste which is exceptionally low by international standards.

Earlier Mr. Delgerbayar explained about the weigh bridge in detail, I will show a picture that shows the inside of the monitoring building, including weigh bridge digital monitor.

Q3: SKHD 4th khoroo resident, representative of a Tolgoit NGO Ms. Batbileg
Were there any people present during the selection of the candidate sites and final disposal site? Since the choice has been made, how are you going to deal with the sanitation problem that occurs in khoroos that are passed through by the collection vehicles? The research shows that the new site is far from the residential area, but as we live there I am more familiar with the situation and it is very close to the residential area. What would you say about this?

A2: Mr. Delgerbayar
There is a shortcoming in some people: for them, if the bad stuff is further away from them it is the best solution, even if it means others will get the bad stuff. I think this question has that kind of ideology. First, the study team has conducted a survey among the residents of khoroo number 4, then the next day we went and introduced the results to them. There are all participating and encouraging this study well. To change this bad image about the waste disposal site, we are conducting a pilot project with a US$200,000 dollar budget, that will transform the current UCDS into an international standard disposal site. At the end, there will be a road built to the disposal site, there will be no smell, fire, or scattered waste on and around the disposal site.

The residential area is exactly 1.8 km away from the disposal site, we measured the distance from the last family. Also, with the help of the Japanese Government there will be some new vehicles introduced that have closed compartments, which will prevent the waste from scattering along the road.

Q4: Water Facility Company Ms. Yanjindulam
On the pilot project explanation chart, the base of the big excavated area was covered with cement. What happens to that cement after the site is full and the whole area is covered with soil? Will it affect the environment? Will UCDS become a residential area in the future? Earlier you have mentioned that at the weigh bridge they will record the TUK name, waste type and amount. So how are you going to differentiate the waste type, will there be constructed a separating facility in each district or there will be one central one at the disposal site? Also, there are many companies that transport their own waste with own trucks, what about those companies? Also, what are you planning to do with the construction waste?

A4-1: Mr. Delgerbayar
In the 2nd phase of the study we will conduct many researches that will show whether the site was chosen correctly. It will show if there will be any negative impacts. During those studies opinions of the residents will be very important to us. The waste recycling is a very important issue, thus we will search for that kind of opportunity. There will be 2 more public hearings organized. During them we welcome any opinions and suggestions from the residents.

A4-2: Mr. Shimura
There was public opinion survey held in SKHD 4th khoroo and the result was introduced there. Most of the residents stressed the importance of waste recycling. Thus, we will conduct a pilot project to see if a waste recycling factory can be built and operated. If it is possible, there will be many advantages like more employment etc.

At the moment, there is no work done for hazardous waste in UB, thus we are going to conduct research on it, then we will solve the monitoring problem. What do you think, which one is better: that hazardous waste is dumped all around the city in secret without being identified or identifying the waste and letting the waste generators keep or discharge it?

Q5: Nalaikh district TUK director Mr. Z. Erdenekhuu
Our TUK don't own any heavy equipments like bulldozers to cover the waste with soil, we sometimes borrow military vehicles from nearby army station to cover our waste. I heard that Nuuts company equipments are being renewed and their budget is being increased three fold. Will our TUK receive any of that kind of help?

A5-1: Mr Delgerbayar
The Nuuts company budget is set by the city government and they are talking about increasing it, thus since your company is not included in the state budget we cannot help you with your daily operational costs. However, there is going to be some equipment help from the Japanese side.

A5-2Nuuts company director Mr. Jambaldorj
When I worked in SKH district Governor's Office, I used to have a very negative opinion about this study. However, my opinion has changed lately. We should support the project as much as we can. People are trying to do a good thing for us. You should receive and read all the material that the team has distributed before and ask reasonable questions.

Q6: Ministry of Environment Ms. Nergui
The selection of the disposal site was made from a very few candidate sites. These 6 sites are badly chosen, for example, 2 of these sites are coal mines. Coal emits methane gas and what will happen together with a waste that emits methane gas too, thus this site wasn't even supposed to be suggested at 1st place.

I want to mention also, that we are talking about building a hazardous waste crematorium.

Nalaikh district Governor Mr. Sh. Vanganjil:
I participated in the Second workshop of this study and gained much knowledge about this project. I want to confirm that these people came to our khoroo many times, maybe 20 times, watching around, asking questions, doing research. I showed them around and tried to help as much as I can. We should be grateful; they are doing much work for our benefit. I am personally very thankful. They say they don't want the disposal site, well, give it to me, I want it, I will be happy to have such a clean and convenient disposal site, our environment will improve, equipment will be renewed, there will be no smoke and waste. The Ministry of Environment did not participate in Second workshop, I was looking for them, we were divided into groups to talk but no one from MOE was there.

You have seen the slide about Sri-Lanka, they don't have smoke and scattered waste now, it was beautiful, they are trying to make it like that, be positive about it. Excuse me, I did not mean to offend anyone, if I did.

Q7: Mr. Byambatogtokh, World Vision Representative
First of all I think there is nothing wrong with clarifying the positive and negative impacts that this study can have, today, right now. Today, from Germany or Japan, doesn't matter, from where people are coming and doing some studies and leaving. Only Mongolians will be left to deal with the works that they left. Thus, grandmothers and grandfathers who will live in that region should come up and let their voices be heard. We should let them speak out. I don't live in that 4th khoroo but I spend most of my day working there, thus I think this issue concerns us too.

During the 90's we imported many trolleybuses from Russia, now look at them, cannot use but cannot toss them out too. To avoid such problem in the future, we should talk about the problems and benefits here. The materials that were handed out today say that the water will have worse quality and even though there is no great negative impact on the environment, it says that the natural environment will be altered. You also say that there are only 7 families living there, which is also a false information, there are about 10,000 families living there.

Building a new disposal site will probably benefit Bayanzurkh or SKH district Governor's Office in some ways today because their work is being completed. But the residents suffer the effects. There a health problems from the polluted water and air.

A7: Mr. Delgerbayar
I think that all the residents who are representing the khoroo here are fully speaking their mind. We went to 4th khoroo and exchanged our opinions with khoroo residents. They are not only in favor of this project but even offered their help, including waste picker. Some said that they could help us pick up plastic bags from certain hills etc. You are a young person, instead of have these kinds of negative thoughts you should represent your World Vision organization and help us in some ways. About that 7 families, we are talking about families that are living on Narangiin Enger, not 4th khoroo residents.

4.1.2 Second Seminar

a. Objectives

The objectives of the second seminar were:

1. To present the proposed M/P and priority projects in order to achieve consensus among the stakeholders; and
2. To explain the pilot projects and seek the active cooperation of relevant stakeholders.

b. Outline of the Second Seminar

The Study's Second Seminar was held on Wednesday July 6th, 2005 at the Ulaanbaatar Hotel in Ulaanbaatar City, from 09.05 to 13.20.

Upon consideration of the objectives of the seminar 100 participants were invited from the following:

- Members of the St/C

- Members of the Technical Working Group
- Representatives of Duureg and Khoroo governments near proposed priority and pilot project sites
- Representatives of residents near proposed priority and pilot project sites
- Representatives of NGOs
- Mass Media.

Representatives of the Japanese Embassy in Mongolia and of JICA in Mongolia were also invited.

Attachment 1: presents the list of invitees.

Attachment 2: reports the questions the participants asked and the responses of the counterparts and consultants.

c. Seminar Program

The seminar program is shown in the table below.

Topic	Expositor	Time
1. Opening Address by Mongolian Side	MUB	9:00 – 9:15
2. Opening Address by the Japanese Side	JICA	9.15 – 9:30
3. Explanation of background and objectives of the second seminar	C/P and Study Team	9.30 – 9:45
4.1 Explanation of draft M/P and priority projects	C/P and Study Team	9:45 – 10:50
4.2 Question and answer	Participants, C/P and Study Team	10:50 - 11:10
Coffee break		11:10 – 11:30
5.1 Explanation of pilot projects	C/P and Study Team	11:30 – 12:30
5.2 Question and answer	Participants, C/P and Study Team	12:30 - 12:50
6. Closing Speech by Mongolian Side	MUB or MONE	12:50 – 13:00
Lunch		13:00 – 14:00

Opening addresses were made by Mr Munkhbayar, General Manager of the Mayor's Office of Ulaanbaatar City, and Mr Yoshio Kanzaki, JICA Resident Representative in Mongolia. Closing remarks were made by Mr Ch. Batsaikhan, Specialist of the City Development Policy Planning Department.

Full handouts of the presentation material for items 3, 4.1 and 5.1 were made available to participants in both Mongolian and English languages. The presentations were made by Mongolian counterparts Mr B Delgerbayar, Officer of the City Maintenance and Public Utilities Division of MUB (items 3, 4 and part of 5.1), and Mr Jambaldorj, Director of the Nuuts Company (part of item 5.1). This speeded presentation, by avoiding consecutive interpretation, and provided for greater counterpart ownership of the material. All Consultant's Team Members currently in Mongolia also attended in order to hear the views of the participants and to assist with responding questions.

Participants were very active in contributing to the discussion and those unable to do so in the available time were invited to contact the project at any time via the means indicated in the latest Study newsletter, which was also made available to participants.

d. Participants

There were 100 related people invited to the seminar and 75 people, including 4 uninvited guests, actually attended the seminar. The breakdown of the 75 attendants from various organizations is as follows:

MUB	8	Ministries and their departments	12
District Governor	4	Khoroo Governor	1
NGOs	3	TUKs	2
Private companies	2	Residents representatives (Khoroo of SKHD)	4 33
Press	6	JICA Mongolian Office	4

e. Presentation Materials

Item 3

Background and Objectives of the Second Seminar for THE STUDY ON SOLID WASTE MANAGEMENT PLAN FOR ULAANBAATAR CITY

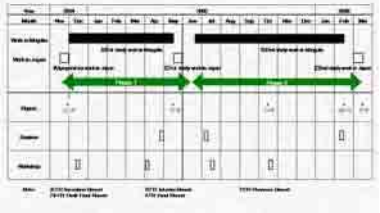
July 6, 2005
Counterparts of the Study and JICA Study Team

1. Background
1.1 Study Schedule (1)

- The Study on Solid Waste Management Plan for Ulaanbaatar City in Mongolia (hereinafter called the Study) is being conducted from November 2004 and will end March 2006. The Study consists of the following two phases and implemented as shown in the Figure below.

1. Phase 1: Formulation of the Master Plan (M/P) from November 2004 till May 2005
2. Phase 2: Feasibility Study for Priority Projects and Implementation of Pilot Projects from June 2005 till March 2006

1. Background
1.1 Study Schedule (2)



1. Background
1.2 Main Works in the Phase 2

- Feasibility study of the priority projects based on the draft M/P elaborated in the Phase 1 of the Study
- Implementation of the five pilot projects

2. Objectives

The objectives of the second seminar are:

- To present the proposed M/P and priority projects in order to achieve consensus among the stakeholders; and
- To explain the pilot projects to ask active cooperation from relevant stakeholders.

Thank you very much for your attention

Item 4

Draft M/P and Priority Projects

the Second Seminar
for THE STUDY ON SOLID WASTE MANAGEMENT PLAN FOR ULAANBAATAR CITY

July 6, 2005
Counterparts of the Study and JICA Study Team

Agenda

A) Outline of the Draft Solid Waste Management (SWM) Master Plan (M/P)
M/P 1: Planning Frameworks
M/P 2: Selection of an Optimum Technical System
M/P 3: Institutional Requirements
M/P 4: Outline of Draft M/P
B) Priority Projects for the Feasibility Study (F/S)

M/P 1: Planning Frameworks

1. Population
   - Proportion of Planned (Apartment) area vs. Unplanned (Ger) area:
   * 50.4 : 49.6 in 2004
   * 82 : 18 in 2020 based on City Development M/P
   - Forecast of future population based on "Population Projections of Mongolia, National Statistic Office of Mongolia"

Note: Waste generation rates of Ger area is 951 g/per/day, about 4 times more than it of Apartment area (256).

2. Waste Amount & Composition (to be modified based on the waste amount & composition survey in summer)
3. Waste Flow without M/P (to be modified)

Future Population Forecast

Duureg	2000	2005	2010	2015	2020
Bayangol	-	160,982	205,521	254,782	306,958
Bayanzurkh	-	178,809	212,120	246,811	281,332
Songinokhairkhan	-	185,634	200,274	211,575	218,496
Sukhbaatar	-	108,480	118,848	127,699	134,371
Khan-Uul	-	82,787	90,068	96,042	100,219
Chingeltei	-	124,640	133,058	138,898	141,499
Nalaikh	-	25,259	27,791	29,998	31,723
Study area	-	866,591	987,680	1,105,805	1,214,598
Baganuur	-	23,954	27,301	30,566	33,572
Bagakhangai	-	3,770	4,297	4,811	5,285
All Ulaanbaatar	772,126	894,315	1,019,278	1,141,182	1,253,455

The study area is seven Duuregs in Ulaanbaatar.

Future Waste Generation Amount

Category	2005	2010	2015	2020
Household Waste	511.0	536.7	554.0	562.8
General	(183.2)	(240.9)	(310.0)	(390.5)
Ash	(327.8)	(295.8)	(244.0)	(172.3)
Commercial Waste (Restaurant)	10.5	13.2	16.3	19.7
Commercial Waste (Other Shop)	3.6	4.5	5.6	6.8
Office Waste	13.7	17.3	21.2	25.9
Market Waste	3.7	4.7	5.8	7.0
School Waste	0.8	0.9	1.4	1.5
Hotel Waste	1.5	1.9	2.3	2.8
Road Cleaning Waste	8.0	9.1	13.6	14.9
Total	552.8	588.2	620.2	641.4

Decrease of ash due to reduce of Ger area population affects very much for future generation.

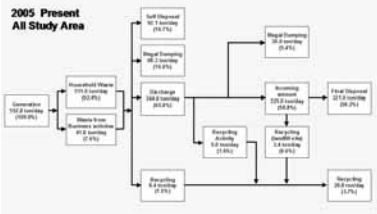
Future Waste Composition

Waste Composition of MSW	2005 (%)	2010 (%)	2015 (%)	2020 (%)
Kitchen Waste	12.5	15.5	19.3	23.7
Paper	5.2	6.5	8.1	10.0
Textile	2.0	2.5	3.1	3.8
Grass and Wood	0.5	0.5	0.5	0.6
Plastic	7.8	9.8	12.1	14.9
Leather and Rubber	0.3	0.3	0.4	0.4
Combustibles	28.2	35.1	43.5	53.4
Metal	1.5	1.9	2.4	2.9
Bottle and Glass	5.5	7.1	8.8	10.7
Ceramic and Stone	1.9	2.0	2.1	2.3
Miscellaneous	2.7	2.8	3.0	3.2
Non-combustibles excluding ash	11.6	13.8	16.3	19.1
Other Weight (%)	39.8	48.9	59.8	72.5
Ash Weight (%)	60.2	51.1	40.2	27.5
Total	100.0	100.0	100.0	100.0

Rate of kitchen waste is small while rate of paper and plastic is high.

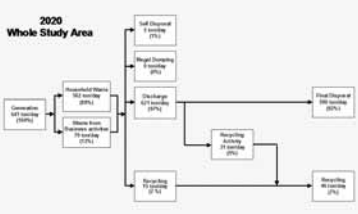
Waste Flow in 2005

2005 Present
All Study Area



Waste Flow in 2020: without M/P

2020
Whole Study Area



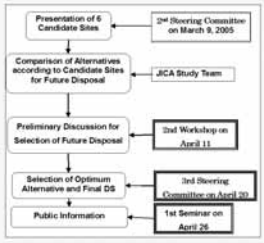
M/P 2: Selection of an Optimum Technical System

Selection Procedure of an Optimum System

1. Selection of future disposal site(s):
   Any SWM needs at least one final disposal site. A sound SWM will be able to establish by setting up a sound waste collection system and final disposal system. The 3Rs (Reduce, Reuse and Recycling), introduction of intermediate treatment system (processing including recycling) can be examined separately because the need of it highly depends on the location of landfill.
2. Identification of potential subsystem technologies
3. Screening potential subsystem technologies
4. Selection of an optimum technical system

Procedure of the Site Selection

The technical working group for site selection was organized. After the examination of 16 candidate sites, the group recommended the 6 candidates for further study by the end of February 2005.



Location of 6 Candidates for Future Disposal Site(s) and a Transfer Station

Presentation of Alternatives: Examination of Alternatives

Alternative (Site)	System
Alt 1: Narangiin Enger candidate site (NECS)	6 Districts ⇒ NEDS Nalaikh District ⇒ NCMDS
Alt 2: XMKCS	6 Districts ⇒ XMKDS Nalaikh District ⇒ NCMDS
Alt 3: Morin Davaa candidate site (MDCS)	6 Districts ⇒ MDDS Nalaikh District ⇒ NCMDS
Alt 4 : Tsagaan Davaa candidate site (TDCS)	6 Districts ⇒ TDDS Nalaikh District ⇒ NCMDS
Alt 5: Bayangiin Khonkhor candidate site (BKCS)	6 Districts ⇒ T/S ⇒ BKDS Nalaikh District ⇒ BKDS
Alt 6 BCMDS: Baganuur coal mining candidate site (BCMCS)	6 Districts ⇒ T/S ⇒ Railway ⇒ T/S ⇒ BCMDS Nalaikh District ⇒ NCMDS

Conclusion of 2nd Workshop & 3rd St/C

1. Workshop (2)

Group	First Choice	Second Choice
A	Narangiin Enger	No preference expressed
B	Narangiin Enger	Tsagaan Davaa
C	Narangiin Enger	Tsagaan Davaa
D	Narangiin Enger	Tsagaan Davaa

The workshop participants confirmed that Narangiin Enger and Tsagaan Davaa should be recommended for consideration by the Steering Committee.

2. 3rd St/C

After the various discussion and site visit to the Narangiin Enger and Tsagaan Davaa sites, Member of Steering Committee (St/C) reached the decision that future disposal site should be ***Narangiin Enger.***

First Seminar

The First Seminar was held on April 26 to present decision on the selection of Narangiin Enger candidate site for the future final disposal site in order to achieve consensus among the stakeholders. 100 persons from relevant organizations and communities were invited and in total 61 participated including 13 persons in total from residents and administrative officers of Khoroo No. 4 of SkhD where the Narangiin Enger candidate site is located.

Optimum Technical System

Discharge & Collection System
Planned Area

1. Separate collection
   - General waste: 2 days/week, fixed days
   - Recyclable waste: 1 day/week, fixed days
2. Compactor truck
3. Entrance collection with bell system
   - Residents discharge their waste inside of the entrance of the apartment.
   - When a compactor truck comes, it informs of its arrival by playing music.
   - Then guards and cleaners of apartments carry waste to the compactor truck for loading.

Discharge & Collection System
Unplanned Area

1. Mixed collection
   1 day/2 weeks, fixed days
2. Dump truck
3. Door to door collection with bell system
   - Residents store their waste inside of the Hasha.
   - When a truck come, it informs of its arrival by playing music.
   - Then residents carry waste to the truck for loading.

Or, Curb-side collection with bell system.

Discharge & Collection System
Special Order

- Waste which are not suitable for regular collection
- Large amount of waste
  - Factories, Supermarkets, Hotels, Restaurants, large amount of waste from residence, etc.
- Bulky waste
  - Furniture, TV, Refrigerator, Washing machine, Computer, etc.
- Request of collection by telephone
- Special fee

Special Collection

Recycling and Intermediate Treatment System: Objectives of SWM

The objectives of SWM change as social development progresses.

1st stage: Sanitation → Collection improvement
2nd stage: + Environmental Protection (Sanitary Landfill) → Sanitary landfill
3rd stage: + Conservation of Natural Resource = Minimization of consumption of natural resources → 3 Rs

We should target the 3rd stage objective.

Required Energy Input

Reduce is the best because it requires the least energy input.

MSWM Policy
Priority Ranking of Measures

1. Reduce: At first, we should try to minimize the waste generation amount.
2. Reuse: If waste is generated, we should try to reuse it.
3. Material Recycle: If waste is generated and if it can not be reused, we should produce goods by using waste as raw material.
4. Thermal Recycle: If material recycle is difficult, you should do Thermal Recycle of it.
5. Sanitary disposal of waste

Proposed Recycling and Intermediate Treatment System

- Proposed system
  - Material recycle: Private companies (main) and a sorting yard
  - Thermal recycle: RDF plant
- Separate collection: two kinds of waste
  - Recyclable waste → Sorting yard + RDF production plant
  - Non-recyclable waste → Disposal sites

What are Recyclables?

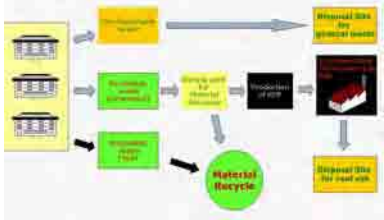
- Paper
  - High quality => Material recycle "Toilet paper"
  - Low quality => Thermal recycle "RDF"
- Plastic
  - High quality => Material recycle
    - Plastic bottle goes to China.
    - HDPE goes to plastic bag factory in Ulaanbaatar.
  - Low quality => Thermal recycle "RDF"
- Can => Material recycle
- Metal => Material recycle
- Bottles => Material recycle

(Under the deposit system)

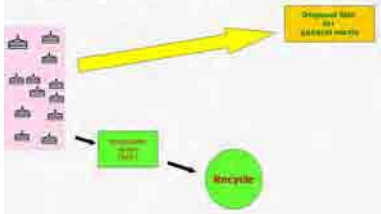
Material recycle targets these.

Thermal Recycle "RDF" Targets These.

Master Plan of Waste Stream for Planned Area



Master Plan of Waste Stream for Unplanned Area



Reasons of recommendation

- Waste composition: large portion of recyclable wastes (especially it of planned, 51.6%) and small portion of compostables (13.0 %)
- Possibility of material recycle is limited due to very limited final users, i.e. most of them are in China.
- Big demands of fuel for heating and power generation plants.
- RDF is made from SW (paper and plastics) of higher calorific value, 5,000 and 8,000 kcal/kg (coal 3,200 kcal/kg).
- Material recycle needs purity & quality of waste as raw material while thermal recycle doesn't require them.

Final Disposal System

- Sanitary landfill operation to avoid adverse impacts => See pictures !!!
- Location of disposal site:

1. NECS for the use of the central six Duuregs;
2. Nalaikh mining pit candidate site for the use of the Nalaikh Duureg;
3. Morin Davaa disposal site for the use of the Khoroo 12, 13 and 14 of Khan-Uul Duureg; and
4. Songinokhairkhan Duureg (SKhD) Khoroo 21 disposal site for the use of the Khoroo 21 in SKhD.

Location of Future Disposal Sites

M/P 3: Institutional Requirements

1. Financial System
2. Private Sector's Participation
3. Others

Financial System (1)

1. Waste revenues will be centralized into a municipal-level waste fund so that cross-subsidy is made possible among Duuregs and that MUB, which has authority to levy penalties against non-payers, will be responsible for fee collection through Duureg governments.
2. In Ger area, fee payment is made compulsory while waste will be collected from all households, in order to increase the fee revenue and at the same time reduce illegal dumping.
3. Strict enforcement measures for payment are introduced to all categories of waste generating sources. As a result, revenues from Ger area will increase significantly.

Financial System (2)

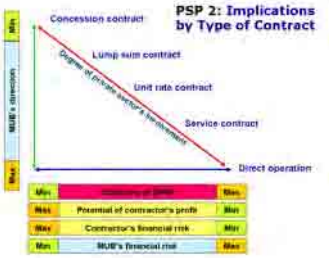
4. A uniform household-based fee is introduced in all residential areas of all Duuregs, including Ger and apartment areas, which enables the introduction of cross-subsidies between Ger and apartment areas and between Duuregs.
5. Poor residents in Ger areas are exempt from waste fee payment in exchange of labor contribution to street cleaning.
6. TUKs assets are privatized and their management are integrated into a "waste management unit" of their respective Duureg governments. Waste collection are contracted out to private waste collectors.
7. Part of fee revenues is used to finance landfilling at the final disposal site.

Private Sector's Participation (PSP 1): General Objectives

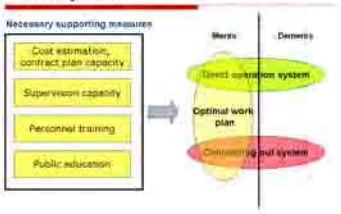
1. Market competition
   - Minimization of expenditure
   - Transparency, accountability
2. Reducing municipal outflow by using private capital
3. Increasing flexibility

Objective 1 is important.

PSP 2: Implications by Type of Contract



PSP 3: Policy for Private Sector's Participation



PSP 4: Proposed Plan

Waste collection
- Lump sum contract by collection area.
  - MUB hold and lend some equipment to contractors . Many contractors can participate.
  - Division of collection areas will be planned in phase 2 of the Study.

Intermediate facilities
- MUB owns main facilities, i.e. Sorting yard, RDF, etc.
- Operation: Leasing contract

Final Disposal
- MUB owns the disposal site.
- Operation: Direct operation or Contracting out. It will be planned in phase 2.

Workshop for equipment maintenance
- MUB owns it.
- Operation: Direct operation

Others

- Strengthening of monitoring and information management system
- Strengthening of City Maintenance and Public Utilities Division of MUB
- Strengthening of Nuuts comapny

M/P 4: Outline of Draft M/P

1. Goal of the M/P
2. Policies of the M/P
3. Technical system scenarios and targets
4. Waste flows of each scenario

Goal of the M/P

The goal of the M/P for SWM in MUB is:

"To establish an environmentally sound SWM system in MUB by 2020".

The establishment of such a system will:
- Maintain the urban environment and public health of MUB, which is the center of economic and industrial activities of Mongol and has 40 % of national population, and contribute to the sound development of urban life.
- Motivate foreign investment and tourism whereby the economic development of Mongol will be promoted.

Policies of the M/P (1)

- Collection service will cover all the residents in the study area by 2010.
- The wastes collected will be disposed of at final disposal sites by sanitary landfill method to minimize negative effects on environment.
- The fundamental goal of the M/P is to establish an environmentally sound SWM system in MUB by the target year 2020.
- To achieve this goal, 3Rs (Reduce, Reuse, Recycle) will be actively promoted to reduce waste generation at first, then to reuse and recycle generated wastes as a resource as much as possible in order to reduce the amount of the solid waste to be disposed of at the landfills.

Policies of the M/P (2)

- To realize the goal, MUB will actively support the activities for "Reuse" and "Material Recycle" by the private sector.
- Among the non-reusable and non-materially-recyclable wastes, paper and plastic wastes are higher calorific materials but problematic for sanitary landfill operation.
- Plan for "Thermal Recycle" by the public sector participation such as construction and operation of RDF (Refuse Derived Fuel) plant will be conducted to recycle and process those materials.

Technical System Scenarios and Targets (1)

- From the viewpoint of public participation on reuse and recycling of wastes the following four scenarios are examined and M/P will target scenario 4.

1. Minimum Participation (Current level) => Recycling rate 7%
2. Medium Participation => Recycling rate 10%
3. Active Participation => Recycling rate 15%
4. Maximum Participation => Recycling rate 18%

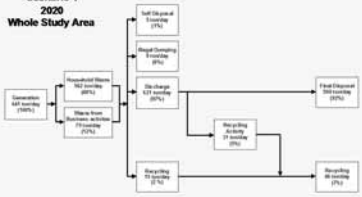
Recycling rate of Japan in 1999 is 13.7%. M/P will target scenario 4 and detailed activities will be examine in Phase 2 of the Study.

Technical System Scenarios and Targets (2)

Scenario		1	2	3	4
Promotion of 3Rs other than demand creation by minimum technical and financial support		-	●	●	●
Separate collection of recyclable wastes initiated by MUB		-	-	●	●
Recovery by sorting plant		-	-	●	●
Thermal recycle by RDF		-	-	●	●
Creation of demand for recyclable waste		-	-	-	●
Collection service to whole population		●	●	●	●
Sanitary landfill		●	●	●	●
Amount of recyclable materials (papers, plastics, metals, and bottles and glass: 38.5 % x 641.4)		247 ton/day	247 ton/day	247 ton/day	247 ton/day
Recycle rate (by the generation waste amount)		7 %	10 %	15 %	18 %
Recycled Amount	Total	46 ton/day	64 ton/day	96 ton/day	116 ton/day
	Public	0 ton/day	0 ton/day	32 ton/day	32ton/day
	Private	46 ton/day	64 ton/day	64 ton/day	64 + 20 ton/day

Waste flow of scenario 1

Scenario 1
2020
Whole Study Area

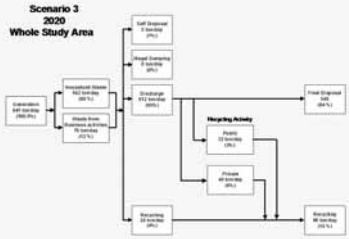


Waste flow of scenario 2

Scenario 2
2020
Whole Study Area

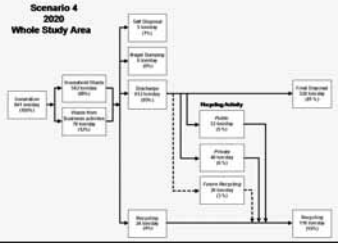
Waste flow of scenario 3

Scenario 3
2020
Whole Study Area



Waste flow of scenario 4

Scenario 4
2020
Whole Study Area



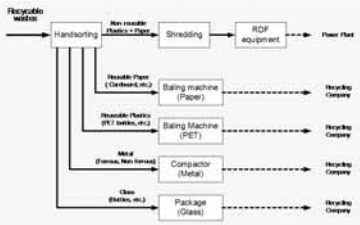
B. Projects for the Feasibility Study(1)

1. Improvement of collection system including development of a central workshop
2. Development of the new NEDC
3. Development of a recycling complex next to the NEDS

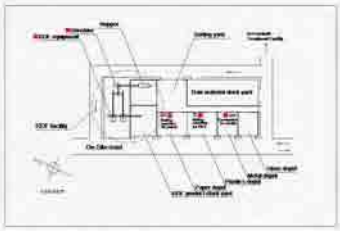
Development Plan of NEDS and Recycling Complex (1)

Development Plan of NEDS and Recycling Complex (2)

- Construction of a sorting yard and a RDF plant
  - Promotion of 3Rs by MUB and provision of job opportunities for waste pickers and residents nearby
- Provision of infrastructure for private investors for recycling business
  - Recycling business needs residue a disposal site.
  - The recycling complex will develop cooperation in a mutually complementary form if various kinds of recycling factories locate in the site.
  - Thus, it creates jobs opportunities to residents around the site.



Processing Flow of Recycling Complex



Plan of Recycling Complex

Shredder

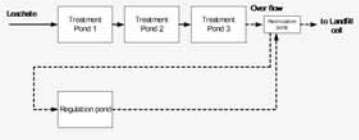
RDF Production Machine with Feeder

RDF Product (Plastics + Paper)

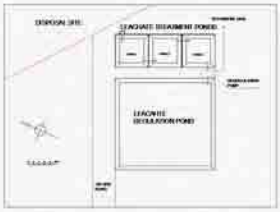
Baling machine for Paper

Baling machine for PET bottles

Compactor for Metals



Leachate Treatment Flow



Plan of Leachate Treatment Facility

Thank you very much for your attention

Item 5

Pilot Projects

the Second Seminar
for THE STUDY ON SOLID WASTE MANAGEMENT PLAN FOR ULAANBAATAR CITY

July 6, 2005
Counterparts of the Study and JICA Study Team

General Objectives of Pilot Projects (PPs)

- The objectives of pilot projects are:
1. To examine the viabilities of the technologies proposed in the M/P
2. To actually demonstrate the proposed technologies to stakeholders to deepen their understanding on them
3. To provide on-the-job-training opportunities and transfer proposed technologies to counterparts through the joint implementation
4. To motivate counterparts and relevant people towards the improvement of SWM
5. To review and to improve the draft M/P by counterparts through the experience of PPs

Proposed Pilot Projects (PPs)

- The following PPs will be conducted:

PP.1 Urgent improvement of Ulaan Chuluut disposal site (UCDS)
PP.2 Thermal recycling "RDF"
PP.3 Movable recyclable collection system "Chirigami Kokan", swapping recyclable for toilet paper
PP.4 Examination of the loading device for heavy waste
PP.5 Raising public consciousness on waste issues

PP.1 Urgent improvement of UCDS: Objectives

1. To establish a control and management system of collected waste in order to avoid illegal dumping; i.e. to dispose of all collected wastes at UCDS;
2. To dispose of the wastes to be hauled at the designated area of the UCDS, that is the first step of the sanitary landfill operation; and
3. To rehabilitate completed landfill area of the UCDS and conduct a sanitary landfill operation as much as possible.

Improvement works for objective 1

Work Items	Responsible Body
1.1 Registration of collection service organizations other than TUK and establishment of control system of them	MUB
1.2 Strengthening control and management capability of Nuuts Co., Ltd. including increase of budget for it	MUB
1.3 Unification of access to the southern road a. Installation of fences, etc. b. Enforcement	 JICA ST MUB
1.4 Installation of a weigh bridge and construction of control building a. Installation of electricity b. Procurement and installation of a weigh bridge c. Operation and maintenance of the bridge	 JICA ST JICA ST MUB
1.5 Development of a database for control & management of waste collection and disposal a. Development of a database b. Operation and maintenance of it	 JICA ST MUB
1.6 Development of monitoring and control system for illegal dumping	MUB
1.7 Strengthening enforcement	MUB

Improvement works for objective 2 & 3

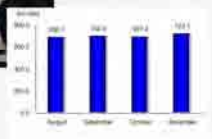
Work Items	Responsible Body
For objective 2	
2.1 Establishment of boundary of the UCDS by installation of a gate/fences and enclosing bank	JICA ST
2.2 Construction of enclosing dam and bank to establish waste disposal operation area (working face)	JICA ST
2.3 Improvement of on-site road	JICA ST
For objective 3	
3.1 Cleaning wastes dumped along access road and surround areas	MUB
3.2 Rehabilitation of completed landfill area by re-shaping, slope trimming of existing landfill surface and soil covering	MUB
3.3 Plan and conduct of waste disposal plan	MUB & JICA ST
3.4 Conduct of waste compaction and leveling	MUB
3.5 Conduct of soil covering	MUB
3.6 Control of waste pickers	MUB & JICA ST
3.7 Installation of gas removal facilities	JICA ST
3.8 Installation of storm water drain	JICA ST
3.9 Installation of leachate treatment facility	JICA ST
3.10 Establishment of a monitoring committee of disposal sites and conduct of periodical monitoring	MONE & MUB

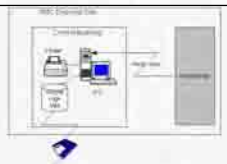
Urgent improvement of UCDS

Weighbridge (1)
Installed at Phnom Penh => All incoming vehicles are checked

Weighbridge (2)
installed at Phnom Penh

=> All wastes disposed of at the disposal site are input into the database





Weighbridge Data Base Diagram in Phnom Penh

Weighbridge Data

Once the Weighbridge data is imported to the PPWM's office DB, the following reports are available:
- Incoming waste by Vehicle
- It by collection area
- It by waste category

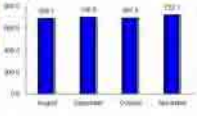
Also all the data can export to excel file format and then make any type of report like:
- Daily, monthly and yearly disposal amount of waste
- Disposal amount according to waste categories
- Others

Incoming waste amount by vehicle

Incoming waste amount by collection area

Incoming waste amount by waste category

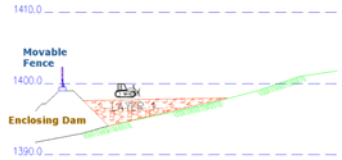
Average daily amount of waste brought to disposal site

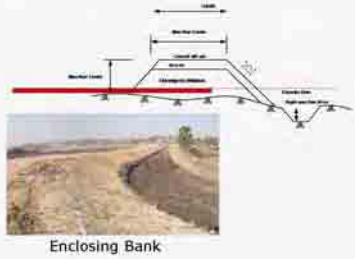


Average daily amount of waste brought to disposal site by District

Khan	Month	Average Daily Amount (ton/day)
Chankar Mon	August	156.7
	September	138.0
	October	157.1
	November	173.2
Daun Penh	August	186.9
	September	214.9
	October	201.3
	November	150.4
Thilleara	August	133.5
	September	114.3
	October	97.6
	November	97.5
Toul Kok	August	182.8
	September	190.3
	October	187.7
	November	161.2
Dang Kor	August	7.5
	September	6.1
	October	16.7
	November	23.5
Mean Chey	August	-
	September	-
	October	66.1
	November	58.7
Russei Keo	August	13.2
	September	9.4
	October	30.6
	November	49.5

Enclosing dam and sanitary landfill operation (1)





Enclosing Bank

Enclosing dam and sanitary landfill operation (2)

Rehabilitation of completed landfill area

Example of Rehabilitation of a Completed Landfill Area in Mexico (Before Improvement)

Re-shaping Operation

Soil Cover

After Improvement

Gas Removal Facility

Leachate Treatment Pond in Phnom Penh

Monitoring Committee

- In order to maintain sanitary landfill operation, which needs continuous efforts and financial input a monitoring committee with the following members will be established to monitor the operation:
  - Government officers from MOE, MUB, Songinokhairkhan Duureg and Khoroo No 4
  - Neighborhoods
  - Local environmental NGOs
  - Others

Schedule of Improvement of UCDS

PP.2 Thermal recycling "RDF (Refuse Derived Fuel)"

Why we will examine possibility of RDF production from waste (1)

1. There are a lot of papers and plastics wastes which can not be recycled and those wastes cause many problems to landfill operation such as waste scattering and creation of unstable land due to difficulty of compaction and decomposition.

Why we will examine possibility of RDF production from waste (2)

2. Waste characteristics
- Large portion of papers and plastics especially apartment area, i.e. 12.8% and 22.4%.
- In future portion of papers and plastics will increase and apartment area will be enlarged.

3. Economically prospective waste recycling technology
- Composting → Not feasible
  - Unsuitable waste composition
  - Lack of demand for compost
- Waste Incineration → Not feasible
  - Too expensive in investment and operation costs
  - Large area of land for landfill is available. No reason to spend much money for waste reduction by incineration.

Why we will examine possibility of RDF production from waste (3)

- To burn RDF in the existing power generation and heating plants
  - No investment cost
  - No extra operation cost
  - → may be Feasible
- Production cost of RDF is not expensive.

4. Prospective demands for RDF
- Calorific value of RDF made from papers and plastics will be range of between 5,000 and 8,000 kcal/kg (coal 3,200 kcal/kg)
- There are many possible users of RDF, i.e. power generation and heating plants.
- Needs of fuel for heating is very high due to extremely cold weather.

Why we will examine possibility of RDF production from waste (4)

5. There are many environmental concerns of combustion of RDF made from paper and plastic wastes, such as emission gas. Continuous combustion under high temperature (> 850 C°) can minimize generation of dioxin. => should not burn under the conditions other than this.
6. However, since RDF is not popular technology, people concern about environmental aspects => Therefore, we need to conduct this pilot project to relieve them

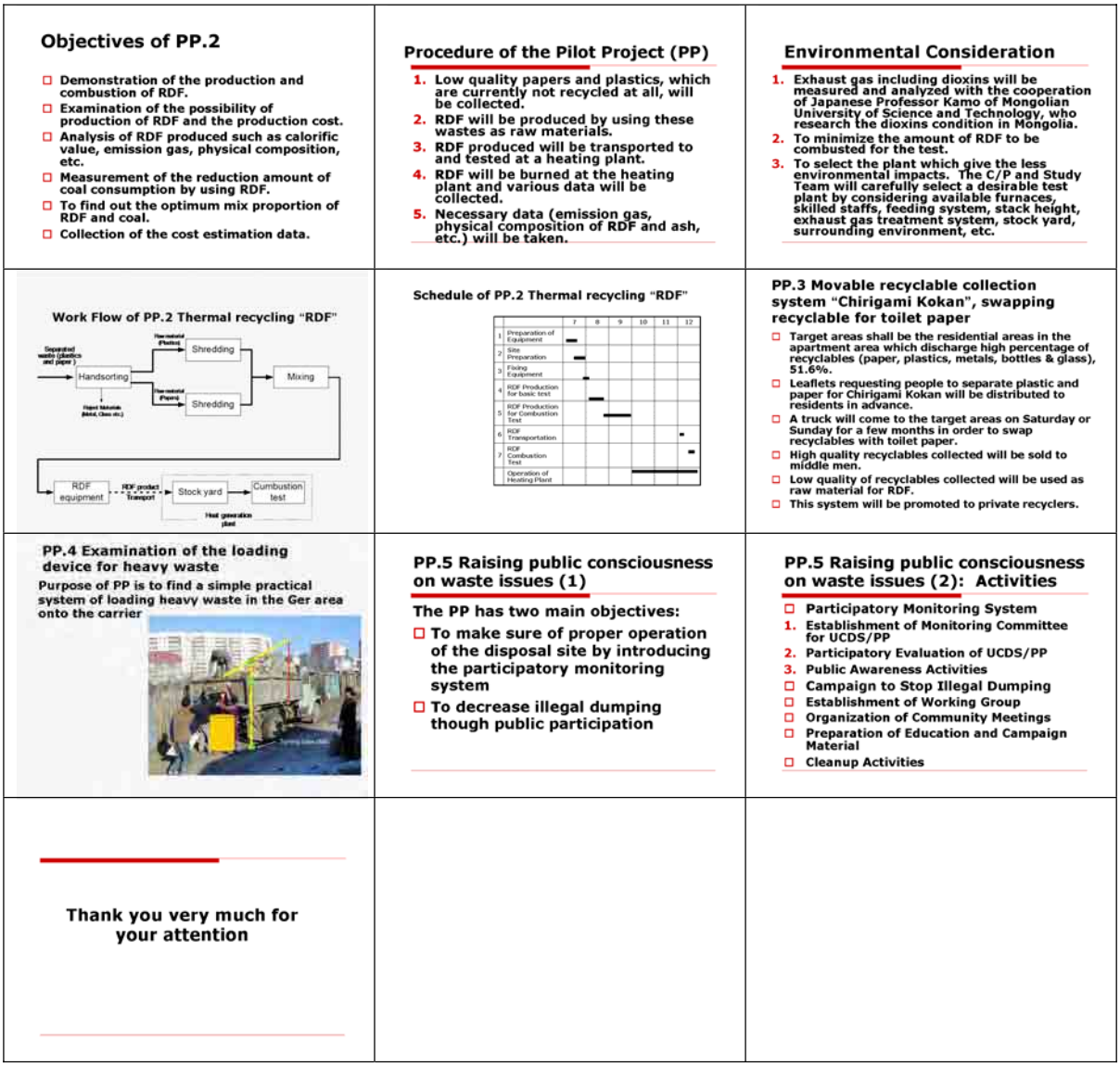
Should stop open burning of plastic wastes

Comparison RDF to Coal

1. NOx and SOx in emission gas: RDF = Coal
2. Dioxins in emission gas: RDF > Coal
3. RDF more often imperfectly combust because its combustion speed is higher than that of coal. Secondary combustion system to stabilize combustion and gas treatment system are preferable for RDF.
4. HCl generated through combustion of RDF may make water pipes corrode.
5. RDF increase the combustion temperature. It may affect the furnace which was designed for low temperature.

Concept of RDF in Master Plan

1. Target Plant: 3rd Power Station
   - 2 furnaces may be OK for RDF
   - Combustion temperature is enough high, 1200 deg C . Dioxin guideline in Japan impose more than 850 C.
2. Target Waste
   - Used paper excluding cardboard
   - Low quality plastic excluding plastic pet bottle which is currently recycled.
3. Target waste amount
   - 6.5% of the total waste generation in 2005. about 30 ton per day in 2005.
   - It will increase because the packaging waste increase.



f. Q & A

Q1: Mr. Darisuren, Residents' Representative of Khoroo No. 4, SKh District

I have a few questions to ask.

1. How the future population forecast is being corresponded to reality?

2. For the waste discharge and collection system in planned area it was mentioned that the guards and cleaners of apartments will carry wastes which were collected in an entrance to the compactor truck for loading. Most of the guardman of the entrance are the old people or only a woman who is not strong so do you think these people can carry the waste to compactor for loading?

3. When I was in army there was an arm roll container truck if this kinds of truck is available it will be useful and better for the guardman because they do not need to collect the wastes in their entrance and take it to the compactor truck for loading as these people are not strong enough. The public container will be outside of the apartment so all the residents of that apartment should dispose the waste in that container then the guardman will collect the wastes which were only disposed outside of the container and put it to public container.This

kinds of procedure will be easier for the guardman instead of collecting wastes in their entrances.

4. Currently, dump truck is collecting wastes in unplanned ger area and even they have a covering on top of the wastes in dump truck it catches a wind and scattered everywhere while it was loading to Ulaanchuluut Disposal Site. In this regard, if available, these dump trucks should be replaced by compactors or the waste collection trucks which are not open on top. (the tops are not open)

5. I liked your financial system of waste collection fee which is included in your Master Plan.

6. It seems like the current waste pickers working at Sorting yard are working with good earnings at the moment so if in case they will be asked to work on Sorting yard the salary provided to them will be same as their previous income or not. I hope the salary wouldn't be less than their previous income. Did you conduct a survey in accordance with this matter?

A1-1: Mr. Delgerbayar
You have asked some valuable questions that we should consider in our Master Plan. For your first question regarding future population forecast, we have taken these numbers officially from National Statistic Center and as we can see these official report the numbers of population is expected to be in increased in the future.

A1-2: Mr. Shimura:
I would like to respond for the question of waste discharge and collection system. For the question of guards and cleaners will carry the waste that collected in entrance in their apartment, the condition of every apartment is different than each other while some of the apartment has dust chute and the residents dispose the waste in their apartment dust chute however, for some apartment the residents just put the waste outside of the door and the guard and cleaners collect it and carry it to waste collection truck for loading. Even there are some apartments which has only the public container outside of the apartment and residents dispose the waste in that public container. Concerning with these different condition we are going to implement the different system for this. Moreover than this, in accordance with our study we will find out who will load the waste and there is a variable system that we can carry out. Current waste discharge and collection system is different than another and the presentation is done for this question. The most important thing of waste discharge and collection system is the residents and waste collectors (loaders). Therefore, these two parts should fix the certain day and time to collect the waste. For instance, in my office building, somebody has put the cigarette butt in dust chute in couple months ago and there occurred two incidents almost to catch the fire. I think the problem with this is because we didn't fix the certain day and time to collect the waste therefore, the wastes can catch the fire in dust chute and not only this even, there is a potential risk of building can catch a fire. Another example is there is a public container just in front of my rented house as I have noticed the apartment residents dispose the waste any time they wanted thus sometimes because of someone's careless action it catches a fire, briefly saying the residents have established a dump site just outside of their building. In consequence of this action, we would not like to introduce the public container system through our study. Because nobody is responsible for cleaning this public container and nobody owns it however, if someone will bear the responsible for this no problem we can use the public container system. I know the dump truck is open on top and these kinds of dump trucks are being used for collecting wastes in ger area currently. Only the problem for this dump truck is light wastes can be scattered everywhere on the way to disposal site thus considering this problem we are intended to introduce the compactor or waste collection truck which is closed on top in accordance with

our Master Plan. We have conducted a survey on waste pickers daily income, the result shows the daily average income of waste pickers was 3500 tug (three thousand and five hundred tugricks). If you have seen a waste picker that was driving a truck that vehicle can be a Company truck or middleman's own truck who purchases the raw materials and recyclable wastes.

A1-3: Mr. Delgerbayar, Officer of Public Service Department
We have conducted a survey regarding waste pickers daily income. It was 2500 tug (two thousand and five hundred tugricks only) however, we are going to cooperate with a project on "Improvements for waste pickers" jointly funded by initiative of sustainable countries, Canadian Fund and UNDP to take action for how to stop waste picking, to include the waste pickers in vaccination and to register the waste pickers, genders etc. In other words, as we will cooperate together with this Canadian project we will conduct a detailed study regarding waste pickers.

Q2: Mrs Gantsetseg, Residents' Representative of Khoroo No. 4, SKh District
What are you going to do with sludge of Ulaanchuluut Disposal Site what action is to be taken? Are you going to doze this sludge by dozer or cover it by soil?

A2: Mr. Delgerbayar:
We will talk about this question clearly on our next presentation.

Q3: Ministry of Environment specialist Khishigjargal
I have 2-3 proposals, firstly, I think the fact that Ger khoroo produces 4 times more waste than apartment khoroo but receives less collection service might bring up some negative side effects. 2. About the fixed collection system, our country had this kind of system 15 years ago during the communist times, I think now people's ideologies have changed, much more advertisement and teachings would be needed to create the conditions needed to introduce this system. 3. Narangiin Enger site is still located above the wind direction like the current disposal site. Please, take into your consideration that we are still receiving lots of complaints about this issue. 4. People working at the disposal site currently would not want to work for lesser salary, what would you propose to solve this? 5. You proposed this cross subsidy method in collecting the collection fee. Ministry of Environment is in charge of the collection fee and we have decided about collecting it according to the family members' number not the income level. Thus, do you have any other alternative solution? 6. On the lowest level of the landfill, do you plan to create a protecting level that will protect the soil from the pollution?

A3-1: Mr. Shimura
Majority of the waste produced in Ger area, in fact, 90% percent is ash. The major cause of a problem with keeping waste at home is kitchen waste. However, ger area produces very small amount of kitchen waste, can say doesn't produce at all. This is the first reason of proposing to collect less frequent from Ger area, secondly, collection from ger area requires more costs. 2. I really appreciate the old communist time fixed collection system. Fixed collection system is agreed to be the best system all over the world. In Japan all the municipalities have to submit their fixed schedule and follow it strictly.

A3-2: Nuuts company director Mr. Jambaldorj
Reply to your 6th question, we have just talked about the landfill layers in detail, thus, I will not talk about it again.

A3-3: Governor's Office, City Renovation Department specialist Mr. Delgerbayar
I would like to add a few things. The main reason of building the landfill is the issue you just mentioned. We want to build a disposal site that will not pollute the environment and the city. The landfill is surrounded by a "green wall" and fence, and site workers would cover the

waste with soil on a daily basis so that it will not let the waste to be scattered by wind. I will answer the 4th question now. The waste pickers will not receive a salary by working at the sorting yard, they will sort and pick their waste as they are doing now and with the same principle they will sell those items. What we are doing is we are organizing them, giving them better working condition, also they will be vaccinated. 5th question, Ministry of Environment only has to come up with the collection methods, not the collection amount. MUB has a right to select the amount of payment, it is stated so in the law.

A3-4: Mr. Shimura
About the financial system, I would like to add something, ger area receives comparatively less collection service, and it only receives 50-55% of service while apartment area receives 100% of service. The reason why it happens this way is that ger area collection fee is 2-3 times more than of apartment area. Thus collection rate from ger area reaches only 10-20% and apartment area 100%. Without solving this problem with differences Ulaanbaatar city residents cannot 100% receive collection service. Our ST cannot make decision on this, Mongolian side can. Our team will pay much attention to improve ger area fee collection system. There is no better solution or system on collecting fees than cross subsidy. Here I would like to say to the participants from the Ministry of Environment to regularly attend our weekly meeting and give your opinions there often.

Q4: Noosimpex company director Tsolmon
Our Company was established in 1992 and since then we are producing toilet paper with recycled paper using Japanese machines and technology. First of all, I would like to express my gratitude to your ST for conducting this study that will solve our city solid waste management issue. On previous presentation it showed that waste paper amount is 28.7 tons. Do you have separate information on recyclable and non-recyclable waste paper amount? I think there should be conducted lots of training for public and it is best if solid waste lessons are included in middle school program. Also, I think it is a very good idea to collect separated waste from apartment entrance. However, the Chirigami Kokan system might cause a price increase when middle-men collect waste items and sell to us, thus is it possible to give to the producers directly? My last question is about the sorting yard that will be built on the disposal site. The waste separated there will be sold to producers or just given for free like it is done in Japan, in Japan I heard that it is given for free almost like a reward for recycling waste.

A4-1: Mr. Shimura
According to our winter WACS, the waste paper rate was 5.2, however we did not conduct a detailed survey on how many percent is recyclable paper. But I think that it is possible to obtain a rough data during one of our pilot projects, Chirigami Kokan.

A4-2: Governor's Office, City Renovation Department specialist Mr. Delgerbayar
When we say middle-men we refer to anyone who buys the recyclable waste, including the producers, we think that producers mainly will receive the waste directly from the households. We also think that we will distribute Mongolian made toilet papers to support domestic production. We will not only collect waste paper but also many different types of recyclable waste and will work closely on materials for RDF. However, about the waste distribution on sorting yard, we haven't decided yet how to give, for free or sell. We will meet certain amount of cost issue during the sorting procedures and haven't decided yet about how to reclaim that cost. About the training, we will conduct lots of training, distribute brochures, and will have volunteers and train them.

Q5: State Inspection Agency Inspector Oyundari
It is said that there will be 4 final disposal sites. Will all this sites have the same operational

system as Narangiin Enger? What about hazardous waste? Have you planned a facility?

A5-1: Mr. Shimura
We will give an idea of how to be organized, how to operate and how to manage the daily land filling operations to other three sites. We will give them instructions. The most important site is Narangiin Enger, 90% of all city waste is delivered there thus our study is focusing on improving this site. 2. Yes I agree that hazardous waste issue is very important. However, Narangiin Enger is a disposal site for non-hazardous waste only. Thus, every vehicle coming to the site will be inspected for a hazardous waste and if it carries hazardous waste it will not be allowed in. Control building will record the origin of the waste and its type. If the vehicle is carrying suspicious waste it will be checked. Our study will not include the hazardous waste, however to know the amount of hazardous waste we conducted factory survey. But the result was none, that there was no any hazardous waste produced in Ulaanbaatar. The reason for this false result is that we haven't cooperated with Inspection agencies thus factories hid the real data. If you need this survey to be conducted again, we ask Inspection agency to work closely with us.

A5-2: Governor's Office, City Renovation Department specialist Mr. Delgerbayar
I will add something here; Ministry of Health together with World Health Organization has conducted a medical waste survey. We agreed to cooperate on that matter and on disposal issue with them. There is a working group established especially to point out the hazardous waste disposal site.

4.1.3 Third Seminar

a. Background and Objectives

a.1 Background

The Study on Solid Waste Management Plan for Ulaanbaatar City in Mongolia (hereinafter called the Study) is being conducted from November 2004. The original study schedule consists of the two phases and would end March 2006.

As stipulated in the scope of work of the Study, which was discussed and agreed upon between the Municipality of Ulaanbaatar (MUB) and JICA on 13th September 2004, both MUB and JICA have agreed to conduct a Phase 3 study in order to monitor and follow-up the projects and programs to be proposed in the Study. Consequently the Study schedule has been revised as shown in the Figure below and consists of the following three phases:

Phase 1: Formulation of the Master Plan (M/P)

Phase 2: Feasibility Study for Priority Projects and Implementation of Pilot Projects

Phase 3: Monitoring and follow-up of the projects and programs to be proposed in the Study

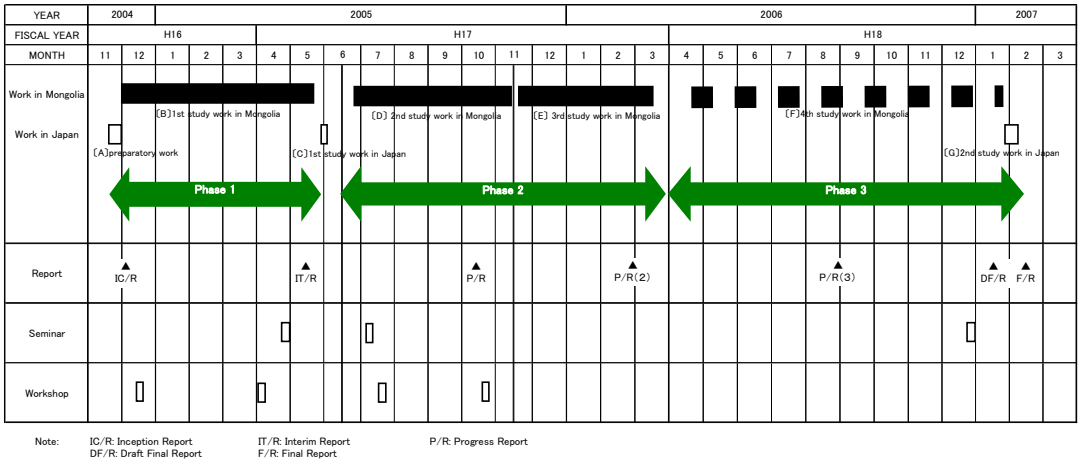


Figure 4-1: Revised Study Schedule

Phase 1 of the Study has been completed by the end of May 2005 and the JICA study team (the Team) in close collaboration with the counterpart (the C/P) has prepared a draft M/P. Based on the draft M/P the Team and the C/P conducted the priority projects for the feasibility study and several pilot projects in the Phase 2 of the Study. The Phase 2 commenced from mid-June 2005 and ended mid-March 2006. In order to monitor and follow-up the projects and programs proposed in the Study, the Phase 3 study is being conducted from April 2006 and will end February 2007.

a.2 Objective

The objectives of the third seminar are:

- To present the results of the Study to stakeholders;
- To share the important experiences of the Study in order to implement the proposed M/P; and
- To exchange opinions among stakeholders in order to smoothly implement the M/P.

b. Outline of the Third Seminar

b.1 Date and Venue

Date: January 5th (Fri), 2007

Place: Mongolia-Japan Center in Ulaanbaatar City

b.2 Participants

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

- Members of the St/C
- Members of the Technical Working Group
- Representatives of Duureg and Khoroo governments near proposed priority and pilot project sites
- Ulaanbaatar Citizens who are interested in SWM
- Representatives of NGOs
- Mass Media

c. Seminar Program

The seminar program is shown in the table below.

Topic	Expositor	Time
1. Opening Address by Mongolian Side	MUB	10:00 – 10:15
2. Opening Address by the Japanese Side	JICA	10.15 – 10:30
3. Explanation of Background and Objectives of the Third Seminar	Chairman of JICA advisory committee	10.30 – 10:45
P.1 Explanation of the M/P	C/P	10:45 – 11:15
P.2 Explanation of the Pilot Project on Collection System Improvement	C/P or Study Team	11:15 – 11:45
P.3 Question and answer on P.1 and P.2	Participants, C/P and Study Team	11:45 - 12:00
P.4 Pilot Project on Organization of Waste Pickers	C/P	12:00 – 12:30
Lunch Break		12:30 – 14:00
P.5 Results of the Second Mixed Combustion Test of RDF with Coal	Study Team	14:00 – 14:30
P.6 RDF System in Sapporo	Member of JICA advisory committee	14:30 – 15:00
P.7 Question and answer on P.4, P.5 and P.6	Participants, C/P and Study Team	15:00 - 15:30
P.8 Exchange of Opinions for Smooth Implementation of the M/P	Participants, C/P and Study Team	15:30 – 15:50
Coffee break		15:50 – 16:10
P.9 Conclusions and Recommendations	C/P and JICA advisory committee	16:10 – 16:20
4. Closing Speech by Mongolia - Japan Center	Mongolia – Japan Center	16:20 – 16:30

d. Presentation Materials

P.1

Master Plan for SWM in UBC

the Third Seminar
for THE STUDY ON SOLID WASTE MANAGEMENT PLAN FOR ULAANBAATAR CITY

January 5, 2007
Counterparts of the Study and JICA Study Team

Agenda

A) Planning Frameworks
B) Selection of Optimum Technical System
C) Outline of M/P

A) Planning Frameworks

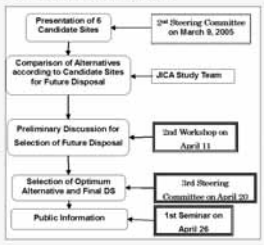
1. Site Selection for Final Disposal Site
2. Social Framework
3. Forecast of Future Waste Flow

A) 1. Site Selection for Final Disposal Site

- The solid waste management system formed a collection and haulage system to remove waste from the living space and a final disposal system to appropriately dispose of the removed waste.
- The site which disposes the most waste is Ulaan Chuluut Disposal Site (UCDS) which disposes over 90% of the waste generated in Ulaanbaatar City, however this site will reach capacity in a couple of years.
- The selection of a future disposal site in place of UCDS became an urgent issue in the formulation of the Ulaanbaatar SWM Master Plan (M/P).

Procedure of the Site Selection

The technical working group for site selection was organized. After the examination of 16 candidate sites, the group recommended the 6 candidates for further study by the end of February 2005.



Location of 6 Candidates for Future Disposal Site(s) and a Transfer Station

Examination of Each Candidate Site

Alternative (Site)	System
Alternative 1: Narangiin Enger disposal site (NEDS)	6 Districts => NEDS Nalaikh District => Nalaikh Coal Mining disposal site (NCMDS)
Alternative 2: XMK disposal site (XMKDS)	6 Districts => XMKDS Nalaikh District => NCMDS
Alternative 3: Morin Davaa disposal site (MDDS)	6 Districts => MDDS Nalaikh District => NCMDS
Alternative 4 : Tsagaan Davaa disposal site (TDDS)	6 Districts => TDDS Nalaikh District => NCMDS
Alternative 5: Bayangiin Khonkhor disposal site (BKDS)	6 Districts => Transfer Station (T/S) => BKDS Nalaikh District => BKDS
Alternative 6 BCMDS: Baganuur coal mining disposal site (BCMDS)	6 Districts => T/S => Railway => T/S => BCMDS Nalaikh District => NCMDS

Conclusion of 2nd Workshop & 3rd St/C

1.Workshop (2)

Group	First Choice	Second Choice
A	Narangiin Enger	No preference expressed
B	Narangiin Enger	Tsagaan Davaa
C	Narangiin Enger	Tsagaan Davaa
D	Narangiin Enger	Tsagaan Davaa

The workshop participants confirmed that Narangiin Enger and Tsagaan Davaa should be recommended for consideration by the Steering Committee.

2. 3rd St/C

After the various discussion and site visit to the Narangiin Enger and Tsagaan Davaa sites, Member of Steering Committee (St/C) reached the decision that future disposal site should be ***Narangiin Enger.***

First Seminar

The First Seminar was held on April 26 to present decision on the selection of Narangiin Enger candidate site for the future final disposal site in order to achieve consensus among the stakeholders. 100 persons from relevant organizations and communities were invited and in total 61 participated including 13 persons in total from residents and administrative officers of Khoroo No. 4 of SkhD where the Narangiin Enger candidate site is located.

A) 2. Social Framework: Population Forecast

- Proportion of Planned (Apartment) area vs. Unplanned (Ger) area:
  - * 50.4 : 49.6 in 2004
  - * 82 : 18 in 2020 based on City Development M/P
- Forecast of future population based on "Population Projections of Mongolia, National Statistic Office of Mongolia"

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Future Population Forecast

Area	2006		2010		2015		2020	
	Ratio (%)	Population persons	Ratio (%)	Population persons	Ratio (%)	Population persons	Ratio (%)	Population persons
Apartment Area	54	481,037	62	612,362	72	796,180	82	995,970
Ger Area	46	409,772	38	375,318	38	309,625	18	218,628
Study Area	**100**	**890,809**	**100**	**987,680**	**110**	**1,105,805**	**100**	**1,214,598**

The study area is seven Duuregs in Ulaanbaatar.

A) 3. Future MSW Generation Amount (Winter)

Category	2005	2006	2010	2015	2020
Household Waste	511.0	518.8	548.3	585.4	625.0
General	(183.2)	(195.9)	(252.5)	(341.4)	(452.7)
Ash	(327.8)	(322.9)	(295.8)	(244.0)	(172.3)
Commercial Waste (Restaurant)	10.5	11.4	15.8	24.1	36.4
Commercial Waste (Other Shop)	3.6	3.9	5.5	8.3	12.6
Office Waste	13.7	14.9	20.7	31.5	47.8
Market Waste	3.7	4.0	5.6	8.5	12.9
School Waste	0.8	0.9	1.1	1.4	1.7
Hotel Waste	1.5	1.6	2.3	3.4	5.2
Road Cleaning Waste	10.0	10.3	11.4	12.8	14.0
Total	554.8	565.8	610.7	675.4	755.6

Decrease of ash due to reduce of Ger area population affects very much for future generation.

Future MSW Generation Amount (Summer)

Category	2005	2006	2010	2015	2020
Household Waste	186.7	198.2	249.5	327.5	421.2
General	(186.7)	(198.2)	(249.5)	(327.5)	(421.2)
Ash	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Commercial Waste (Restaurant)	11.3	12.3	17.1	25.9	39.3
Commercial Waste (Other Shop)	4.9	5.4	7.5	11.3	17.2
Office Waste	19.0	20.6	28.8	43.6	65.9
Market Waste	7.5	8.1	11.3	17.2	26.0
School Waste	0.4	0.4	0.5	0.5	0.6
Hotel Waste	1.3	1.4	1.9	2.9	4.4
Road Cleaning Waste	17.0	17.5	19.4	21.7	23.8
Total	248.1	263.9	336.0	450.6	598.4

GDP Growth Rate is 5.5%.

A) 3. Future MSW Composition (Winter)

Waste Composition of MSW	2005 (%)	2006 (%)	2010 (%)	2015 (%)	2020 (%)
Kitchen Waste	**12.6**	**13.2**	**16.3**	**20.7**	**25.7**
Paper	**5.2**	**5.4**	**6.7**	**8.5**	**10.6**
Textile	2.0	2.1	2.4	2.9	3.3
Grass and Wood	0.5	0.5	0.6	0.6	0.6
Plastic	**7.8**	**8.2**	**10.1**	**12.8**	**15.8**
Leather and Rubber	0.2	0.3	0.3	0.3	0.4
Combustibles	**28.3**	**29.7**	**36.4**	**45.8**	**56.4**
Metal	1.5	1.6	2.0	2.5	3.1
Bottle and Glass	5.4	6.0	7.2	9.3	11.3
Ceramic and Stone	1.9	1.9	2.1	2.3	2.5
Miscellaneous	2.7	2.7	3.0	3.3	3.5
Non-combustibles excleding ash	**11.5**	**12.2**	**14.3**	**17.4**	**20.4**
Other Weight (%)	39.8	41.9	50.7	63.2	76.8
Ash Weight (%)	**60.2**	**58.1**	**49.3**	**36.8**	**23.2**
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Rate of kitchen waste is small while rate of paper and plastic is high.

A) 3. Future MSW Composition (Summer)

Waste Composition of MSW	2005 (%)	2006 (%)	2010 (%)	2015 (%)	2020 (%)
Kitchen Waste	**33.8**	**33.9**	**34.5**	**35.2**	**35.8**
Paper	**18.9**	**19.0**	**19.3**	**19.7**	**20.0**
Textile	4.8	4.8	4.6	4.3	4.1
Grass and Wood	4.8	4.7	4.2	3.7	3.3
Plastic	**15.2**	**15.2**	**15.5**	**15.8**	**16.1**
Leather and Rubber	0.6	0.6	0.6	0.6	0.5
Combustibles	**78.1**	**78.2**	**78.7**	**79.3**	**79.8**
Metal	3.5	3.5	3.6	3.6	3.7
Bottle and Glass	10.5	10.6	10.7	11.0	11.2
Ceramic and Stone	6.8	6.6	6.0	5.3	4.6
Miscellaneous	1.1	1.1	1.0	0.8	0.7
Non-combustibles excleding ash	**21.9**	**21.8**	**21.3**	**20.7**	**20.2**
Other Weight (%)	100.0	100.0	100.0	100.0	100.0
Ash Weight (%)	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Rate of kitchen waste is small while rate of paper and plastic is high.

Other Wastes than MSW

	2006 ton/day	2020 ton/day
Non-Hazardous Industrial Waste	**67.8**	**143.3**
Hazardous Industrial Waste	**NA**	**NA**
General Waste from Medical Institutions	**15.2**	**20.8**
Infectious/Hazardous Medical Waste	**1.6**	**2.2**
Construction Waste in Winter	**60.6**	**128.0**
Construction Waste in Summer	**123.0**	**260.0**

Waste Flow in 2006 in Winter

Waste Flow in 2006 in Summer

Waste Flow in 2020 in Winter: without 3Rs Promotion

Waste Flow in 2020 in Summer: without 3Rs Promotion

B) Selection of Optimum Technical System

1. Policy of M/P
2. Method of Selection
3. Optimum Technical System

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B) 1. Policy of M/P

- Collection service will cover all residents by 2010. The waste collected will be disposed of at the final disposal site by sanitary landfill in order to minimize the negative effects on the environment.
- The fundamental goal of the M/P for SWM in MUB (Municipality of Ulaanbaatar) is to establish an environmentally sound SWM system in MUB by the target year 2020. To achieve this goal, the 3Rs (Reduce, Reuse, Recycle) will be actively promoted firstly to reduce waste generation, then to reuse and recycle generated waste as a resource as much as possible in order to reduce the amount of solid waste to be disposed of at the landfills.

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B) 2. Method of Selection

1. Site selection work was carried out for the final disposal site and a disposal site was selected which can be used until the M/P target year of 2020.
2. The necessity of introducing an intermediate treatment system was examined using the selected final disposal site as a base. Consequently, it was decided to plan the introduction of a valuables sorting yard and RDF production facility in order to promote the 3Rs.
3. As the introduction of a valuables sorting yard and RDF production facility was decided, optimum discharge and storage systems, and collection and haulage systems were examined for the introduction of separated collection necessary for the operation of the facility.

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B) 3. Optimum Technical System: 1. Final Disposal Sites in 2020

1. NEDS for the use of the central six Duuregs;
2. Nalaikh disposal site for the use of the Nalaikh Duureg;
3. Morin Davaa disposal site for the use of the Khoroo 12, 13 and 14 of Khan-Uul Duureg; and
4. Songinokhairkhan Duureg (SKhD) Khoroo 21 disposal site for the use of the Khoroo 21 in SKhD.

Landfill site	Ratio (%)	Final Disposal Amount (ton/day)	
		Winter season	Summer season
NEDS	91	935.4	911.2
MDDS	5	51.3	50.1
NDS	3	30.8	30.1
KH21DS	1	10.3	10.0
Total	100	1027.8	1001.4

Location of Four Final Disposal Sites in 2020

2. Recycling and Intermediate Treatment System: Objectives of SWM

The objectives of SWM change as social development progresses.

1st stage: Sanitation → Collection improvement
2nd stage: + Environmental Protection (Sanitary Landfill) → Sanitary landfill
3rd stage: + Conservation of Natural Resource = Minimization of consumption of natural resources → 3 Rs

We target the 3rd stage objective.

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MSWM Policy
Priority Ranking of Measures

1. Reduce: At first, we should try to minimize the waste generation amount.
2. Reuse: If waste is generated, we should try to reuse it.
3. Material Recycle: If waste is generated and if it can not be reused, we should produce goods by using waste as raw material.
4. Thermal Recycle: If material recycle is difficult, you should do Thermal Recycle of it.
5. Sanitary disposal of waste

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Recommended System

1. A Sorting Yard
2. RDF (Refuse Derived Fuel) Plant

- RDF (Refuse Derived Fuel) is a solid fuel made from solid wastes of higher calorific value wastes such as plastics and paper. RDF is like coal.

Why Sorting Yard ?

- To provide work opportunities to current waste pickers in UCDS in order to ensure sanitary landfill operation at the NEDS. Therefore, the facility shall limit use of machinery as much as possible;
- To promote reuse/material recycle of wastes; and
- To pre-treat wastes for RDF production.

Why RDF? (1)

- To mitigate problems for the sanitary landfill operation; i.e. scattering wastes and spoiling stability of landfill, by reducing problem some wastes such as plastics and papers; and
- To introduce and disseminate a thermal recycling technology of RDF that the private sector can not deal with at present and can recycle problem some wastes.

Target Waste for RDF Production

Proposed Recycling and Intermediate Treatment System

- Proposed system
  - Reuse & Material recycle: Private companies (main) and a sorting yard
  - Thermal recycle: RDF plant
- Separate collection: two kinds of waste
  - Recyclable waste → Sorting yard + RDF production plant
  - Non-recyclable waste → Disposal sites

Why RDF? (2): Waste Characteristics in MUB (All year in Apartment Area)

- Few portion of kitchen waste => 34.2%
- Few portion of compostable wastes (kitchen+ grass/wood) => 37.0%
- Large portion of high calorific wastes (paper + plastic) => 36.1%
- Ger area : Large portion of Ash => 82.9% (winter season)

Why RDF? (3):

- Why not an incineration plant?

Country	A. Unit Cost for Landfill (US$/ton)	B. Unit Cost for Incineration (US$/ton)	C. Benefit by Sales of By-product Electricity & Heat (US$/ton)	D. Benefit by Reduction of Landfill Cost (A x 0.8) (US$/ton)	E. Profit or Loss (C +D - B) (US$/ton)
Japan	300	150	5	240	+ 55.0
Bangkok in Thailand	10	60	2	8	- 50.0
UBC	4	60	3	3.2	- 53.8

If you incinerate all waste from Apart area in 2010, i.e. 250 ton/day, you have to pay an extra cost of 13,450 US$/day and 4.8 million US$/year.

- Why not a composting plant?

Few demand of compost made from municipal solid waste. Because animal manure is disposed of at municipal landfill with paying tipping fee.

Discharge & Collection System Planned Area

1. Separate collection
   - General waste: 2 days/week, fixed days
   - Recyclable waste: 1 day/week, fixed days
2. Compactor truck
3. Entrance collection with bell system
   - Residents discharge their waste inside of the entrance of the apartment.
   - When a compactor truck comes, it informs of its arrival by playing music.

Discharge & Collection System Unplanned Area

1. Mixed collection
   1 day/2 weeks, fixed days
2. Dump truck
3. Door to door collection with bell system
   - Residents store their waste inside of the Hasha.
   - When a truck come, it informs of its arrival by playing music.
   - Then residents carry waste to the truck for loading.

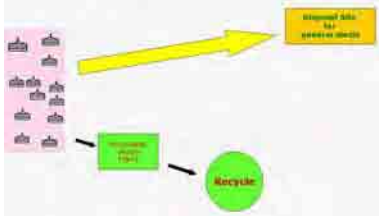
Or, Curb-side collection with bell system.

C) Outline of Master Plan

1. Proposed SWM System
2. Quantitative Targets
3. Future Waste Flows
4. Implementation Plan and Project Cost
5. Institutional Issues

C) 1. Proposed SWM System in Planned Area

Proposed SWM System in Unplanned Area

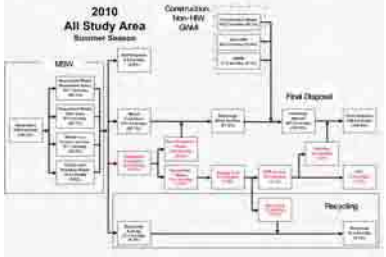


c) 2. Quantitative Targets

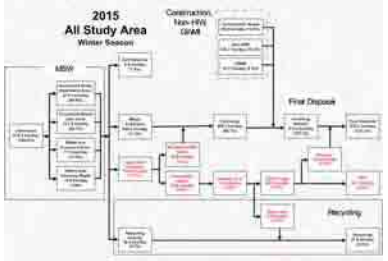
Items	2006	2010	2015	2020
Waste Collection Rate (%) Apartment Area Ger Area	100 42	100 100	100 100	100 100
Separate collection in apartment area •Separate collection rate (%) •Covered population (person)	0 0	15 83,587	40 289,809	70 634,432
Percentage of separate collection in generation amount (%) •Winter •Summer	0 0	4.9 8.5	17.7 25.4	40.4 48.9
Percentage of intermediate treatment in generation amount (%) •Winter •Summer	0 0	Pilot Plant 2.2 3.6	Medium Scale 8.0 11.1	Large Scale 18.5 21.8
Final Disposal Method • NEDS • Other 3 disposal sites	Open Dumping	Sanitary Landfill Level 4 Sanitary Landfill Level 2		

C) 3. Future Waste Flows: Winter in 2010

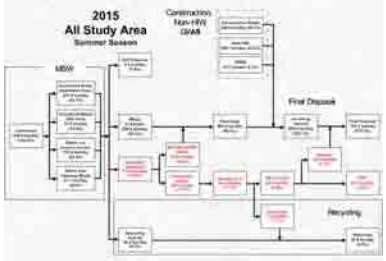
Future Waste Flows: Summer in 2010



Future Waste Flows: Winter in 2015

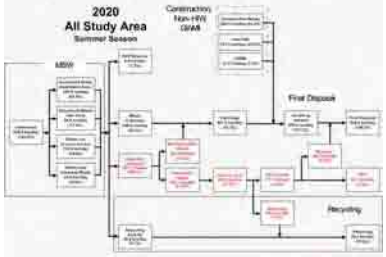


Future Waste Flows: Summer in 2015

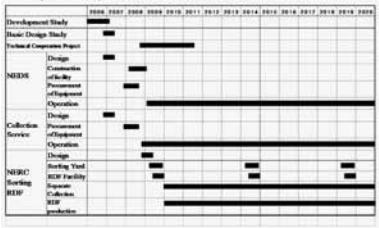


Future Waste Flows: Winter in 2020

Future Waste Flows: Summer in 2020



C) 4. Implementation Plan



Project Cost

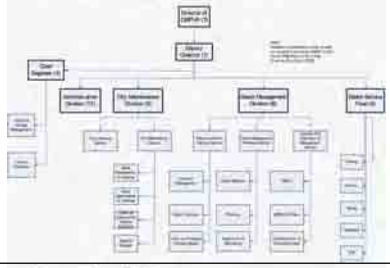
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Collection	Collect. Truck	Invest.	13	4,323	0	340	210	226	0	534	342	3,658	228	625	534
		OAM	0	0	3,375	3,867	3,915	4,044	4,086	4,258	4,411	4,533	4,511	4,689	4,883
Intermediate Treatment	Sorting RDF	Invest.	0	588	0	0	0	0	3,245	0	0	76	0	1,680	0
		OAM	0	0	191	191	191	191	196	431	431	431	431	441	867
Final Disposal	Equip & Facility Landfill	Invest.	209	4,936	0	0	0	0	0	0	0	286	0	0	0
		OAM	0	0	589	517	530	463	589	463	469	565	463	650	463
Total		Invest.	222	9,847	0	340	210	226	3,245	534	342	4,023	228	2,353	534
		OAM	0	0	4,467	4,515	4,636	4,698	4,871	5,152	5,311	5,529	5,411	5,980	6,008
		Total	222	9,847	4,467	4,857	4,846	4,926	8,116	5,686	5,653	9,552	5,639	8,053	6,542

C) 5. Institutional Issues

1. In order to smoothly implement the M/P Municipality of Ulaanbaatar (MUB) needs to execute the following institutional development:
   - Strengthening responsible organization for SWM in MUB => CMPUD to CMPUA
   - Improvement of financial system for SWM => Establishment of Waste Service Fund

Schedule	Staffs to be Employed and Paid by MUB	Staffs to be Employed and Paid by CMPUA	Total
By the end of 2006	30	To be advised by the JICA B/D Study Team	NA
By the end of 2008	45	To be advised by the JICA B/D Study Team	NA

Proposed Organization Structure of CMPUA



Improvement of Financial System

- The Waste Service Fund is established in the City and Districts named as City Waste Service Fund (CWSF) and District Waste Service Fund (DWSF).
- Instead of TUKs staff of the DWSF will collect waste collection fee from Business establishment.
- Instead of TUKs officers of Khoroo or Kheseg will collect waste collection fee from household in the Ger Area.
- Waste Collection Section or Unit of CMPUA will be able to provide waste collection service according to the order of District and be paid for the service by DWSF.
- Instead of Nuuts Co., Disposal Site Operation and Management Section of CMPUA will conduct operation of the disposal sites.

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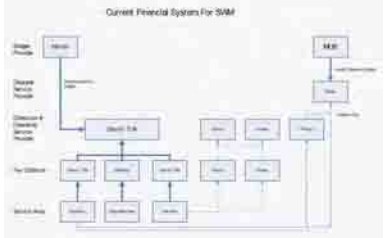
Current Financial System



Future Financial System

Collection System Improvement

1

Objectives

Longer term
- To promote 3R

Short term
- To examine the applicability of separate collection system

Separate Collection System requires:
- ✓ Scheduled Collection Service
- ✓ Discharge Rules

2

Collection System Improvement

To Proceed in Two Phases

1. Improvement of Collection System
   - Modification of Collection System
   - Introduction of Discharge rules
2. Introduction of Separate Collection

3

Project Site

4

1. Improvement of Collection System

- To implement a scheduled collection service
- To introduce discharge rules

5

Why we need discharge rules?

6

A collection Point in the Chingeltei District (2005)

Under the Container Collection System

7

Example of Waste Heaps in the Chingeltei District (Before PP)

A Loading Work in the Chingertei District (now)

8

How waste heaps are created?

10

How to prevent waste heaps?

A period of time between discharging and collecting waste have to be controlled within a certain interval of time.

- The schedule of collection service is fixed. (TUK is responsible)
- Residents discharge waste according to the collection schedule. (You are responsible)

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In order to achieve these 2 things, discharge rules are most effective tools.

Therefore…

We need discharge rules in order to keep our areas Clean!

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Proposed Discharge Rules

- Day
  - You can discharge waste only on the collection days.
    - Area A (Khoroo 2 & 3): Monday, Wednesday, Friday
    - Area B (Khoroo 1 & 4): Tuesday, Thursday, Saturday
- Time
  - People can discharge waste only at the designated time.
    - Please place waste in the morning of the collection day (by 9:00 a.m.) at a designated place

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Proposed Discharge Rules

- Place
  - People can discharge waste only at a designated place. (you can bring waste directly to a collection vehicle if you want)
- Manners
  - People have to discharge in the following way.
    - To discharge waste in a plastic bag (Don't dump waste directly on the ground.)
    - To bind tightly a plastic bag

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Roles and Responsibilities

MUB and JICA Study Team

- ✓ To formulate the draft of discharge rules (the rules is finalized through discussion with the Khoroo governments and housing associations)
- ✓ To prepare for educational materials in order to raise public awareness and make newly introduces discharge rules known widely

Khoroo Government

- ✓ To take an initiative to remove waste heaps from the Khoroo
- ✓ To encourage housing associations to implement discharge rules
- ✓ To raise public awareness
- ✓ To give punishment with fine, if someone or some business continue to dump waste at illegal dumping places

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Roles and Responsibilities

TUK

- ✓ To improve a collection service: fixing the collection time, not leaving any waste after the collection work, to do loading work quickly, and so on
- ✓ To make a consensus with business establishments (renegotiate its contract with each business establishment, if necessary)
- ✓ To monitor the discharge manner of business establishments and to give an instruction to them, if necessary

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Roles and Responsibilities

Housing Associations

- ✓ To decide discharge points
- ✓ To distribute education materials
- ✓ To give information on discharge rules to households and small shops
- ✓ To maintain discharge points clean
- ✓ To monitor the discharge manners of local residents and to give an instruction to them, if necessary

Local Residents and Business

- ✓ To support housing associations in order to keep their areas clean
- ✓ To follow rules

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Procedures (1)

Modification of Collection System

- Entrance Collection System
- Frequency of Collection Service (3 days per week)
- Collection Days
  - Area A: Monday, Wednesday, Friday
  - Area B: Tuesday, Thursday, Saturday
- Separation of Business Waste from Household Waste
- Adoption of Bell Collection System

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Collection Day

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Procedures (2)

Introduction of Discharge Rules

- Preparation Work
  - Baseline surveys
  - Consensus building with housing associations and the Khoroo government
  - Formulation of draft of discharge rules
  - Preparation of educational materials
    - Entrance Signboard
    - Leaflet
    - Street Signboard
  - Selection of monitoring person
  - Kick-off meetings
  - Cleaners meetings
  - Distributions of educational materials
  - Community meetings

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Procedures (3)

Introduction of Discharge Rules

- After implementation
  - Monitoring work
  - Continuous Educational Activities
  - Law Enforcement

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Signboard at Entrance

22

Leaflet

23

Street Signboard

24

Community Meetings

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Implementation (1)

	Areas	Starting Date
1st Area	North part of Khoroo 3 East part of Khoroo 1 Apartment no. 13 of Khoroo 4	August 28
2nd Area	South part of Khoroo	September 11
3rd Area	3Main part of Khoroo	September 18
	1(re-trial in Khoroo 1)	(October 23)
4th Area	1)Residential area in Khoroo	October 16
5th Area	2Khoroo 4	November 14

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Results (First Area in Khoroo 3)

Current Collection System

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Results (Second Area in Khoroo 3)

Current Collection System

Results (Third Area in Khoroo 1)

Results (Fourth Area in Khoroo 2)

Current Collection System

Results (Fifth Area in Khoroo 4)

New waste heap was created

2. Introduction of Separate Collection System

Target Buildings

4 apartment buildings of Housing Association "Ireedui-3" in Khoroo 3

Types of Recyclable

Category	Items included	Collection Day
General waste	Other than recyclable waste	Monday, Wednesday, Friday
Recyclable waste	Bottle, Plastic bottle, Paper, Can, Metal, Plastic	Saturday

Separate Collection System started on November 18, 2006 and continued for one month.

Notice for Separate Collection

Recyclable Waste Separately Discharged

Recyclable Waste Separated by Cleaners

Lessons and Recommendations

Findings

- To eliminate the waste heaps by improving the waste collection system is the essential first step toward the introduction of the separate collection.
- The entrance collection method was fount to be appropriate for the planned area in Ulaanbaatar City.
- The waste collection frequency of three times per week is enough for residential waste.
- It is possible to get cooperation to the waste collection by citizens.

Main Factors for Smooth Implementation of Discharge Rules

- Leadership of Khoroo Governor
- Roles of Housing Associations
- Support of Cleaners and Keepers
- Selection of Appropriate Monitoring Person

Issues to be Solved

- How to strengthen the community
- How to disseminate information to all the households
- How to take the value of property into account
- How to control the development of new buildings
- How to achieve the real collection efficiency (TUK)

Separate Collection
Findings

- People well cooperate for separate discharge.
- Cleaners sort tradable items from recyclable waste and sell to dealers. They earn about 1000Tg every week.
- The contents of waste collected by the recyclable waste can be very suitable for the raw material of RDF.

Separate Collection
Recommendations

- The separate collection should be introduced in the three years after the entrance collection system is introduced. Even if the separate collection has to be quickly introduced in, it should wait for one year after the entrance collection started.
- To sort recyclables by cleaners is the effective way as the waste source separation.

Organization and Control of Waste Pickers

Nuuts Co. Director
Mr. Jambordorj

1

Contents

1. Background of Organization of Waste Pickers
2. Waste Pickers Meeting
3. Registration of Waste Pickers
4. Waste Pickers Fund
5. Fire Fighting
6. Now and Future

2

Background-1

- Around 300 waste pickers are working at Ulaan Chuluut Disposal Site
- They are picking PET bottle, cardboard, aluminum can, steel and selling to traders and earning money for life.
- They are working very close to bulldozer, trucks in order to get valuables earlier than others
- Condition is Open dumping

4

Particular of WP s

	Female		Male		Total	
	Count	%	Count	%	Count	%
Adult	138	89%	136	79%	276	84%
Child	17	11%	36	21%	53	16%
Total	155	100%	172	100%	327	100%

7

Are you working whole the year?

Working form	Whole the year		Only in Summer	
	Count	%	Count	%
Adult	271	90%	3	12%
Child	31	10%	22	88%
Total	302	100%	25	100%

9

Are you working whole the year?

Working form	Whole the year		Only in Summer	
	Count	%	Count	%
Adult	271	90%	3	12%
Child	31	10%	22	88%
Total	302	100%	25	100%

9

Background-2

- UCDS will close in 2009
- NEDS will be constructed and replaced to UCDS
- NEDS will be operated under sanitary condition and not open dumping
- Waste will be covered with soil everyday
- Waste pickers will not be allowed to work at discharge point.

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Sanitary landfill

- Animation

11

Back ground-3

Sanitary landfill operation can become practical or not depends on the WP's cooperation

⇩

Organization of Waste Picker is essential

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WP Meeting

- WP meeting was held form 3 May 2006
- Meetings are held weekly
  - Thursday morning 10:00 - 11:00
- Warm garage was used for the meeting
- Minutes were recorded

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Topic s of the Meeting

1. Grouping of the WP s
2. Members rule
   - 16 years and above,
   - Change of members
   - Number of members, etc
3. Registration of WP s
4. Fire Fighting
5. Waste Pickers Foundation
6. Maintenance of Fair Trade Center

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Registration of Waste Pickers

Several meetings were held among WPs, Nuuts, JICA ST discussing about grouping and registration of WPs
Something to identify the registered members was required.

More than half of WPs does not have even national ID card.

⇩

Finally, issuance of Identification Card was decided

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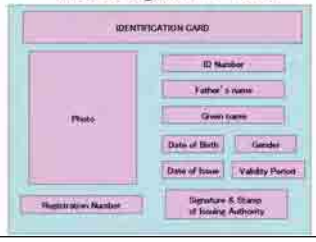
The design of ID card



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Registration for Photo Taking

ID Card

- Around 220 ID card was issued

Registration Database is kept in Computer in Weigh Bridge Control Building

Waste Pickers Fund

- Purpose of the Fund
  - The Fund that was established by WPs initiative shall be utilized to help members who are sick or somebody passed away, to get medical and sanatorium treatment, to organize certain events, to get civil registration documents and to provide one-time assistance for those who are having hard living.

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Fund Accounts

- Every week, the group leader collect 600 Tg from own members.
- Those members who are not able to pay shall be involved in cleaning up or related activities as their contribution to the Fund.
- Collected money shall be kept by Nuuts co.
- This Fund is used solely for WPs welfare.

And Now.

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Fire Fighting

- Fire in the disposal site causes not only troubles for landfill operation and surrounding environmental problems but also lose opportunities for WPs to earn money by picking valuables from the wastes.

Cooperation between WPs and Nuuts to fight with the fire.

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How to Fight with the Fire

- Fire fighting team was formed from each group
- Each group in charge three days a month as a fire fighting team
- Fire fighting team wears vest to be identified by the others.
- In case find fire, inform to Nuuts.
- Assist to extinguish fire with Nuuts.

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Last Fire

Fire Fighting Group with Vest

Extinguish Fire

Working face without Fire

Clean Up Activity

After clean up activity

Now and Future

- Current Condition of Waste Pickers
  - Working conditions in winter season
  - Children working in the Disposal Site
  - Assisting parents who do not have national ID
- Future Plan
  - No WPs working at working face of Disposal Site.
  - WPs are working at sorting yard where separated waste at generation source are collected and transported.

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Thank you very much for your attention

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Results of the Mixed Combustion Test of RDF with Coal

THE STUDY ON SOLID WASTE MANAGEMENT PLAN FOR ULAANBAATAR CITY

January 5, 2007
Counterparts of the Study and JICA Study Team

P.5

Agenda

A) What and Why is RDF?
B) Outline of the First Combustion Test of RDF with Coal
C) Necessary Information to Understand the Results
D) Result of the Test

A. What is RDF?

- **RDF (Refuse Derived Fuel) is a solid fuel made from solid wastes of higher calorific value wastes such as plastics and paper. RDF is like coal.**

Production Method of RDF

- RDF can be produced by compacting or heating raw materials. Through this process, plastic contents of the raw materials are melted and form RDF.

1. **Compaction Method:**
   This method is applied to the production of RDF in Japan. It requires high pressure for compaction of raw materials to generate heat and melt plastics by compaction heat. It, therefore, need a big RDF production machinery.
2. **Heating Method:**
   Under this PP, we could not provide a big compaction machine. In stead we produce RDF by melting raw plastics by external heating.

RDF Production in Japan by Compaction Method

RDF Production for the First Mixed Combustion Test (1): Raw Materials

RDF Production for the First Mixed Combustion Test (2): Heating Method

RDF Production for the First Mixed Combustion Test (3): Heating Method

RDF Production for the First Mixed Combustion Test (4): Heating Method

Why RDF? (1): To solve one of the most serious problems in MUB

There are a lot of papers and plastics wastes which can not be recycled and those wastes cause many problems to landfill operation such as waste scattering and creation of unstable land due to difficulty of compaction and decomposition.

Plastic Waste Problems at UCDS

The important issues for RDF are i. Separation of such wastes, ii. Costs of separate collection, iii. Air pollution measures and cost.

Why RDF? (2): Waste Characteristics in MUB (All year in Apartment Area)

- Few portion of kitchen waste => 34.2%
- Few portion of compostable wastes (kitchen+ grass/wood) => 37.0%
- Large portion of high calorific wastes (paper + plastic) => 36.1%
- Ger area : Large portion of Ash => 82.9% (winter season)

Current and future waste composition – Without Ash

Category of MSW	2005	2010	2015	2020
Kitchen Waste	34.2	34.9	36.0	37.3
Paper	17.4	17.8	18.4	19.1
Textile	4.4	4.1	3.7	3.1
Grass and Wood	2.8	2.5	1.9	1.3
Plastic	18.6	19.0	19.6	20.3
Leather and Rubber	0.5	0.5	0.5	0.4
Combustibles Sub-Total	77.9	78.8	80.1	81.5
Metal	3.0	3.1	3.2	3.3
Bottle and Glass	11.0	10.9	11.2	11.5
Ceramic and Stone	5.3	4.7	3.6	2.4
Miscellaneous	2.8	2.5	1.9	1.3
Non-combustibles Sub-Total	22.1	21.2	19.9	18.5
Total	100.0	100.0	100.0	100.0

Comparison of waste composition

Country/City	Year	GDP per Capita (US$)	Kitchen Waste (%)	Papers + Plastics (%)	Metal, Bottle and Glass
Tokyo in Japan	1994	31,961	25.1	50.9	11.9
Vientiane Lao	1991	290	35.1	16.3	8.9
Phnom Penh	2003	268	63.5	21.9	1.9
Dar es Salaam Tanzania	1996	280	45.0	6.1	4.6
Asuncion Paraguay	1994	1,450	37.4	14.4	4.8
Metro Manila Philippines	1997	1,040	45.4	32.4	8.6
Adana Turkey	1999	3,090	64.4	20.3	4.5
Mexico Mexico	1998	5,080	38.7	34.6	NA
Ulaanbaatar with Ash*1	2005	552	16.4	16.9	8.2
Ulaanbaatar without Ash*1	2005	552	32.6	33.5	16.1

*1: All year in study area

Why RDF? (3): Needs of RDF in MUB

- For recycling of wastes, demands of product/by-product and supply of wastes as raw materials are critical.
- Small demand of compost => cow dung is disposed of at Khan-Uul District dump site with tipping fee
- Large demand of fuel for heating plants and power generation plants => Thermal recycling of waste is prospective
- Regarding scale of the country final users of reuse & recyclable materials from SW (paper, plastics, metals, bottles/glass) will be limited.

Cow dung is disposed of at Khan-Uul District dump site with tipping fee

Cow dung is much better organic fertilizer/soil conditioner than compost made from solid waste

Why RDF? (4): Cost of RDF

Items	Unit	Cost
1. RDF for Mixed Combustion Test	US$/ton	475
1.1 Purchase of Raw Materials	US$/ton	114
1.2 Production	US$/ton	361
2. RDF for Master Plan	US$/ton	18 (27 - SI*1)
Construction Cost	US$/ton	74,000
2.1 Operation & Maintenance	US$/ton	14
2.2 Depreciation	US$/ton	13
3. Incinerator	US$/ton	64
Construction Cost	US$/ton	164,000
3.1 Operation & Maintenance	US$/ton	27
3.2 Depreciation	US$/ton	37

SI = Sales income. F/S sets 9US$/ton

Incineration is not feasible since its cost is 3.6 times more than RDF. RDF cost can be reduced if sales price increases.

Why RDF? (5): Why we do not make material recycle of plastic and paper wastes?

- Limited final users in terms of capacity and categories
- Most of recyclables are transported to China => huge transportation cost
- Current final users in UBC limit generation sources of recyclable wastes. Because wastes as raw materials for them should be pure and clean as much as possible.
- If a recycling facility will not limit its sources of wastes, it will not be profitable due to cleaning and purification processes and costs. => At present final users in UBC face to the difficulty in supply of suitable waste while a lot of plastic wastes are scattering at UCDS.

Final users in UBC: Plastic

Raw waste

Melting and Production of Pellets

The wastes of raw materials for the production of plastic pellets come from factories, supermarkets, etc. The wastes are already segregated at the generations. Even though quality (no transparent one) of products are limited to.

Production of Plastic Bags

B. Outline of the Combustion Test of RDF with Coal

Objectives of the Test

- To mainly investigate degree of negative impacts which may be caused by mixed combustion of RDF with coal at the existing heating plant;
- To demonstrate citizens in MUB both negative and positive impacts of the mixed combustion of RDF with coal at the existing heating plant in order to obtain the consensus to implement the proposed M/P regarding thermal recycle "RDF"; and
- To examine economic viability of the use of RDF at the existing heating and/or power generation plant. => It may need long term use.

Negative Impacts

- Generation of air pollutants such as black smoke, dust, SOx, NOx and HCl;
- Generation of dioxins ; and
- Damage to the internal furnace due to higher combustion temperature than pure coal combustion.

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Outline of the Test (1)

- The M/P proposes to use RDF at the existing power plants in which continuous and higher combustion of it is done in order to reduce adverse impacts.
- Even if RDF is produced at maximum amount in the target year of F/S, i.e. 2010, the portion of RDF mixture to coal is less than 4% in weight[1]. Calorific value of RDF is estimated as two times of that of coal. So mixing 4 % of RDF means 8% in terms of calorific value.

[1] No. 3 power plant has 13 furnaces and two of them are fluid type furnaces which will be able to burn particle type fuel like RDF. However, the other furnaces of the existing power plants uses powder coal which can not burn RDF without providing grades.

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Outline of the Test (2)

- Compare with the mixed combustion of RDF at the power plants, it at the Nalaikh heating plant may cause more serious negative impacts. It is, therefore, more convenient to conduct the combustion test at the Nalaikh heating plant.
- Furthermore, since available RDF amount for the test was very limited, i.e. about 12 tons, mix proportion of RDF to coal is decided at 2 % and 4 % in weight (4% and 8 % in terms of calorific value) in this test.
- In the test RDF and coal were mixed and burned in the furnace and to obtain combustion data, check equipment running condition and inspect combustion conditions visually.

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Outline of the Test (3)

- There were four kinds of combustion tests, 1. Preliminary test, 2. Baseline test for 100% coal combustion, 3. Mixed combustion of RDF (of 2% in weight) with coal and 4. Mixed combustion of RDF (of 4% in weight) with coal. In the preliminary combustion test, lower mixing rate was applied first to carefully check the combustion conditions such as relevant equipment and exhaust gasses then, to increase mixing proportion gradually.
- Mixed combustion tests of RDF (of 2% and 4% in weight) with coal will be carried out more than 10 hours continuously. Necessary data will be collected to investigate the negative impacts. In addition suitability of the equipment and economical aspects will also be examined.
- It requires more than 2 hours operation during obtaining data for dioxin analysis.

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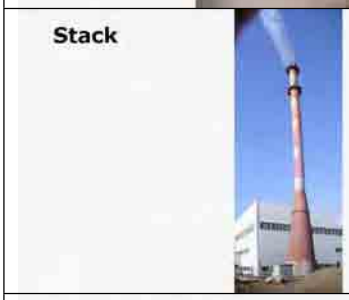
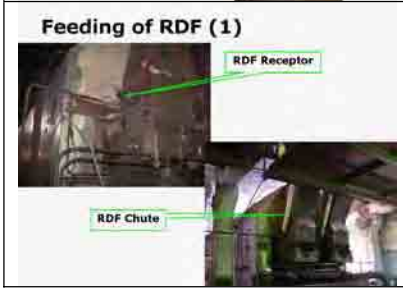
Schedule of First Mixed Combustion Test

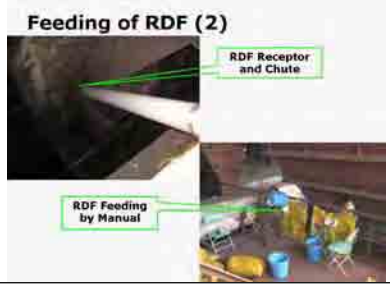
February, 2006	12	13	14	15	16	17
	Sun	Mon	Tue	Wed	Thu	Fri
1. Preliminary Test		—				
2. Baseline Test (100% Coal)			—			
3. Mixed Combustion Test (RDF 2% Mixture)				—		
4. Mixed Combustion Test (RDF 4% Mixture)					—	

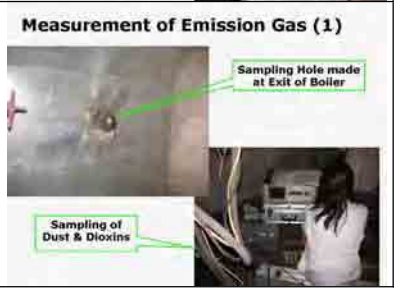
Schedule of 2nd Mixed Combustion Test

October, 2006	16	17	18	19	20	21	22
	Mon	Tue	Wed	Thu	Fri	Sat	Sun
1. Preparation work	—						
2. Baseline Test (100% Coal)		—					
3. Mixed Combustion Test (RDF 2% Mixture)			—	—			
4. Mixed Combustion Test (RDF 4% Mixture)					—	—	

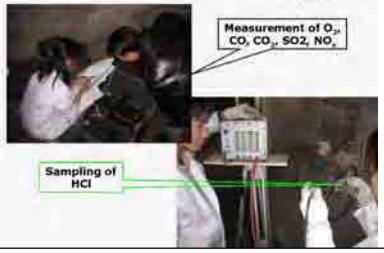




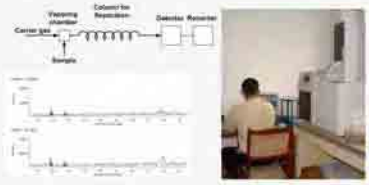




Measurement of Emission Gas (2)



Analysis of Dioxins by Gas Chromatography



C. Necessary Information to Understand the Results

1. Environmental Standard and Emission Standard
2. Definition of Dioxins

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Environmental Standard Emission Standard

1. **Environmental Standard**
   - In order to preserve environmental conditions each country sets its own standard. There is an environmental standard in Mongolia.
   - In Japan, the Environmental Standard are set regarding air pollution, water contamination, soil contamination and noise to protect health of human beings and preserve their living environment.
2. **Emission Standard**
   - Emission standard is the regulation value of pollutants emission from a generation source in order to maintain the environmental standard. Normally it sets allowable emission limit of pollutants.
   - There is no emission standard in Mongolia.

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Environmental Standard on Air quality in Mongolia: MNS 4585:1998

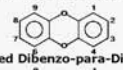
Toxic substance		Tolerated amount
Sulfur dioxide, SO_2	One time Daily average	500 μg/m³ 30 μg/m³ *1, 70μg/m³ *2
Nitrogen dioxide, NO_2	One time Daily average	85μg/m³ *1, 150μg/m³ *2 40μg/m³ *1, 60μg/m³ *2
Carbon monoxide, CO	One time Daily average	8 mg/m³ 3 mg/m³
Ozone, O_3	One hour average	120μg/m³
Dust	One time Daily average	500μg/m³ 150μg/m³ *1, 200μg/m³ *2
Lead, Pb	Daily average	1.0μg/m³
Benzpyrene	Daily average	0.001μg/m³

Note : *1 Manual analysis
*2 Automatic analysis

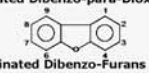
Results of Emission Gas Analysis (Dioxins)

Definition of Dioxins

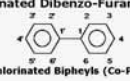
There are 222 kinds of dioxins at present and they are broadly categorized into three groups below.



Polychlorinated Dibenzo-para-Dioxins (PCDDs): 75



Polychlorinated Dibenzo-Furans (PCDFs): 135



Co-planar Polychlorinated Bipheyls (Co-PCBs): 12 at present

Toxic Equivalency Factor (TEF)

- Among about 222 dioxins, 29 are identified as toxic and degree of toxicity differs each other. However, toxic or not of the other dioxins than 29 are not determined yet.
- Toxicity of each dioxin (isomer) is defined as TEF of which the strongest is 1 for 2,3,7,8-TeCDD.

Toxic Equivalent (TEQ)

- Toxicity of dioxins is presented as Toxic Equivalent (TEQ) which is the sum of each toxic amount to be calculated by multiplying amount of each dioxin by each TEF of it.

Toxic Equivalency Factor (TEF)

PCDDs	TEF	PCDFs	TEF	Co-PCBs		TEF
2,3,7,8-TeCDD	1	2,3,7,8-TeCDF	0.1	Non-ortho PCBs	3,4,4',5-TeCB	0.0001
1,2,3,7,8-PeCDD	1	1,2,3,7,8-PeCDF	0.05		3,3',4,4'-TeCB	0.0001
1,2,3,4,7,8-HxCDD	0.1	2,3,4,7,8-PeCDF	0.5		3,3',4,4',5-PeCB	0.1
1,2,3,6,7,8-HxCDD	0.1	1,2,3,4,7,8-HxCDF	0.1		3,3',4,4',5,5'-HxCB	0.01
1,2,3,7,8,9-HxCDD	0.1	1,2,3,6,7,8-HxCDF	0.1	Mono-ortho PCBs	2,3,4,4',5-PeCB	0.0001
1,2,3,4,6,7,8-HpCDD	0.01	1,2,3,7,8,9-HxCDF	0.1		2,3',4,4',5-PeCB	0.0001
OCDD	0.0001	2,3,4,6,7,8-HxCDF	0.1		2,3,3',4,4'-PeCB	0.0001
		1,2,3,4,6,7,8-HpCDF	0.01		2,3,4,4',5-PeCB	0.0005
		1,2,3,4,7,8,9-HpCDF	0.01		2,3',4,4',5,5'-HxCB	0.00001
		OCDF	0.0001		2,3,3',4,4',5-HxCB	0.0005
					2,3,3',4,4',5'-HxCB	0.0005
					2,3,3',4,4',5,5'-HpCB	0.0001

Unit for Extremely Small Amount of Concentration like Dioxins

Weight			Concentration		
gram		= 1 g			
mg		$=10^{-3}$ g	$1/10^{3}$		
Micro g	(μg)	$=10^{-6}$ g	$1/10^{6}$	ppm	(million)
Nano g	(ng)	$=10^{-9}$ g	$1/10^{9}$	ppb	(billion)
Pico g	(pg)	$=10^{-12}$ g	$1/10^{12}$	ppt	(trillion)
Femto g	(fg)	$=10^{-15}$ g	$1/10^{15}$	ppq	(quadrillion)

One pg means that one gram of contaminant is in a million tons of water, i.e. one gram of contaminant in a 1,000m length x 1,000 width x 1m depth swimming pool.

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D. Result of the Test

1. Difference between the First and Second Test
2. Results of analysis of air pollutants in emission gas
3. Analysis of economic viability

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D.1 Difference between the First and Second Test

1. Quality of RDF and Coal
2. Mixture Rate of RDF and Coal
3. Sampling of Dioxin done by the Japanese Standard Method => Suction instrument brought from Japan. => Particle and gas dioxins were sampled in the 2nd test. => Dust, O_2 and CO were measured at the same time.
4. Furnace temperature was measured.

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D.1.1 Quality of RDF and Coal

1. LCV of RDF for the 2nd test far less than the 1st due to combustion at the production stage.
2. On the contrary, LCV of coal for the 2nd test much higher than the 1st due to less moisture

Physical composition			RDF		Coal	
			1st test	2nd test	1st test	2nd test
Higher calorific value (HCV)		(kcal/kg)	5,820	3,320	3,875	4,700
Lower calorific value (LCV)		(kcal/kg)	5,290	3,200	2,470	3,680
Industrial chemical analysis	Moisture (W)	(%)	8.3	0.9	31.3	19.2
	Combustible	(%)	86.0	74.9	59.9	61.2
	Ash (Non-Combustible)	(%)	5.7	24.2	8.8	19.6
Apparent density*1		(ton/m³)	0.41	0.43	0.86	0.87

Note *1 Measurement value by Study team

Combustion of RDF at the Production Stage

D.1.2 Mixture Rate of RDF and Coal

Target mixture rate	2.0 %	4.0 %
1st combustion test	2.3 %	5.7 %
2nd combustion test	2.5 %	4.6 %

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D.1.3 Sampling of Dioxin done by the Japanese Standard Method

1. The study team was worried about sampling of dioxin at the 1st test.
2. Most of the sampling tools was brought from Japan for the 2nd test.

Sampling of Dioxins base on Japanese Standard (1)

Sampling of Dioxins base on Japanese Standard (2) - Sampling for Gaseous Dioxins -

Sampling of Dioxins base on Japanese Standard (3)

Gas Suction instrument brought from Japan

D.1.4 Furnace Temperature

Temperature of Inside of Furnace – 2nd Combustion test -

1. Furnace temperature range between 644 – 855 °C.
2. It did not create the dangerous temperature of dioxin generation (around 300 °C).
3. Dioxins concentration of emission gas is under the standard.
4. Japanese standard for waste incinerator sets higher temperature than 850 °C is preferable. Therefore, more stable temperature is preferable.

	100 % Coal	Coal + RDF (2%)	Coal + RDF (4%)
Number of Sampling	8	13	14
Average	727 °C	749 °C	744 °C
Max.	769 °C	855 °C	819 °C
Min.	690 °C	644 °C	650 °C

D.2 Results of Emission Gas Analysis (1): Japanese and European Emission Standard

Items	Limit value	
	Japan (Maximum)	EU*4 (Daily average value)
Total dust	40*1 mg/m³N	10 mg/m³N
Sulphur dioxide (SO_x)	K value *2	50 mg/m³N
Nitrogen oxide (NO_x)	250 ppm (513)*3 mg/m³N	200 mg/m³N
Hydrogen chloride (HCl)	700 mg/m³N	10 mg/m³N
Standard percentage oxygen concentration	12 %	11 %
Dioxins	0.1 ng-TEQ/m³N	0.1 ng-TEQ/m³N

Note *1: Incineration capacity is more than 4ton/hour.
*2: Japanese standard regulates maximum concentration of SO_2 at certain point (it differs place.) departed from an emission source. K value is regulated according to the location with the range of 17.5-3.0.
*3: Although unit of limit value is set in ppm, we convert it in (mg/m³N) for comparison.
*4: "Implementation of European Council Directive 2000/76/EC on the Incineration of Waste (August 2002, Paper 2002/24)"

Results of Emission Gas Analysis (2): Other than Dioxins

		1st combustion test			2nd combustion test		
		100% Coal	Coal + 2%RDF	Coal + 4%RDF	100 % Coal	Coal + 2%RDF	Coal + 4%RDF
Dust*1	mg/m³N	315	431	380	11,800	7,300	5,400
SO_x*1	ppm mg/m³N	255 (729)*2	137 (391)*2	117 (334)*2	209 (597)*2	333 (951)*2	110 (314)*2
NO_x*1	ppm mg/m³N	336 (690)*2	324 (665)*2	326 (669)*2	186 (382)*2	136 (279)*2	135 (277)*2
HCl*1	ppm mg/m³N	0.11 (0.18)*2	0.19 (0.30)*2	0.16 (0.25)*2	NA*3		

Note
*1 : Conversion equivalent of 12% O_2
*2 : Although unit of limit value is set in ppm, we convert it in (mg/m3N) for comparison.
*3 : HCl could not analyzed in Mongolia. In 1st combustion test sample was analyzed in Japan.

Results of Emission Gas Analysis (Dioxins) -- Converted value (ng-TEQ /m³N) --

	100% Coal	Coal + RDF (2%)	Coal + RDF (4%)
	ng-TEQ/m³N	ng-TEQ/m³N	ng-TEQ/m³N
1st combustion test	0.00003 (Particle)	0.00038 (Particle)	0.00062 (Particle)
2nd Combustion test	0.0078 (Particle + Gas)	0.024 (Particle + Gas)	0.071 (Particle) 0.00046 (Gas)

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Evaluation of the Results of Analysis of Air Pollutants in Emission Gas (1)): Other than Dioxins

1. **Common**
   - Data obtained by the 2nd test is more reliable because of Gas Suction Instrument brought from Japan.
2. **Dust**
   - No significant difference on measured values between 100% coal and RDF mixed combustion.
   - The measured values far exceed the regulation value for the incinerator in Japan and EU.
   - It is necessary to improve the dust precipitator of the furnace.

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Evaluation of the Results of Analysis of Air Pollutants in Emission Gas (2): Other than Dioxins

3. **Sulfur Oxides (SO_x)**
   - Measured value shows mixed combustion may improve emission gas on SOx .
   - The measured values exceed the EU emission standard.
4. **Nitrogen Oxides (NO_x)**
   - No significant difference on measured values between 100% coal and RDF mixed combustion.
   - The measured values over the regulation value for the incinerator in EU.
5. **Hydrogen Chloride (HCl)**
   - No significant difference on measured values between 100% coal and RDF mixed combustion.
   - The emission gas satisfies the Japanese emission standard.

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Evaluation of the Results of Analysis of Air Pollutants in Emission Gas (3): Dioxins

- Since concentrations of dioxins for mixed combustion are 3.1 – 9.2 times (2nd Test) more than it of 100% coal, RDF mixed combustion impacts on generation of dioxins.
- However, TEQ value of RDF mixed combustion, according to the calculation method of the Japanese standard for an waste incinerator, is less than 0.1 ng, the strictest value of the Japanese emission standard. It is below the regulation value set in the emission standard in Japan for solid waste incinerators.

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Evaluation of the Results of Analysis of Air Pollutants in Emission Gas (4): Dioxins

- The second test analyzed two state of dioxins in RDF 4% mixture test; i.e. of particle state and gaseous, which is commonly done in Japan. Based on the results, most of dioxins are in the particle state as follow.
  - Particle state dioxins : **0.071 ng-TEQ/m³N**
  - Gaseous dioxins: **0.00046 ng-TEQ/m³N**
- This indicates that good bag filter could catch most of dioxins generated by the mixed combustion of RDF with coal.

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D.3 Analysis of economic viability

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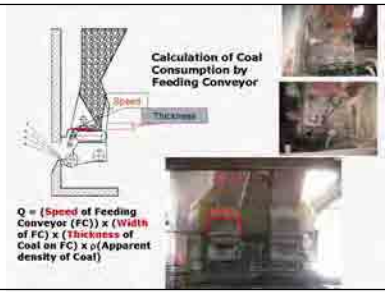

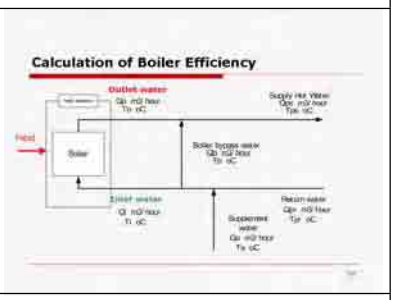

Boiler efficiency

Boiler efficiency
= (Total calorific value of Outlet water – Total calorific value of Inlet water) / (Total calorific value of Fuel)

	100% Coal	Coal + RDF2%	Coal + RDF4%
1st combustion test	41.3 %	53.3 %	66.0 %
2nd combustion test	56.3 %	59.5 %	50.8 %

Evaluation of Economic Viability

- If the calorific value of RDF is higher than coal, mixed combustion of RDF with coal improve efficiency of boiler. => The calorific value of RDF (3,200 kcal/kg) used for the 2nd Combustion test is lower than coal (3,680 kcal/kg) due to combustion when produced. => If RDF made by compaction method calorific value is much higher than it, i.e. more than 5,000 kcal/kg.
- It should be examined carefully whether increase of mixture rate of RDF may cause decease of boiler efficiency or not.

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Thank you very much for your attention

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1. 札幌市における清掃事業の歩み
2. RDF製造工場設立の経緯
3. RDF製造工場の概要
4. 運転上の問題点
5. 今後の課題

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札幌市における清掃事業の歩み - 1

- 1971年：最初の焼却工場の完成（それまでは埋立処理のみ）
  - –ごみの持つエネルギーの活用
  - –連続運転の実証
  - –積雪寒冷地における余熱利用のノウハウを得る

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最初の焼却工場

札幌市における清掃事業の歩み - 2

- 現在４箇所の焼却工場
  - ①発寒清掃工場　600ｔｏｎ/24ｈ
  - ②篠路清掃工場　600ｔｏｎ/24ｈ
  - ③駒岡清掃工場　600ｔｏｎ/24ｈ
  - ④白石清掃工場　900ｔｏｎ/24ｈ

  合計　2700ｔｏｎ/24ｈ
- 1990年：RDF製造工場の稼動

ごみ処理の概要

- 2005年
- 収集対象人口：1,889,100人
- 年間総収集量：492,370ｔ
- 日平均収集量：1,901t
- 収集車両：301台（直営車　112台、委託車　189台）
- 一人１日あたり排出量：717ｇ

収集方法

- スチール缶　週１回
- 燃やせるごみ　週２回
- 燃やせないごみ　週１回
- びん、ペットボトル　週１回
- プラスチック製容器包装　週１回

以上は無料

- 大型ごみ　申込制(有料)

2005年ごみ処理量

総処理量

家庭ごみ	492,370 ton
事業ごみ	390,750 ton
合　計	883,120 ton

⇨

施設別受け入れ量

資源化工場	31,786ton
資源選別施設	50,708ton
破砕工場	90,451ton
焼却工場	617,457ton
埋立地	92,718ton
合計	883,120ton

2005年資源化工場実績

受け入れ量

搬入	24,252 ton
梱包ごみ	7,534 ton
合計	31,786 ton

⇨

生産量

RDF	24,354ton
燃料チップ	862ton
ﾎﾞｰﾄﾞﾁｯﾌﾟ	1,578ton
合計	26,794ton

RDF事業設立の経緯

1. 廃棄物の約50%が、建築現場、事務所、スーパー等の事業系ごみ
2. 建設系ごみの大部分が可燃物、不燃物が分別されず埋立処理されていた
3. 木くず及び紙くずなどの高カロリーごみが清掃工場の焼却能力を低下させていた
4. 建設系ごみの発生量は、夏期間は多く、冬期間は少ない
5. RDFを製造し、冬期間に燃料として利用

RDF製造工場

- 建築面積：4,201m^2
- 延べ床面積：6,300m^2
- ごみ処理能力：２００ｔ/日（１３Ｈｏｕｒ）
- ＲＤＦ製造能力：140t/日

RDF製造工場写真

RDF製造フロー

RDFの原料ごみ

RDFの製造

- 木くず：紙：プラスチックを50%：40%：10%
  （現在は、25%：65%：10%）
- 成形機先端部は、電気ヒーターにより加熱
- ヒーター熱及び圧縮熱で約200℃
- 販売単価　2,300円／ｔｏｎ（運搬費込み）

成形機

運転上の問題点 - 1

1. ごみ種別受け入れ量のバランス
   - RDFの原料として、木・紙・プラスチックを4:5:1の割合で使用するため、受け入れごみ量のバランスが崩れた場合のＲＤＦの製造
2. 不適物の除去
   - 機器類の損傷を防ぎ、安定した品質のRDFを生産するためには人手による分別作業が欠かせない。不適物が多いと作業効率が極端に低下する。

運転上の問題点 - 2

3. 作業環境
   - 粉塵が立ちこめ作業環境が非常に悪く、積もったちりに火がつくこともあった。現在は改善された。
4. 廃プラスチック
   - 塩ビ系を排除するための作業が、困難。

運転上の問題点 - 3

5. 設備の問題点
   - 粉塵が多く集塵機が閉塞→粉塵を紙くずラインに戻すことで解消
   - 破砕物の空気輸送ラインの閉塞
6. 火災対策
   - 破砕機内における爆発火災→スプレー缶が原因。手選別の強化及び分別指導の強化により改善。

運転上の問題点 - 4

7. 成形機部品の消耗
   - 機器内部ライナーの消耗
   - フォーミングヘッドの消耗
   - 軸受けの痛み

解決策

- 分別指導及び手選別の徹底
- 料金の改訂→解体ごみからの土砂の激減

受け入れ料金の推移（ごみ処理手数料）

	ＲＤＦ工場	清掃工場	最終処分場
1990年	3000円/ton	3000円/ton	3000円/ton
1994年	4500円/ton	7000円/ton	7000円/ton
1996年	6000円/ton	9000円/ton	9000円/ton
2001年	7000円/ton	11000円/ton	11000円/ton
2005年	9000円/ton	13000円/ton	14000円/ton

料金改定により格差を付けること及び分別指導の徹底によりごみ量は減ったが、ごみ質（分別状態）は良好になった。

e. Q & A

Q1: Mr.D.Tsogbadrakh (Member of a local NGO, Tolgoit)
Ash from generated Ger area will be dumped in disposal site and covered by soil according to Master Plan. We thought about produce a block by ash. I know one company named “San Origu”, Director’s name is Mr.Olombayar. They produce some productions such as fence railings, lid of sewerage by plastic bags in place of wood. So, I want study team to go towards on Ger area.

A1: Mr.Ts.Bold (Head of City Maintenance Public Utilities Agency (CMPUA)
We thought that what to do by ash. Many of people talk about make a block by ash and do that. But they stopped producing. Since radioactive substance is discharged from it, Specialized Inspection Agency is not allowed to produce it. So, it is impossible to produce the block at the present.

I know that “San Orgio” company. They produce railings and lid of sewerage by plastic bags and plastic bottles. They turned to us for selling is limited and we helped them. Their company was located in Darkhan-Uul province. Now they are moving in Khoroo 9 of Chingeltei district in here from Darkhan-Uul. We provide raw material and require them to produce sewerage lids of 6 types in high quality. They installed 10 lids but only 2 lids in here without stolen. Those 2 lids are sagged and cracked. Therefore we asked to them to install reinforce bars into sewerage lids in order to improve a quality.

Q2: **Ms.Ch.Ulzii** (Residents)
I studied in Japan and came back in here recently. Dust bin is not enough in city. At least there isn’t dust bin at the bus stations. It is necessary to produce dust bins for a source separation like “San Orgio” company (above-mentioned).

Result of survey is limited in my opinion. In ger area, only ash is mentioned according to your survey. In apartment area, waste will be collected from front of entrance according to your pilot project. But people park their car front of entrance. Also, you mentioned container, there are containers in old buildings area. But new apartments are dust chute system.

A2: Mr.Ts.Bold
You're right. There is not enough in UB city. We are increasing number of dust bin by way of make dust bin by stone and concrete. However we place 1500-2000 dust bins a year, population is increasing and people break it, so number of dust bin is still few. If put dust bins of 150000-200000 in UB city, it is enough. But our country's budget is low. But we will try to increase number of dust bin without tell any pretext.

Residents already saw collection truck with melody. Collection truck with melody collects waste from apartments without dust chute.

Regarding increase awareness, City governor and district governor are starting to spend for advertising from now. We made social officers of school educational training of environment issue for school children on 1st of September. We are planning to continue this training.

Q3: Mr.Batsuren (leader of "Myangat" Housing Association, Ch district, Khoroo 2)
JICA study team members performed a lot of work. I have comments. I understood that implement operation smoothly from waste collection to covering soil. But you should pay attention for proceed of waste collection. It is necessary to conduct campaign activity to increase people's awareness. I am afraid If you don't do that, your good project might be not implementing. It is improper to place waste inside of building. It makes problems for cleaners. They spent a lot of time for collect resident's waste from inside of building. Need to increase their salary. According to waste flow survey in 2006, 164 ton waste generated per day. According to waste flow survey in 2020, 520 ton waste will be generated per day. It seems to only cleaners will collect large amount waste.

We have not any place to keep waste, so waste might be scatter. I suggest placing dust bin with lock, made by iron between 3 apartments. Cleaners' responsible key of lock. When generate waste, they will open the dust bin and discharge into dust bin. When collection truck comes, they open the dust bin and collection worker collect from it.

A3: Mr.Ts.Bold
We don't agree with dust bin with lock. We were using container, high is 1 meter 2 years ago. But there were various problems caused by containers such as breeding flies and coming homeless people. Therefore, we don't use container again.

Q4: Ms.L.Dolgarmaa (Officer of WWF):
At first, I want to appreciate to JICA study team members for their hard work. I understand that innovation is running for recycling and reuse issue.

I live pilot project area. Awareness of residents is very low. They discharge waste inside of building when collection truck just go away. Our WWF is conducting some activity in order to include educational training of environmental protection into school curriculum.

Concerning hazardous industrial waste, it seems not mentioned much at the Seminar. Did you include issue of the hazardous industrial waste in Master Plan? Will be RDF used only at Heating plan? Or household can use it?

A4-1: Mr.Ts.Bold
Hazardous industrial waste is not included in Master plan. Hazardous waste disposal site is constructing nearby Bagakhangai district under a law. Technical working group is appointed

last year. Mr.Ch.Batsaikhan (Expert for Ecological Policy Urban Development Division) is chairman of TWG.

JICA study team members constructed special waste site in UCDS.

Regarding RDF, proposed to use it at the power plants which higher combustion, furnace temperature range between from 640 to 855. It means, it is impossible using for households. If household use RDF in sample furnace, it will smolder. Also need to petrol in order to fire.

A4-2: Mr.B.Delgerbayar (Director of Solid waste management division, CMPUA)
In the beginning, hazardous industrial waste issue is not included in Master plan according to contract. In the future, we will make a request to Japanese side to help for hazardous and medical waste.

Since standard of RDF combustion is designated, only 3 power plants which are Nalaikh heating plant, Baganuur heating plant and 3rd power plant can combust RDF. We should control usage of RDF to prevent from household use it.

Q5: Ms.Ya.Ariulzul (Head of Division on Environment, Geodesy and Cartography)
1.How did you calculate amount of mixture? 2. Cost of 1 ton RDF is how much? 3. How many tons RDF will be produced a year and how many tons RDF of them will be burned at the heating plant? 4. Sawdust is included in material content of RDF? 5. Is RDF and coal mixed and burned in Japan?

I want to ask Mr.Delgerbayar next questions. Issue of industrial waste and illegally dumped waste is included in Master plan? Is there any survey of generation amount per day by a person in Mongolia? Where did you hold population data? You estimated population of UB city will be 1,150,000. But current population is like this.

A5-1: Mr.Bold
Industrial waste and old waste is not included in Master plan. We requested to conduct survey of construction waste. JICA study team conducted construction waste survey on 50 construction companies.

A5-2: Mr.Shimura
1. We calculated coal consumption based on speed of feeding Conveyor. 2. During the trial period cost of RDF was high. It was 500$. But there were various items included such as equipment cost, repairing of facilities and depreciation in total cost.

In the future, 1 ton of RDF production cost will be 50$ by 2010. 3. We planned production of RDF 2210 tons in 2010, 9010 tons in 2015, 23700 tons in 2020 a year. 4. Sawdust is not included in RDF content. Plastic 75% and paper 25%. 5. In the case of Japan, RDF and coal not mix and burn. We burn RDF at the RDF combustion factories.

A5-3: Mr.Delgerbayar
1. Generation amount is calculated precisely. A person will generate waste of 294 gram in summer and 700 gram in winter (included ash).

2. JICA study team estimated forecast of future population based on “Population Projections of Mongolia, National Statistic Office of Mongolia”. We said UB city population will be 1 million by February. But study team keeps their position that is forecast of future population must be based on national statistic of Mongolia.

3. Regarding construction waste, generation amount is 60 tons per day in winter and 123 tons per day in summer. 10% of total amount is not dumped at UCDS. It seems

impossible to use until 2008, if construction waste will dump at the disposal site. We are planning solve the problem of construction waste within 2008.

Q6: Mr.Bulgan (Chief of Department of Production, service and punishment, Chingeltei district governor's office)
We changed container system to bell collection system in September, 2005. This time governors did not accept it. Many problems caused by container system are solved by bell collection. JICA study team modified this bell collection system and now implementing smoothly. We requested schools and kindergarten to conduct educational training on environment issue of air pollution and global warming. We have not received reply from them yet.

Q7: Mr.Ch.Oyunbaatar (Chief of Department of Production, service and punishment, Khan-Uul district governor's office)
Firstly, I want to appreciate to JICA study team for successfully implementation of Master plan. I have few questions. 1. How solve to industrial waste and hazardous waste? In our district, industrial waste and hazardous waste is 30% from total amount waste. 2. How to solve transporting waste by illegally? 3. NEDS will be started to construct from 2008 according to your implementation plan. So, implementation plan will break for 1 year. Is it possible to antedate this period? 3. I understood that around 300 waste pickers are working at the disposal site. If City Mayor provides 40-50 ger to them, waste pickers who are not at the disposal site might work at the disposal site in order to improve their live hood.

A7:Mr.Ts.Bold
We need to cooperate with Land agency in order to solve illegally dumped waste. We have one way, people clean illegally dumped waste generated site and transport to the disposal site. Then they can owner the site.

Concerning the construction of NEDS, Japan side announces a tender for construct design in spring of 2007. After that contractor will be decided and start to construction of NEDS. Also, budget will be decided on April, 2007

Concerning improvement of waste pickers live hood, we provided ger to waste pickers. But few waste pickers sold it or some ger burned. We don't want to enter waste pickers who are not working at the UCDS. Because most of them are low awareness. If they come in UCDS, Nuuts company can't control them, can't organize them.

Q8: Mr.Ch.Oyunbaatar:
But there is 10 hectare land with ash of 2 meters in Nalaikh district. Do people own this land? I have doubt it.

I heard about "improvement of waste pickers live hood" project of Canada.

A8-1: Mr.Ch.Bold
Yes. Propose of the project is to help to waste pickers by various way. For example: to provide clothes and immunity against disease so on. But the project not implemented. Because, budget of the project is 35000$. Since Canada is immigration country, they can't spend a lot of budget like this. So they stopped the project.

A8-2: Mr.Ch.Batsaikhan (Expert for Ecological Policy Urban Development Division):
JICA study team worked very hard for 2 years. We were discussing about industrial

waste will be included in Master plan. If we included industrial waste in Master plan, JICA study team had to conduct survey for 3-4 years. Therefore we did not include issue of industrial waste. But they implemented pilot projects while they are implementing Master plan. It is big success.

Concerning old waste, we can solve it through people can lease land when they clean illegally dumped waste of the site.