

Appendix 11-5: Sub-group Meeting for Output 4

11-5-4 : 4th SG4

TECHNICAL COOPERATION PROJECT (TCP) FOR THE CAPACITY DEVELOPMENT ON IMPROVING SOLID WASTE MANAGEMENT THROUGH ADVANCED/INNOVATIVE TECHNOLOGIES

4th SUB-GROUP MEETING FOR PROJECT OUTPUT 4

ENHANCEMENT OF THE NATIONAL GOVERNMENT'S CAPACITY TO IDENTIFY ISSUES AND PROVIDE SUGGESTIONS/ RECOMMENDATIONS FOR OTHER SWM TECHNOLOGIES OTHER THAN WASTE-TO-ENERGY (WTE)

25 March 2021, Thursday, 9:00 AM (via MS Teams)

4th SUB-GROUP MEETING FOR PROJECT OUTPUT 4
ENHANCEMENT OF THE NATIONAL GOVERNMENT'S CAPACITY TO IDENTIFY ISSUES AND PROVIDE SUGGESTIONS/RECOMMENDATIONS FOR OTHER SWM TECHNOLOGIES OTHER THAN WTE

25 March 2021, Thursday, 9:00 AM (via MS Teams)

TENTATIVE AGENDA

1. Call to Order/Meeting Objectives/ Acknowledgement of Attendees and Adoption of Agenda by EMB-SWMD, PMO
2. Review of the previous Sub-group meeting by JET
3. Technical presentation and discussion points by JET
 - Good practices of SWM technologies and introduction of Activity 4-4: Summary and Provision of Suggestion/Recommendation to Improve Utilization of other SWM Technologies to Target LGUs
 - Short presentation on the BAT/BEP Guidelines
4. Wrap-up/Required Actions/Agreements/Timelines by JET
5. Schedules of the next Sub-group meetings by EMB-SWMD-PMO
6. Other matters

4th SUB-GROUP MEETING FOR PROJECT OUTPUT 4
ENHANCEMENT OF THE NATIONAL GOVERNMENT'S CAPACITY TO IDENTIFY ISSUES AND PROVIDE SUGGESTIONS/RECOMMENDATIONS FOR OTHER SWM TECHNOLOGIES OTHER THAN WTE

25 March 2021, Thursday, 9:00 AM (via MS Teams)

LIST OF PARTICIPANTS

NO	NAME	AGENCY/OFFICE	CONFIRMED
CONCERNED GOVERNMENT AGENCIES			
1	Engr. Reynaldo L. Eguerra	DOST-ITDI	
2	Ms. Ruby de Guzman	DOE-REMB	Representative: Ms. Gemmalyn Galang
	Mr. Romeo M. Galangam		
	Ms. Charisse Jane Pascual		✓
3	Mr. Carlo Mari Crisregjenald C. Tan	DILG NAPOLCOM CENTER	✓
	Ms. Maria Clarisol L. Agas		
4	Mr. Aldwin U. Urbina	NEDA-IPG	
	Mr. Gilbert V. Kintanar, Jr.		
	Kevin Gilbert M. Manzano		
5	Ms. Justine E. Padiermos	PPP Center	✓
	Ms. Aislyn Janelle L. Yao		

4th SUB-GROUP MEETING FOR PROJECT OUTPUT 4
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25 March 2021, Thursday, 9:00 AM (via MS Teams)

LIST OF PARTICIPANTS

NO	NAME	AGENCY/OFFICE	CONFIRMED
LOCAL GOVERNMENT UNITS			
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	Mr. David John Vergara		✓
7	Engr. Editha Peros	LGU Cebu City ENRO	
	Engr. Glory Rose Manatad		✓
8	Atty. Dwight Tristan Domingo	LGU Davao City ENRO	✓
	Engr. Elisa Madrazo		✓
	Engr. Lakandiwa Orcullo		✓

4th SUB-GROUP MEETING FOR PROJECT OUTPUT 4
 ENHANCEMENT OF THE NATIONAL GOVERNMENT'S CAPACITY TO IDENTIFY
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 TECHNOLOGIES OTHER THAN WTE

25 March 2021, Thursday, 9:00 AM (via MS Teams)

LIST OF PARTICIPANTS

NO.	NAME	AGENCY/OFFICE	CONFIRMED
EMB Central Office			
9	Engr. Marcelino N. Rivera, Jr.	EMB-EQMD (Central Office)	
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	Dr. Fatima Anneglo Molina	EMB-ERLSD (Central Office)	
	Atty. Carmelo R. Segui	EMB-Legal Division (Central Office)	
	Engr. Jundy del Socorro	EMB-AQMS (Central Office)	✓
	Engr. Wyona Kay Rativo		
PROJECT COORDINATORS			
10	Director Angelito V. Fontanilla	DENR-FASPS (Central Office)	
	Mr. Eddie Abugan		
	Ms. Marianica Philina Obmerga		✓

4th SUB-GROUP MEETING FOR PROJECT OUTPUT 4
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25 March 2021, Thursday, 9:00 AM (via MS Teams)

LIST OF PARTICIPANTS

NO.	NAME	AGENCY/OFFICE	CONFIRMED
PROJECT COORDINATORS			
11	Ms. Maria Delia M. Valdez	EMB-SWMD-PMO (Central Office)	✓
	Ms. Elvira S. Pausing		
JICA EXPERTS TEAM			
	Mr. Takahiro Kamishita		✓
	Ms. Kyoko Kimura		✓
	Mr. Satoshi Higashinakagawa	JET	✓
12	Ms. Nikole Andrei Louise Mallare		✓
	Ms. Eric Cea		✓

4th SUB-GROUP MEETING FOR PROJECT OUTPUT 4
 ENHANCEMENT OF THE NATIONAL GOVERNMENT'S CAPACITY TO IDENTIFY
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25 March 2021, Thursday, 9:00 AM (via MS Teams)

LIST OF PARTICIPANTS

NO.	NAME	AGENCY/OFFICE	CONFIRMED
EMB-SWMD-Project Management Office (PMO)			
	Ms. Nelle A. Dimer	EMB-SWMD-PMO (Central Office)	
	Ms. Rodeith Antonio	EMB-SWMD-PMO (Central Office)	✓
13	Engr. Roxanne Barcenas	EMB-SWMD (Central Office)	✓
	Engr. Jedidiah Mangubat	EMB-SWMD (Central Office)	✓
	Ms. Kris Morada	EMB-SWMD (Central Office)	✓

4th SUB-GROUP MEETING FOR PROJECT OUTPUT 4
 ENHANCEMENT OF THE NATIONAL GOVERNMENT'S CAPACITY TO IDENTIFY
 ISSUES AND PROVIDE SUGGESTIONS/RECOMMENDATIONS FOR OTHER SWM
 TECHNOLOGIES OTHER THAN WTE

25 March 2021, Thursday, 9:00 AM (via MS Teams)

PROPOSED SCHEDULE OF MEETINGS for CY 2021

PROJECT OUTPUT	JAN	FEB	MAR	APRIL	MAY	JUNE
OP 1				07	12	
OP 2				14		
OP 3					19	
OP 4			25			10
ITWG				26		
JCC		09				
PMO	20	10	03	07	05	02

4th SUB-GROUP MEETING FOR PROJECT OUTPUT 4
ENHANCEMENT OF THE NATIONAL GOVERNMENT'S CAPACITY TO IDENTIFY
ISSUES AND PROVIDE SUGGESTIONS/RECOMMENDATIONS FOR OTHER SWM
TECHNOLOGIES OTHER THAN WTE

25 March 2021, Thursday, 9:00 AM (via MS Teams)

ADJOURNMENT





4th Sub Group Meeting for

Output 4: Enhancement of The National Government's Capacity to identify issues and provide suggestions/recommendations for other SWM technologies other than WTE

25th March 2021 (Thursday) 9:00 a.m.

The Technical Cooperation Project (TCP) for Capacity Development on Improving Solid Waste Management (SWM) through Advanced/Innovative Technologies

1. Discussions on the technical examples of "Good practices/Good technologies"

- Thanks to all of you who have been collecting technical examples. With your help, we have created a technical example document with additional examples from JET research.
- If you have any comments, please contact me during the presentation or after the SG meeting.
- For Activity 4-4, we will be assessing the gathered technologies on how they can be adopted considering the regional characteristics of each LGU.
- We will continue to add to the technical example document as needed.

Refer to Technical Example Document

Agenda

1. Discussions on the technical examples of "Good practices/Good technologies"
2. Starting of Activity4-4
3. Schedules of the next Sub-group meetings

2. Starting of Activity 4-4

Activity 4-4

Summarize and provide suggestion/recommendation to improve utilization of other SWM technologies to target LGUs.

- Activity 4-4 will be started with the evaluation of the technical examples. However, additional examples may be added to the technical example document as needed.
- LGUs are expected to evaluate the technical examples in each waste management stage (theme) from the following perspectives:
 - ✓ Technical viability
 - ✓ Economical feasibility
 - ✓ Cultural acceptability
 - ✓ Environmental soundness

2. Starting of Activity 4-4

Example of Evaluation of Technology

Technical Example1 Earthworm compost	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	<ul style="list-style-type: none"> food waste should be collected separately. it is necessary to secure a supplier or site for the use of compost. 	<ul style="list-style-type: none"> acceptable 	<ul style="list-style-type: none"> Residents may complain about pests and odors. 	<ul style="list-style-type: none"> acceptable
Applicable conditions for introducing practice/technology	<ul style="list-style-type: none"> Need to introduce a system to separate and collect food waste. For use in suburban areas with farmland. 	---	<ul style="list-style-type: none"> Secure a location away from private homes. 	---

- In Activity 4-4, the goal is for the C/P to be able to evaluate every technology, taking into account the characteristics of the LGU.

Target LGUs. Let's try by next meeting!

Each LGU is expected to evaluate each technology from the four aspects, considering the regional characteristics and resource availability in each LGU, using the format above.

JET will then organize individual meetings with the LGUs to discuss the results of the preliminary evaluations that each LGU has done.

2. Starting of Activity 4-4

[Example 2] Cost recovery of SWM: 1-2. No Segregation – No Sticker – No Collection Policy

1-2	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	<ul style="list-style-type: none"> Collector need to check the sticker and segregation situation. 	<ul style="list-style-type: none"> It is take a time to check the sticker and segregation situation 	<ul style="list-style-type: none"> Need to understanding of residents 	<ul style="list-style-type: none"> Uncollected waste may pollute the surrounding area.
Applicable conditions for introducing practice/technology	<ul style="list-style-type: none"> Give a lecture to collector. 	<ul style="list-style-type: none"> It is recommended to use clear bags that are easy to see what is inside, etc. 	<ul style="list-style-type: none"> Hold briefing sessions for residents. Sell the sticker at places where residents can easily stop by. 	<ul style="list-style-type: none"> Combine with Door – to – Door collection.

[Example 3] Collection and transportation :2-1 Door – to – Door Collection

2-1	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	<ul style="list-style-type: none"> In an area with narrow roads, large trucks cannot access there. 	<ul style="list-style-type: none"> It is take a time to pick up waste from each household 	<ul style="list-style-type: none"> Acceptable 	<ul style="list-style-type: none"> Acceptable
Applicable conditions for introducing practice/technology	<ul style="list-style-type: none"> Combine with smaller size vehicle 	<ul style="list-style-type: none"> It is recommended to use clear bags that are easy to see what is inside, etc. 	---	---

2. Starting of Activity 4-4

[Example 4] Intermediate treatment (3R : 3-11. Waste Bank

3-11	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	<ul style="list-style-type: none"> Regulations on target categories, weighing methods, recording methods, etc. Secure the recyclers to cooperate 	<ul style="list-style-type: none"> Expenses related to the establishment of a waste bank Labor costs 	<ul style="list-style-type: none"> Waste bank should be installed in a location that is easily accessible to local residents Antifire measures for recyclable products 	<ul style="list-style-type: none"> Keep recyclable products clean. (PET bottles and cans soiled with food and drink are a cause of foul odors and pests. These wastes cannot be stored outside because they form a pool of water and become a habited for mosquitoes.)
Applicable conditions for introducing practice/technology	<ul style="list-style-type: none"> Formulate the guidelines Identify the recycler 	<ul style="list-style-type: none"> Secure a certain number of customers so as not to make a deficit in initial cost and operation cost. 	<ul style="list-style-type: none"> Install the waste bank in a place where people can easily gather, such as near a government office. 	<ul style="list-style-type: none"> Only accept the washed recyclable products Secure a storage place indoors

[Example 5] IEC:5-1 Requirement to attend SWM course

5-1	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	<ul style="list-style-type: none"> Secure the teacher of SWM course 	<ul style="list-style-type: none"> Labor costs of the teacher of the SWM course Expenses related to the implementation of the SWM course 	<ul style="list-style-type: none"> Obligation of the target person to participate in the SWM course 	<ul style="list-style-type: none"> Acceptable
Applicable conditions for introducing practice/technology	<ul style="list-style-type: none"> Formulate the manual of the SWM course 	<ul style="list-style-type: none"> Secure a budget for implementing the SWM course or collect tuition fees when obtaining a license 	<ul style="list-style-type: none"> Identify the target person to participate in the SWM course and formulate the rules of participation obligation 	---

For Activity 4-5, target LGUs will give a presentation on the seminar.

3. Schedules of the Sub-group meeting for OP4

Beginning of June 2021

- Meeting with each target LGU and JET (1st time)
- Review and discussion of the Evaluation of Technology prepared by target LGUs

Beginning of August 2021

- Meeting with each target LGU and JET (2nd time)
- Review and discussion to finalize Evaluation of Technology prepared by target LGUs

Beginning of October 2021

- All SG members
- Target LGUs to give a presentation on the results of the Evaluation of Technology

Beginning of December 2021

- All SG members
- Summarize and provide suggestions/recommendations for target LGUs and other LGUs



Contents of Today's Presentation

1. Explanation of Contents of BAT/BEP Guideline
2. Explanation of Case Study Results (Not be presented at previous SG meeting or ITWG meeting)
3. Summarize of Result
4. Further step

The Technical Cooperation Project (TCP) for Capacity Development on Improving Solid Waste Management (SWM) through Advanced/Innovative Technologies

25th March 2021 (Thursday)

Output 1-1 *"Preparation of BAT/BEP Guidelines"*

1

Table of Contents of BAT/BEP Guideline

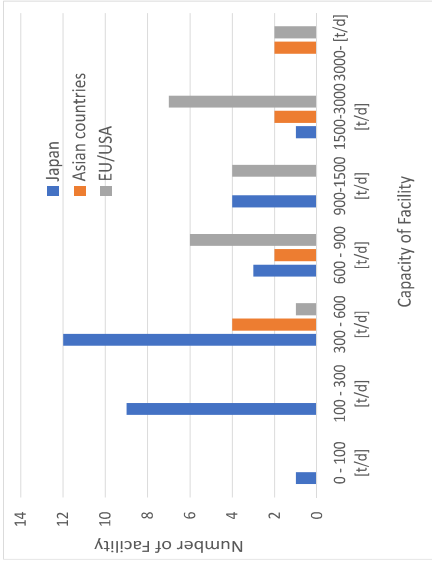
- 1. Introduction**
 - 1.1 Background and Objectives
 - 1.2 Scope of Case Studies
 - 1.3 Type of Combustion Technology
- 2. Case Studies**
 - 2.1 Survey Contents of Studies
 - 2.2 Technical Aspects of Case Studies
 - 2.2.1 Capacity of WtE Facility
 - 2.2.2 Required Area of Facility
 - 2.2.3 Target Waste
 - 2.2.4 Energy Recovery Process
 - 2.2.5 Environmental Pollution Control
 - 2.2.6 Ash Treatment and Disposal
 - 2.3 Institutional and Financial Aspects of Case Studies
 - 2.3.1 Project Implementation
 - 2.3.2 Financial Aspects
 - 2.3.3 Citizen Participation
- 3. Summary**
 - 3.1 Summary of Case Studies
 - 3.2 Findings
- Appendices**

Introduction

- Select the BAT/BEP cases through internet or magazine related to solid waste management
- Collect the detail information including technical, institutional, financial and historical information based on the research format
- Implement Questionnaire survey to WTE operator/manager for data which are not available in the secondary sources.
- Collected data is analyzed quantitatively or qualitatively and highlight some good practices for future reference to consider WtE projects in the Philippines.

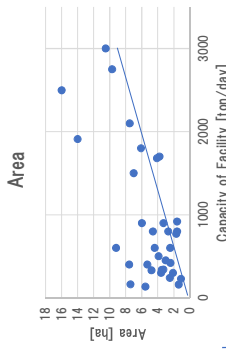
Introduction

- Most of selected facilities are 100 [t/d] to 3000 [t/d]
- Generally, there are large capacity of incinerator in Europe or China due to large collection area or population.
- In Metropolitan Tokyo, the waste generation is totally 12,000 t/d but the largest capacity WtE facility is 1800 t/d due to waste disposal principles in their jurisdiction.
- Most case of incinerators are 300 to 900 t/d and in Bangkok (500 to 1000 t/d) and Cantho city (400 t/d) in cases of south east Asia.

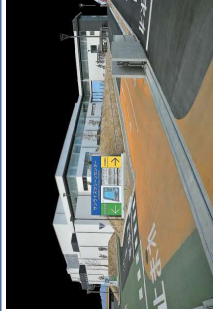


Area and Size of Incinerators

- Land area depends on the capacity of facility and the both relations seems to have proportionality.
- The range of the relationship is wide due to the reason of land availability or type of WtE facility, etc.
- The compact design of WtE facility will be implemented but the cost of civil work will increase



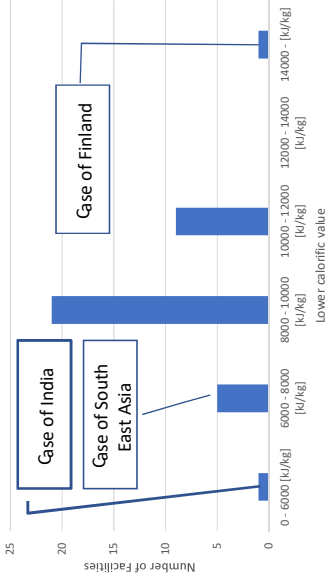
At least, approximately 2 - 4 [ha]/1000 [ton/day] will be necessary.



The case of Iwakuni city in Japan, (25 m stack height)

Waste Characterization (Lower calorific value)

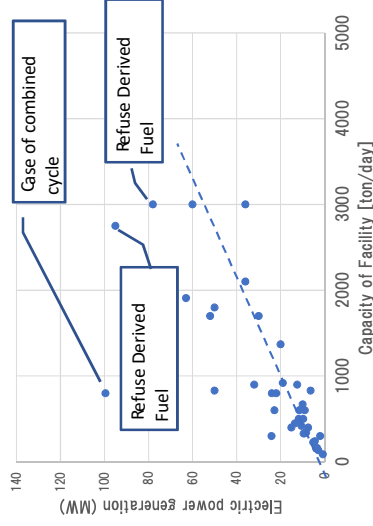
- In most of WtE facilities, the average lower calorific value is around 8,000 to 10,000 [kJ/kg]
- However, there are some facilities which can receive the waste of less than 6,000 [kJ/kg] or more than 14,000 [kJ/kg]



Basically, around 6,000 to 14,000 [kJ/kg] is acceptable for WtE facility.

Energy Recovery (as Power Generation)

- Electric power generation basically depends on the capacity of WtE
- However, pressure or temperature of the entrance of turbine generator or the utilization of surplus heat energy such as combined cycle affects the electric power generation



- Basically, the rate of electric power generation per capacity is approximately 20MW/1000 [ton/day].
- However, it may depend on the energy recovery technique.

Energy Recovery (as Power Generation)

Item	Technology	Explanation
- Optimum heat exchange	- Reduction of boiler exit temperature - Lower air ratio	- Lower temperature economizer cause large amount of heat exchange in the process - Process control will maximize combustion efficiency to control optimum air ratio and exhausted gas circulation
- Effective utilization of steam	- No utilization of steam for reheating of exhausted gas after cooling	- Wet exhausted gas treatment system or prevention of white fume need reheating of exhausted gas
- Increase of the efficiency of steam turbine system	- Introduction of high temperature and pressure boiler - Integration with fossil fueled fired power plant (external superheating)	- Increasing steam pressure and temperature will allow greater energy to be recovered in the steam turbine. - Utilization of exhausted gas from fossil fuel power generation will cause the increase of energy efficiency

Residual handling (material recycle, utilization after treatment, disposal)

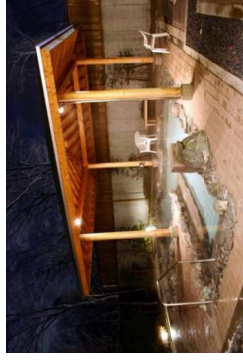
- Normally, the ratio of fly ash and bottom ash occupy respectively 20 wt% and 80 wt% of total ash
- Bottom ash**
- Collection of ferrous material by magnetic separator
- Utilization of bottom ash as cement aggregate
- Utilization of bottom ash as construction material after its melting, baking, aging, etc
- If not, disposal in municipal waste landfill site or hazardous waste landfill site.

Fly ash

- Normally, disposal in municipal waste landfill site after stabilization normally or hazardous waste landfill site
- In case of Japan, some LGUs implement ash melting for utilization as roadbed material, etc

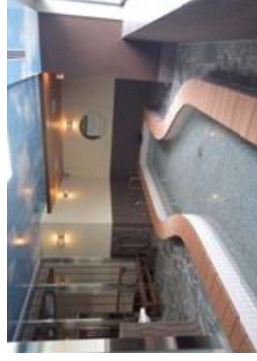


Energy Recovery (as Thermal Utilization)



Utilization of surplus heat after utilization of electric power generation

- District heating
- Hot bath for community
- Botanical garden
- Hot water pool, etc



Environmental Pollution Abatement Process

Exhausted Gas Standard

Japan (Shinkoto)	Japanese Law	Facility standard	Actual
NOx [ppm]	250	60	36 - 41
HCl [ppm]	430	15	<2
SO2 [ppm]	Area basis	20	<1
Particulates [mg/Nm3]	80	0.02	<0.001
Mercury [ug/Nm3]	50	-	<5
DXNs [ug/Nm3]	0.1	-	<0.00005

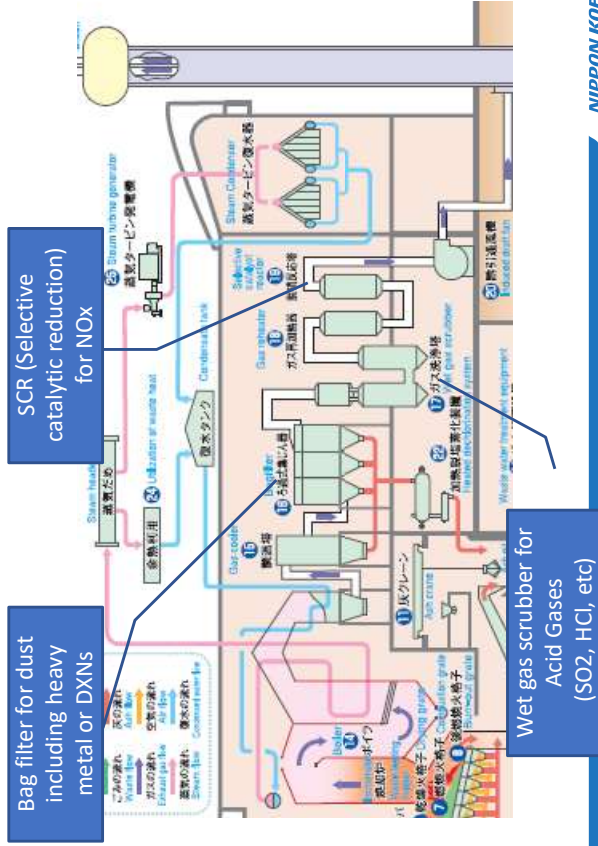
France (Isseane)	EU & French Law	Facility standard
NOx [ppm]	87.7	28.5
HCl [ppm]	5.5	2.2
SO2 [ppm]	15.7	7.5
Particulates [mg/Nm3]	9	1.3
Mercury [ppm]	45	13.1
DXNs [ppm]	0.09	0.03

Note: exchange into O2 (12%)

- In both cases of Japan and EU, WtE facilities stipulates the facility standard which is stricter than national law (or EU Directive)
- The actual emission value of exhausted gas is stricter than the facility standard

Environmental Pollution Prevention Process

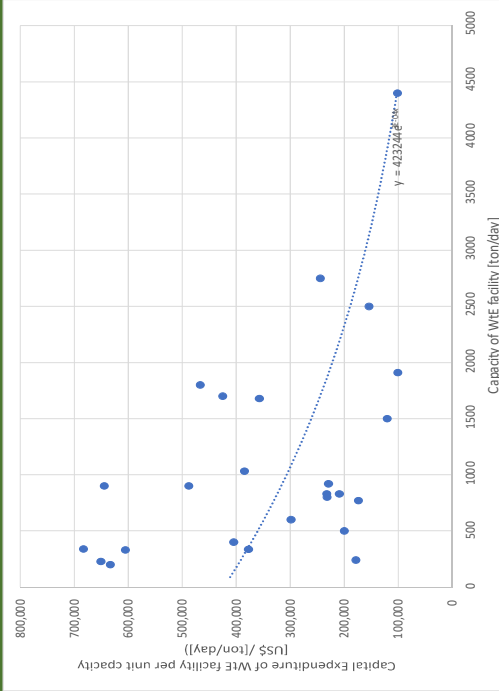
An example of Air Pollution Prevention Techniques



Project Implementation Scheme

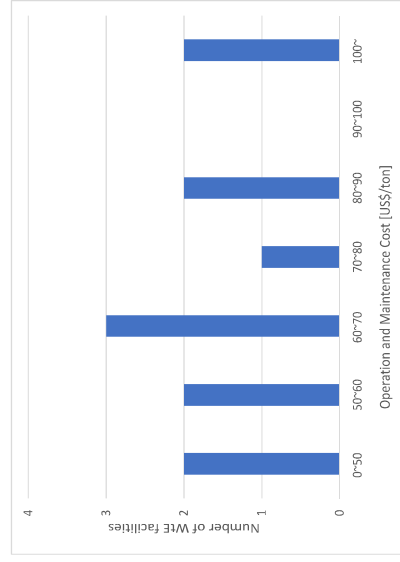
- 1) Financial Scheme
 - In Japan, WtE facilities are usually built under the public-build and operation scheme. The ratio of the projects utilizing Public Private Partner (PPP) scheme is relatively low.
 - In EU and USA, PPP scheme is applied for some facilities, and mainly Design Build Operate (DBO) or Build Operate Transfer (BOT).
- 2) Development approach
 - Solicited approach is mostly applied in both EU and Japan. In the case of EU and Japan, governments have clear master plan of SWM. Therefore, the specification for the bidding document is clear.
 - In case of Asian countries except Japan, the development approach is not clear, however, most of the successful projects seem to apply solicited approach because the project is clearly understood by the governments.
- 3) Implementation Schedule
 - According to available data from cases in Europe and Japan, it takes 2-3 years for planning, 1-2 years for designing, and 2-4 years for construction.
 - Operation and maintenance period of DBO contract, most of cases are range from 15 to 20 years.

Financial Aspect (Capital Expenditure)



- The capital expenditure is from 100,000 US\$ to 700,000 US\$ per ton/day.
- The capital expenditure per capacity tends to depend on the capacity of WtE facility.

Financial Aspect (Operation and Maintenance Cost)



- The OPEX of incineration is approximately 50 to 100 US\$ / ton. There are two cases of more 100 US\$, which will include overhaul maintenance cost.
- There is no identification of significant differences between the costs of DBO projects and Public Build and Own projects.

Citizen Participation

- Citizen participation is an essential part of the smooth implementation of WtE project.
- As part of the process of EIA in most of countries, public hearing and public consultation meeting are held during the planning and/or design stage.
- In EU, USA, and Japan, environmental monitoring reports including the relevant information of WtE operation, especially air quality monitoring of exhaust gas or water quality monitoring of wastewater, if it is discharged, is regularly released.
- WtE facilities provide facility tours for public or environmental education. The examples of facility tour, environmental education area, air quality monitor in a WtE facility are shown in



Utilization of BAT / BEP Guideline

Institutional/Financial Aspect

Item to be considered	Summarization (tentative)
Investment cost	Cost is capital expenditure is from 100,000 US\$ to 700,000 US\$ per ton/day
Operation and maintenance cost	Cost is around 50 to 100 US\$ / ton
Planning/Design/Tender/Construction/Operation Period	Planning(2 – 3 years), Design (around 1 – 2 years), Construction (2 – 4 years), More than five years from planning to operation commencement Operation (15 to 20 years)
Solicited or unsolicited	Most of case studies of good practice are solicited projects

For future introduction of WtEs in the Philippines
Refer this BAT/BEP for the preparation of the plan or technical specification of WtE facility

Utilization of BAT / BEP Guideline

Technical Aspect

Item to be considered	Summarization (Tentative)
Capacity	WtE capacity shall be designed by the waste collection amount and/or MSWM system of LGU, (one LGU or clustering LGUs)
Area size	The smallest area size is around 1 ha
Lower calorific value	Around 6000 to 14000 [kJ/kg] is acceptable for WtE facility
Energy recovery (electric power)	The relationship between electric power generation and the capacity of WtE facility is approximately 20MW/1000 [ton/day].
Energy recovery (heat recovery)	Utilization of surplus heat for various purpose (community heat provision, hot water)
Residual (incineration ash and fry ash) handling or utilization	- Separation of ferrous and non-ferrous metal - Utilization of road construction material or cement ingredient
Air pollution control method/standard	Many facility utilize own standard stricter than national standard (for public acceptance, etc)

For future introduction of WtEs in the Philippines



Refer this BAT/BEP for the preparation of the plan or technical specification of WtE facility

Summarization of Progress

- 60 case studies have been collected but some data collection is difficult.
- Case studies has been analyzed and the result has been summarized and main finding has been described.

Further Step

- Please provide the comments of BAT/BEP Guidelines until the end of March
- Especially, it will be better to summarize to utilize easily for the Philippines side.
- PMO implement the supplemental questionnaire survey and the additional data may be collected

Maraming salamat po !

PROJECT ACTIVITY : 4th SUB-GROUP MEETING FOR PROJECT OUTPUT 4 (ENHANCEMENT OF NATIONAL GOVERNMENTS' AND TARGET LGU'S CAPACITY TO IDENTIFY ISSUES AND PROVIDE SUGGESTION/ RECOMMENDATION FOR THE OTHER SWM TECHNOLOGIES THAN WTE IS ENHANCED)

DATE/TIME : 25 March 2021, 9:00AM - 11:15AM (Philippine Time)

VENUE : Video Conference through Microsoft Teams

Agenda Topics	Issues/Discussions/Actions	Comments/Agreements/ Timelines	Required Actions/Responsible Agency/Person
<p>1.) Call to Order/Meeting Objectives/ Acknowledgement of Attendees and Adoption of Agenda (Ms. Elvira Pausing, EMB-SWMD-PMO)</p>	<ul style="list-style-type: none"> ● Ms. Elvira Pausing of EMB-SWMD-PMO commenced the 4th subgroup meeting for Project Output 4 when quorum was reached and all presenters for the meeting have signed in. ● Ms. Pausing presented the agenda and asked the subgroup members if anything else needed to be discussed. ● Ms. Kris Morada of EMB-SWMD-PMO was called on to acknowledge the presence of participants. 	<ul style="list-style-type: none"> ■ Agenda was moved for adoption with no comments and modifications from the participants. 	
<p>2.) Review of the previous Sub-group meeting (Ms. Kyoko Kimura, Ms. Iku Sato, JET)</p>	<ul style="list-style-type: none"> ● Ms. Kyoko Kimura of JET thanked the subgroup for their participation in the collection of technical examples that JET compiled in a consolidated document. ● Through the contributions, JET was able to find supplementary research to enrich the insight and understanding of the given technologies. ● The compiled technical document (Draft Booklet for Good practice and Good technology) was presented, discussing one example for each category- Cost recovery of SWM, Collection and Transportation, 3R, IEC, and landfill management- emphasizing how the reports were summarized in the template by discussing 		

<p>3.) Technical presentation and discussion points by JET: Good practices of SWM technologies and introduction of Activity 4-4 (Ms. Kyoko Kimura, Ms. Iku Sato, JET)</p>	<p>the outline and good points of the identified technologies.</p> <ul style="list-style-type: none"> ● Ms. Kyoko continued the discussion by introducing Activity 4-4 as a continuation of Activity 4-3. ● The template of the Evaluation of Technology form was presented to discuss how the LGUs will assess the technologies gathered based on its technical viability, economic feasibility, cultural acceptability and environmental soundness, considering the characteristics of their corresponding LGU. Several examples were provided on how the form is used, using the examples presented previously. ● Ms. Kyoko underscored that the goal of Activity 4-4 is for the LGUs to identify the best technologies to be implemented in their jurisdiction, guided by this multi-aspect assessment form. With this, an immersive participation from the LGUs is expected. 	<ul style="list-style-type: none"> ■ In order to have a more detailed discussion on the LGUs outputs, JET will meet with the LGUs individually starting in June and in August, and collect the comments and discussion with SG members on October, to arrive at a final output by December. ■ Ms. Marla Agas of DILG raised a concern on the use of plastic bags for storage of waste, mentioning that local regulations may be in conflict with that, and ends by giving a reminder that LGUs must be mindful of their practices in the assessment of the technologies to avoid conflicts. 	<ul style="list-style-type: none"> ■ [JET] Resend the Evaluation of Technology template along with the compiled technical examples to the LGUs. ■ [LGUs] Prepare Evaluation of Technology for the technical examples. First draft to be sent at the end of May. ■ [JET and LGU] Set a meeting date for June discussion on the first draft of assessment.
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		<ul style="list-style-type: none">○ Ms. Kyoko acknowledged the concern and noted that the example shown in the slide is more for the purpose of discussing the use of the Evaluation form, and that it is up to the LGUs to incorporate their practices.▪ Ms. Agas further suggests that the LGUs can note how they can adopt the technologies better such as entering into MOUs to overcome the technical challenges, etc.<ul style="list-style-type: none">○ Ms. Kyoko raises that the objective of Activity 4-4 is more of assessing the technologies.▪ Engr. Elisa Madrazo of Davao City LGU raised that since JET has already been to Davao to observe their SWM practices, Engr. Madrazo proposes for JET to provide evaluations to the current practices of Davao City instead of them providing assessments to these new technologies.<ul style="list-style-type: none">○ Due to difficulties in internet connectivity, Ms. Kyoko proposed to move the discussion on this matter through email.▪ Ms. Agas asked who will be involved in the evaluation other than the LGUs.<ul style="list-style-type: none">○ Ms. Kyoko responded that only LGUs will be involved in the evaluation at the start but will be
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<p>4.) Brief explanation of BAT/BEP Guideline (Mr. Higashinakagawa, JET)</p>	<ul style="list-style-type: none"> ● Mr. Higashinakagawa thanked the participants for the opportunity to present a brief discussion on the BAT/BEP guideline for OPI. ● Mr. Higashinakagawa presented the template used to collate the insights in the case studies. From the collected 60 examples, a summary on the technical specifications was prepared that can be 	<p>presented to the rest of the subgroup by October.</p> <ul style="list-style-type: none"> ○ Ms. Agas raised if stakeholders from environmental NGOs can be involved in the assessment. ○ Ms. Kyoko would like for the LGUs to do the assessment first. Discussion with the other subgroup members will be facilitated in the October and December meetings, and finally, subgroup members will give a presentation about the result of OP4 to the other LGUs and the stakeholders at the seminar in line with Activity 4-5. ▪ Mr. David Vergara clarified his understanding of the requirement. <ul style="list-style-type: none"> ○ Ms. Kyoko replied by saying that the deadline of submission of the first draft of the Evaluation of Technology is at the end of May, and JET shall review the output for discussion during the June meeting with each LGU. 	
		<ul style="list-style-type: none"> ▪ The deadline for the comments has been tentatively set on March 31, 2021, where OPI subgroup members are encouraged to give insights on the document for further improvement. 	<ul style="list-style-type: none"> ▪ [JET] Provide BAT/BEP Guidelines to the target LGUs including Davao LGU

	<p>used as a guideline for the WtE facilities to be put up in the Philippines.</p>	<ul style="list-style-type: none"> ▪ Ms. Belly Cabeso of EMB-PPDD asked what the calorific value of residual waste in the Philippines is. <ul style="list-style-type: none"> ○ Mr. Higashinakagawa mentioned that the value depends on the area in the Philippines, and should be detailed in the WACS report of the LGUs. ○ Mr. Kosaka replied that the low calorific value for QC is 4000-4500 kJ/kg. ○ Ms. Cabeso further inquired about the basis of the low calorific value in the report (14,000kJ/kg) and whether WtE facilities will be required to find out the calorific value of the feed before putting up a facility. ○ Mr. Higashinakagawa replies that a waste characterization study is needed to be conducted in order to determine the appropriate specifications of the facility in the design stage. ▪ Ms. Pausing raised a suggestion on the provision of the financial mechanism/strategies used to put up facilities. <ul style="list-style-type: none"> ○ Mr. Higashinakagawa expressed that that item is included in the questionnaire to obtain this information, though it was generally difficult to gather this 	<ul style="list-style-type: none"> ▪ [OPI SG members] Provide comments to the BAT/BEP Guideline.
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		<p>information except in the case studies in Japan.</p> <ul style="list-style-type: none">○ Mr. Higashi acknowledged that some examples of financial mechanism will be added in the BAT/BEP Guidelines.▪ Engr. Madrazo asks about how fly ash and bottom ash are managed based on international practices.○ Mr. Higashinakagawa presented the insights from the BAT/BEP guidelines, discussing that bottom ash is used as construction material, while fly ash is stabilized and then sent to landfill sites.○ Mr. Higashi proposed to share the BAT/BEP Guidelines with the target LGUs including Davao LGU which is not included in the member of SG1.
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<p>5.) Wrap-up, Required Actions, and Agreements (Ms. Andrei Mallare, JET)</p>	<ul style="list-style-type: none"> ● Ms. Andrei Mallare of JET wrapped up the earlier discussions and reiterated the arrangements and timelines as agreed. <ul style="list-style-type: none"> ▪ [JET] Resend the Evaluation of Technology template along with the compiled technical examples to the LGUs. ▪ [LGUs] Prepare Evaluation of Technology for the technical examples. First draft to be sent at the end of May. ▪ [JET and LGU] Set a meeting date for June discussion on the first draft of assessment. ▪ [JET] Provide BAT/BEP Guideline to Davao LGU ▪ [OP1 SG members] Provide comments to the BAT/BEP Guideline. ▪ [JET] Provide BAT/BEP Guideline to Davao LGU ● [OP1 SG members] Provide comments to the BAT/BEP Guideline 	<ul style="list-style-type: none"> ▪ No clarifications and/or alterations raised by the subgroup members 	
<p>6.) Way forward, Schedule of the next meetings</p>	<ul style="list-style-type: none"> ● The proposed schedule of subgroup meetings, ITWG and JCC meetings for 2021 was presented by SWMD-PMO. ● Mr. Kamishita acknowledged the proposal and will give feedback and confirmation of the dates after consultation with JET. 		

7.) Other matters	<p>Ms. Roxanne Barcenas also shared updates on the dissemination of the BAT/BEP letters issued to the implementing body of the WtE facilities in the case study where they were asked to validate and supply the missing information. Of the 22 contacted companies, only 3 have replied.</p> <p>Ms. Pausing asked Mr. Higashinakagawa on the timeline of this activity to which he replied that PMO can try to contact them until March 31, 2021, and whatever information gathered until then will be incorporated in the BAT/BEP guidelines.</p>		
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Appendix 11-5: Sub-group Meeting for Output 4

11-5-5 : 5th SG4

OUTLINE OF DISCUSSION

(Based on Draft Booklet-Good Practices and Technologies other than WTE)

- I. Cost Recovery of SWM
- II. Collection and Transport
- III. Intermediate Treatment / 3Rs
- IV. Landfill
- V. Information, Education and Communication
- VI. Waste Analysis and Characterization Study

EVALUATION SUMMARY OF SUITABLE SWM TECHNOLOGIES OTHER THAN WTE.

-DAVAO CITY LGU



I. Cost Recovery of SWM

1. Charge on a waste bag designated by local Government (Japan, USA, Portland, Taiwan and other countries)
2. No Segregation –No Sticker -No Collection Policy (Bayawan City, Negros Oriental, Philippines)
3. Volume-based Fee System Using Designated Garbage Bags (South Korea and other countries)
4. SWM cost allocated from general taxpayer (Japan)
5. Garbage Fee Collection Attached to Public Utility Service Fee/Bill (Olongapo City, Philippines)
6. Sale of Recyclables (Makati City, Philippines)

Charge on Waste Bag/ Designated Garbage bags	
<p>Technical aspect</p> <ul style="list-style-type: none"> Introducing the system needs careful planning, legislation, political will and support from various stakeholders Lessons from the experiences of those who support the system. <p>Applicable conditions for introducing practice/technology</p> <ul style="list-style-type: none"> Consistency of project charging as necessary. 	<p>Economic aspect</p> <ul style="list-style-type: none"> Costs of the waste bag will be an additional burden for the families and especially for low-income families. Consistency of project charging as necessary. <p>Environmental aspect</p> <ul style="list-style-type: none"> Will probably result to open dumping and indiscriminate throwing to avoid the costs of the system. Patronizing non-compliant households in the system. Patronizing non-compliant households in the system. Enforcement of environmental, recycling and disposal laws.
<p>Concerns about introducing practice/technology</p> <ul style="list-style-type: none"> Through information, education, campaign must be made. Through information, education, campaign must be made. 	<p>Cultural aspect</p> <ul style="list-style-type: none"> Needs convincing and educating residents of the benefits of the system. Through information, education, campaign must be made.
<p>Applicable conditions for introducing practice/technology</p> <ul style="list-style-type: none"> Through information, education, campaign must be made. 	<p>Environmental aspect</p> <ul style="list-style-type: none"> Through information, education, campaign must be made.
<p>Concerns about introducing practice/technology</p> <ul style="list-style-type: none"> Allocation for SWM sometimes will start of the required financial support through PPPs. Other funding initiatives and cost reduction. 	<p>Economic aspect</p> <ul style="list-style-type: none"> Allocation for SWM sometimes will start of the required financial support through PPPs. Other funding initiatives and cost reduction. <p>Environmental aspect</p> <ul style="list-style-type: none"> Implementation of programs depends on the budget. Provide contingency plans.
<p>Concerns about introducing practice/technology</p> <ul style="list-style-type: none"> Needs study and planning. Need to be consistent with the service utility. Need to be consistent with the service utility. 	<p>Cultural aspect</p> <ul style="list-style-type: none"> Needs convincing and educating residents of the importance of segregating waste into different types of recyclables. Through information, education, campaign must be made.
<p>Applicable conditions for introducing practice/technology</p> <ul style="list-style-type: none"> Need to be consistent with the service utility. Need to be consistent with the service utility. 	<p>Environmental aspect</p> <ul style="list-style-type: none"> Recyclables without market value may end up in landfills, indiscriminately thrown. Enforcement of environmental, recycling and disposal laws.
<p>Concerns about introducing practice/technology</p> <ul style="list-style-type: none"> Needs study and planning. Need to be consistent with the service utility. Need to be consistent with the service utility. 	<p>Economic aspect</p> <ul style="list-style-type: none"> Feasibility and sharing of profit. Needs educating residents on the importance of segregating waste into different types of recyclables. Memorandum of Agreement with contractor/turnkey.
<p>Applicable conditions for introducing practice/technology</p> <ul style="list-style-type: none"> Need to be consistent with the service utility. Need to be consistent with the service utility. 	<p>Environmental aspect</p> <ul style="list-style-type: none"> Recyclables without market value may end up in landfills, indiscriminately thrown. Enforcement of environmental, recycling and disposal laws.

OTHER SOURCES OF INCOME FOR SWM IN DAVAO CITY: SWM Certificate, Penalty from Violators, Special Collection and Landfill Tipping Fees

II. Collection and Transport

1. Door to door Collection (Japan and other countries)
2. Station collection for recyclable wastes (Japan and other countries)
3. Installation of Mini Recycling Centers (Bristol, UK)
4. Recycling Drop-off Sites (Bristol, UK)

Door-to-door Collection	
<p>Concerns about introducing practice/technology</p> <ul style="list-style-type: none"> Not all houses are directly accessible. Collection points are located on narrow alleys. Utilize carts on alleys or use narrow wheelchairs for these areas. <p>Applicable conditions for introducing practice/technology</p> <ul style="list-style-type: none"> Station collection for recyclable wastes 	<p>Economic aspect</p> <ul style="list-style-type: none"> Requires full manpower. Establish feasibility and collection fits for planning. <p>Environmental aspect</p> <ul style="list-style-type: none"> Unsorted unrecyclable wastes accumulated if not collected. Collected unrecyclable wastes will be disposed according to those company's procedures to those firms. Consistency will mitigate the problems. Enforcement of laws.
<p>Concerns about introducing practice/technology</p> <ul style="list-style-type: none"> Needs educating residents on the benefits of this system. Need to establish market for recyclables. Can be subsidized by the Define Materials that have market value. 	<p>Cultural aspect</p> <ul style="list-style-type: none"> Needs educating residents on the benefits of this system. Awareness campaigns
<p>Applicable conditions for introducing practice/technology</p> <ul style="list-style-type: none"> Maintenance of collection pts. Define Materials that have market value. 	<p>Environmental aspect</p> <ul style="list-style-type: none"> Unsorted unrecyclable wastes accumulated if not collected. Collected unrecyclable wastes will be disposed according to those company's procedures to those firms. Consistency will mitigate the problems. Enforcement of laws.
<p>Concerns about introducing practice/technology</p> <ul style="list-style-type: none"> Needs educating residents on the importance of segregating waste into different types of recyclables. Need to be consistent with the service utility. Need to be consistent with the service utility. 	<p>Cultural aspect</p> <ul style="list-style-type: none"> Needs educating residents on the importance of segregating waste into different types of recyclables. Through information, education, campaign must be made.
<p>Applicable conditions for introducing practice/technology</p> <ul style="list-style-type: none"> Need to be consistent with the service utility. Need to be consistent with the service utility. 	<p>Environmental aspect</p> <ul style="list-style-type: none"> Recyclables without market value may end up in landfills, indiscriminately thrown. Enforcement of environmental, recycling and disposal laws.

SIMILAR TECHNOLOGIES AND SYSTEMS IN DAVAO CITY



RECYCLABLE STORAGE BOXES IN VARIOUS BRGYS.



Brgy. MRFs & Proposed Central MRF

III. Intermediate Treatment/3Rs

- Promotion of Recycle – Refuse derived paper and plastics densified fuel (Hanoi, Vietnam)
- Promotion of Recycle – Waste bank (Bank Sampah)
- Promotion of Recycle – Act on Promoting Green Procurement (Japan and Taiwan)

Refuse derived paper and plastics densified fuel			
Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Lack of processing facility. Open for private proposals	Acceptable	Acceptable
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Not all recyclables have market demand. Private sector funding	Needs cooperation of the vendors.	Acceptable
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Learn from the experiences of market demand. Define materials that have market value.	Awareness campaigns	Acceptable
Act on Promoting Green Procurement			
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Needs careful planning and implementation from various stakeholders Learn from the experiences of market demand. Define materials that have market value.	Needs cooperation of the vendors. Awareness campaigns	Acceptable
Smart Mobile Waste Transfer Centers			
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Availability and adaptability of technology Costs in adapting the technology Conduct of feasibility study.	Needs cooperation of the vendors. Awareness campaigns	Acceptable

- Promotion of Recycle – Smart mobile waste transfer centers (Istanbul, Turkey)



SIMILAR TECHNOLOGIES AND SYSTEMS IN DAVAO CITY



signed in March 29, 2004
by former President
Gloria Macapagal
Arroyo.

III. Intermediate Treatment/3Rs

- Promotion of Reuse – Tax Break for Repair (Sweden)
- Promotion of Reuse – Resource recycling and Reuse Act (Taiwan and other countries)

Tax Break for Repair

Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Involving the system vendors Careful planning, legislation, and consultation with various stakeholders Learn from the experiences of those who adapted the system.	Acceptable	Acceptable
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Lack of recycling systems and equipment Costs of facilities and technology. Conduct of feasibility study. May be funded by government and possible engagements or private sector with the private sector.	Acceptable	Acceptable



III. Intermediate Treatment/3Rs

- Promotion of Recycle – Refuse derived paper and plastics densified fuel (Hanoi, Vietnam)
- Promotion of Recycle – Waste bank (Bank Sampah)
- Promotion of Recycle – Act on Promoting Green Procurement (Japan and Taiwan)
- Promotion of Recycle – Smart mobile waste transfer centers (Istanbul, Turkey)

Refuse derived paper and plastics densified fuel			
Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Lack of processing facility. Open for private proposals	Acceptable	Acceptable
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Not all recyclables have market demand. Private sector funding	Needs cooperation of the vendors.	Acceptable
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Learn from the experiences of market demand. Define materials that have market value.	Awareness campaigns	Acceptable
Act on Promoting Green Procurement			
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Needs careful planning and implementation from various stakeholders Learn from the experiences of market demand. Define materials that have market value.	Needs cooperation of the vendors. Awareness campaigns	Acceptable
Smart Mobile Waste Transfer Centers			
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Availability and adaptability of technology Costs in adapting the technology Conduct of feasibility study.	Needs cooperation of the vendors. Awareness campaigns	Acceptable

- Promotion of Recycle – Smart mobile waste transfer centers (Istanbul, Turkey)



SIMILAR TECHNOLOGIES AND SYSTEMS IN DAVAO CITY



signed in March 29, 2004
by former President
Gloria Macapagal
Arroyo.

IV. Landfill

- Fences, retaining walls (Japan and other countries)
- Daily Soil Cover (Japan)
- Leachate Collection Pipes of Semi-aerobic landfill (Japan and other countries)
- Gas Ventilation System of Semi-aerobic landfill (Japan and other countries)



Fences, retaining walls			
Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Implemented in the City S.U.P.	Acceptable	Acceptable
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Costs of soil and covering operation of the landfill. Influent covering is done	Acceptable	Acceptable
Daily Soil Cover			
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Implemented in the City S.U.P. as a daily basis due to the 24 hr operation. Influent covering is done	Acceptable	Acceptable
Leachate Collection Pipes of Semi-aerobic landfill			
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Frequency of collection pipes to collapse and block the collection and passage. Careful installation and regular monitoring of pipes	Acceptable	Acceptable
Gas Ventilation System of Semi-aerobic landfill			
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Implemented in the City S.U.P. as leachate collection and air passage. Careful installation and regular monitoring of pipes	Acceptable	Acceptable




IV. Landfill

- Surface Lining System (Japan)
- Holding Basin and Regulating Pond for Leachate (Japan)
- Leachate Treatment Facility (Japan)




Surface lining system			
Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Implemented in the City S.U.P. as a daily basis due to the 24 hr operation. Influent covering is done	Acceptable	Acceptable
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Frequency of collection pipes to collapse and block the collection and passage. Careful installation and regular monitoring of pipes	Acceptable	Acceptable
Leachate Treatment Facility			
Concerns about introducing pre/techno/technology Applicable conditions for introducing pre/techno/technology	Implemented in the City S.U.P. as leachate collection and air passage. Careful installation and regular monitoring of pipes	Acceptable	Acceptable

V. Information, Education and Communication

Requirement to attend SWM course		Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
1. Promotion of SWM to Private Companies (Santiago City, Phils.)		Concerns about introducing practicetechnology	Other attendees to the SWM course for compliance purposes only. Actual compliance to proper SWM is still low. Strengthen, enforcement and monitoring.	Low compliance despite the SWM is still low. Strengthen, enforcement and monitoring.	Acceptable
2. Promotion of Segregation – Leaflet explaining waste segregation (Mandaue City, Phils.)		Concerns about introducing practicetechnology	Low compliance despite the SWM is still low. Strengthen, enforcement and monitoring.	Low compliance despite the SWM is still low. Strengthen, enforcement and monitoring.	Acceptable
3. Promotion of Segregation – Application for waste Segregation		Concerns about introducing practicetechnology	Low compliance despite the SWM is still low. Strengthen, enforcement and monitoring.	Low compliance despite the SWM is still low. Strengthen, enforcement and monitoring.	Acceptable

SIMILAR APPLICATIONS IN THE CITY






Attendance to SWM Orientation (C.O. 0361-10)

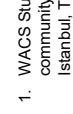
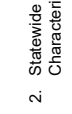
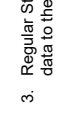
All establishments are required to annually secure a Solid Waste Management Certificate. Requirements:


- Solid Waste Management Plan & Program in accordance with the guidelines to be issued by the Department of Environment and Natural Resources.
- Budget for implementation of such plan and program.
- Attendance to the solid waste management orientation.
- Payment of P500.00 prescribed certificate fee.

V. Information, Education and Communication


Zero Basura Olympics, "ZBO"		Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
4. IEC Event – Zero Basura Olympics (Philippines)		Concerns about introducing practicetechnology	Previously implemented in the City- Annual implementation of Lumbaw Awards.	Previously implemented in the City- Annual implementation of Lumbaw Awards.	Acceptable
5. IEC Event – Spo-GOMI (Japan)		Concerns about introducing practicetechnology	Previously implemented in the City- Annual celebration of ECO-Fest.	Previously implemented in the City- Annual celebration of ECO-Fest.	Acceptable
6. IEC Event – Plastics Smart (Japan)		Concerns about introducing practicetechnology	Previously implemented in the City- Annual celebration of ECO-Fest.	Previously implemented in the City- Annual celebration of ECO-Fest.	Acceptable

VI. Waste Analysis and Characterization Study

WACS study with a classification of the community and seasons (ASTM D5231)		Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
1. WACS Study with a classification of the community and seasons (Kartal District, Istanbul, Turkey)		Concerns about introducing practicetechnology	Other aspects may not be applicable to own setting according to weather, seasons and according to rural and urban category.	Other aspects may not be applicable to own setting according to weather, seasons and according to rural and urban category.	Acceptable
2. Statewide Municipal Solid Waste Characterization Study (Indiana, USA)		Concerns about introducing practicetechnology	Other aspects may not be applicable to own setting according to weather, seasons and according to rural and urban category.	Other aspects may not be applicable to own setting according to weather, seasons and according to rural and urban category.	Acceptable
3. Regular Study and disclosure of WACS data to the public (Japan)		Concerns about introducing practicetechnology	Other aspects may not be applicable to own setting according to weather, seasons and according to rural and urban category.	Other aspects may not be applicable to own setting according to weather, seasons and according to rural and urban category.	Acceptable



WACS @ Source (Composition, Bulk Density)



End-of-Pipe WACS (Composition, Moisture Content, Ash Content, Combustible Content, Calorific Value)

THANK YOU


- Evaluate the technical examples of the “Good practices and Good technologies other than WTE” from the following perspectives:
 - Technical viability
 - Economical feasibility
 - Cultural acceptability
 - Environmental soundness

1. Cost recovery of SWM


Example: No Segregation – No Sticker – No Collection Policy

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	<ul style="list-style-type: none"> • Collector need to check the sticker and segregation situation. 	<ul style="list-style-type: none"> • It is take a time to check the sticker and segregation situation 	<ul style="list-style-type: none"> • Need to understanding of residents 	<ul style="list-style-type: none"> • Uncollected waste may pollute the surrounding area.
Applicable conditions for introducing practice/technology	<ul style="list-style-type: none"> • Give a lecture to collector. 	<ul style="list-style-type: none"> • It is recommended to use clear bags that are easy to see what is inside. etc. 	<ul style="list-style-type: none"> • Hold briefing sessions for residents. • Sell the sticker at places where residents can easily stop by. 	<ul style="list-style-type: none"> • Combine with Door – to – Door collection.

1-1. Charge on a waste bag designated by local government

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	<ul style="list-style-type: none"> • Introducing the system needs careful planning, legislation, political will and consultation from various stakeholder  	<ul style="list-style-type: none"> • Costs of the waste bags will be an additional burden for the families and even greater burden for low-income families. 	<ul style="list-style-type: none"> • Needs convincing and educating residents of the benefits of the system. 	<ul style="list-style-type: none"> • Will probably result to open dumping and indiscriminate throwing to avoid the costs of waste bag. • Patronizing non-complaint households will compromise the system.
Applicable conditions for introducing	<ul style="list-style-type: none"> • Learn from the experiences of those who adapted the 	<ul style="list-style-type: none"> • Consultation on proper charging is necessary. 	<ul style="list-style-type: none"> • Thorough information, education campaign must 	<ul style="list-style-type: none"> • Consistency will mitigate the problems. Enforcement

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
practice/technology	system.		be made.	of laws.
1-2. No Segregation – No Sticker - No Collection Policy				
	Technical aspect Difficult to implement if collection is done through collection points. (Possibility of tampering and etc.)	Economic aspect How and where to purchase stickers needs to be established including how many.	Cultural aspect Needs convincing and educating residents of the benefits of the system.	Environmental aspect • Will probably result to open dumping and indiscriminate throwing to avoid the costs of stickers • Patronizing non-complaint households will compromise the system.
Concerns about introducing practice/technology				
Applicable conditions for introducing practice/technology	House-to-house collection is preferable to easily verify the stickers.	Careful planning is necessary.	Thorough education campaign must be made.	Consistency will mitigate the problems. Enforcement of laws.
1-3. Volume-based Fee System Using Designated Garbage Bags				
	Technical aspect Introducing the system needs careful planning, legislation, political will and consultation from various stakeholders	Economic aspect Costs of the waste bags will be an additional burden for the families and even greater burden for low-income families.	Cultural aspect Needs convincing and educating residents of the benefits of the system.	Environmental aspect • Will probably result to open dumping and indiscriminate throwing to avoid the costs of waste bag. • Patronizing non-complaint households will compromise the system.
Concerns about introducing practice/technology				
Applicable conditions for introducing practice/technology	Learn from the experiences of those who adapted the system.	Consultation on proper charging is necessary.	Thorough education campaign must be made.	Consistency will mitigate the problems. Enforcement of laws.
1-4. Volume-based Fee System Using Designated Garbage Bins				
	Technical aspect Needs curb collection to be successfully implemented. Not all communities in the Philippines have wide roads.	Economic aspect Costly if every household will buy or will be given a mobile garbage bin.	Cultural aspect Needs convincing and educating residents of the benefits of the system.	Environmental aspect • Will probably result to open dumping and indiscriminate throwing to avoid the costs of waste bag. • Patronizing non-complaint households will compromise the system.
Concerns about introducing practice/technology				

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Applicable conditions for introducing practice/technology	Needs thorough study and planning.	The cost of the bin can be added to the SWM fee charged to the household.	Thorough education campaign must be made.	Consistency will mitigate the problems. Enforcement of laws.
1-5. SWM cost allocated from general taxpayer				
	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-Implemented in the City- Acceptable	Allocation for SWM sometimes fall short of the required budget.	The system does not encourage households to generate less wastes.	Implementation of programs depends on the budget.
Applicable conditions for introducing practice/technology		Financial support through PPPs. Other funding initiatives and generating activities.	Implement programs that encourage waste diversion and reduction 	Provide contingency plans.
1-6. Garbage Fee Collection Attached to Public Utility Service Fee/Bill				
	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-Proposed to be implemented in the City (On-going study) – Dependent on agreement with the service utility.	Acceptable	Needs convincing and educating residents of the benefits of the system.	Acceptable
Applicable conditions for introducing practice/technology	Needs study and planning. Learn from the experiences of those adopting the system.		Thorough education campaign must be made.	
1-7. Garbage Fee Collection and MRF Rental				
	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-Garbage Fee implemented in the City- Needs further information especially on MRF Rental schemes.	Acceptable	Needs educating constituents on the benefits of Garbage Fees.	Acceptable
Applicable conditions for introducing practice/technology			Thorough education campaign must be made.	
1-8. Collection Fee for Tagged Sack of Waste				
	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Introducing the system needs careful planning, legislation, political will and a lot of consultation from various stakeholders	Costs for tagged sacks will be an additional burden for the families and even greater burden for low-income families.	Needs convincing and educating residents of the benefits of the system.	<ul style="list-style-type: none"> Will probably result to open dumping and indiscriminate throwing to avoid the costs of waste bag. Patronizing non-complaint households will compromise the system.
Applicable conditions for introducing practice/technology	Learn from the experiences of those who adapted the system.	Consultation on proper charging is necessary.	Thorough information, education campaign must be made.	Consistency will mitigate the problems. Enforcement of laws.

1-9. Sale of Recyclables

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-implemented by some brgy.s In the City- Not all recyclables have market demand.	Feasibility and sharing of profit needs to be established. (Share of Barangay from the sale of recyclables.)	Needs educating residents on the importance of segregating recyclables.	Recyclables without market value may end up in landfills, accumulate on junkyards or indiscriminately thrown.
Applicable conditions for introducing practice/technology	Define materials that have market value.	Memorandum of Agreement between barangay and contractor/junkshop.	Thorough information, education campaign must be made.	Enforcement of environmental laws.

2. Collection and Transportation

Example: Door – to – Door Collection

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	<ul style="list-style-type: none"> In an area with narrow roads, large trucks cannot access there. 	<ul style="list-style-type: none"> It is take a time to pick up waste from each household 	<ul style="list-style-type: none"> Acceptable 	<ul style="list-style-type: none"> Acceptable
Applicable conditions for introducing practice/technology	<ul style="list-style-type: none"> Combine with smaller size vehicle 	<ul style="list-style-type: none"> It is recommended to use clear bags that are easy to see what is inside. etc. 	<ul style="list-style-type: none"> --- 	<ul style="list-style-type: none"> ---

2-1. Door-to-Door Collection

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Not all houses are directly facing the street. Others are located on narrow alleys.	Costly. Requires fuel and manpower.	Segregation must be established	Acceptable
Applicable conditions for introducing practice/technology	Utilize carts on alleys or establish collection pts for these areas.	Establish feasibility and planning.	Awareness campaigns	

2-2. Station collection for recyclable waste

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Many communities regard collection points as NIMBY. Collection points have tendency to become nuisance.	Costs for installation of collection boxes. Need to establish market for recyclables.	Needs educating residents on the benefit of this system.	Uncollected Unsorted wastes may pose as nuisance and will accumulate if not collected. Collected unsorted wastes will set a bad precedence to those complying.
Applicable conditions for introducing practice/technology	Maintenance of collection pts.	Can be subsidized by the government. Define Materials that have market value.	Awareness campaigns	Consistency will mitigate the problems. Enforcement of laws.

2-3. Installation of Mini Recycling Centers

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Many communities regard collection points as NIMBY. Collection points have tendency to become nuisance.	Costs for installation of collection boxes. Need to establish market for recyclables.	Needs educating residents on the benefit of this system.	Uncollected Unsorted wastes may pose as nuisance and will accumulate if not collected. Collected unsorted wastes will set a bad precedence to those complying.
Applicable conditions for introducing practice/technology	Maintenance of collection pts.	Can be subsidized by the government. Define Materials that have market value.	Awareness campaigns	Consistency will mitigate the problems. Enforcement of laws.

2-4. Recycling Drop Off Sites


	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Requires the necessary facility and space.	Needs planning to determine financial feasibility	Needs educating residents on the benefit of this system.	Tendency for wastes to accumulate and become

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Applicable conditions for introducing practice/technology	Needs additional information	Needs additional Information	Awareness campaigns	nuisance to community when not properly managed. Proper management. Fast turnover of materials going to recycling and disposal facilities

2-5. Group Collection of Recyclable Waste

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Requires identifying, registering organizations as collectors including presence of requisite facility and supplier contracts.	Requires budget allocation from City as subsidy or incentive for collector organization.	Acceptable	Tendency for wastes to accumulate and become nuisance to community when not properly managed.
Applicable conditions for introducing practice/technology	Needs planning and further study. Learn from the experiences of those adopting the system.	Needs planning and further study. Learn from the experiences of those adopting the system.		Proper management. Fast turnover of materials going to recycling and disposal facilities

2-6. Kitchen waste collection

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Establishing of system: From food waste collection to processing into compost.	Costs in procurement of bins, collection and transport to composting equipment and processing.	Needs educating residents on the benefit of this system.	Tendency to become nuisance if not properly managed 
Applicable conditions for introducing practice/technology	Careful planning on establishment of system.	Can be funded by government and or private sector.	Awareness campaigns	Proper management.

2-7. Food Waste Truck Program

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Establishing of system: From food waste collection to processing into compost.	Costs in procurement of truck, collection and transport to composting equipment and processing.	Needs educating residents on the benefit of this system.	Tendency to become nuisance if not properly managed.
Applicable conditions for introducing practice/technology	Careful planning and establishment of system.	Can be funded by government and or private sector.	Awareness campaigns	Proper management.

2-8. High-tech food waste recycling machines in Seoul

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Establishing of system: From food waste collection to waste processing.	Cost of equipment, collection, transport and processing.	Acceptable	Tendency to become nuisance if not properly managed.
Applicable conditions for introducing practice/technology	Careful planning on establishment of system.	Can be funded by government and or private sector.		Proper management.

2-9. Transfer Station

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Identifying a strategic location for the facility including the areas to be covered.	Costs of facility, trucks and other equipments.	Acceptable	Acceptable
Applicable conditions for introducing practice/technology	Conduct of Feasibility Study if it's better to just establish another sanitary landfill in the area.	Can be funded by government and or private sector.		

2.10 Transfer Station

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Identifying a strategic location for the facility including the areas to be covered.	Costs of facility, trucks and other equipments.	Acceptable	Acceptable
Applicable conditions for introducing practice/technology	Conduct of Feasibility Study if it's better to just establish another sanitary landfill in the area.	Can be funded by government and or private sector.		

2-11. Truck Routing

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-Implemented in the City- Establishing of routes and mode of collection.	Acceptable	Acceptable	Acceptable
Applicable conditions for introducing practice/technology	Careful planning and coordination.			

2-12. Equipping Transporting Vehicles with GPS

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Lack of knowledge on using the system	Costs for installing the technology	Acceptable	Acceptable
Applicable conditions for introducing practice/technology	Conduct of training on using the system.	Can be funded by government and or private sector.		

2-13. Model Country on waste collection and transportation

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Facilities have to be established (WTE, glass processing facility, etc)	Costs for installing the facilities.	Acceptable	Acceptable
Applicable conditions for introducing practice/technology	Work with what is locally available.	Can be funded by government and or private sector.		

3. Intermediate Treatment/3R


Example: Earthworm compost

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	<ul style="list-style-type: none"> food waste should be collected separately. It is necessary to secure a supplier or site for the use of compost. 	<ul style="list-style-type: none"> acceptable 	<ul style="list-style-type: none"> Residents may complain about pests and odors. 	<ul style="list-style-type: none"> acceptable
Applicable conditions for introducing practice/technology	<ul style="list-style-type: none"> Need to introduce a system to separate and collect food waste. For use in suburban areas with farmland. 	<ul style="list-style-type: none"> --- 	<ul style="list-style-type: none"> Secure a location away from private homes. 	<ul style="list-style-type: none"> ---

Example: Waste Bank

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	<ul style="list-style-type: none"> Regulations on target of recyclable product categories, weighing methods, recording methods, etc. Secure the recyclers to cooperate 	<ul style="list-style-type: none"> Expenses related to the establishment of a waste bank Labor costs 	<ul style="list-style-type: none"> Waste bank should be installed in a location that is easily accessible to local residents Anti-theft measures for recyclable products 	<ul style="list-style-type: none"> Keep recyclable products clean. (PET bottles and cans soiled with food and drink are a cause of foul odors and pests. These wastes cannot be stored outside because they form a pool of water and become a hotbed for mosquitoes.)
Applicable conditions for introducing practice/technology	<ul style="list-style-type: none"> Formulate the guidelines Identify the recycler 	<ul style="list-style-type: none"> Secure a certain number of customers so as not to make a deficit in initial cost and operation cost. 	<ul style="list-style-type: none"> Install the waste bank in a place where people can easily gather, such as near a government office. 	<ul style="list-style-type: none"> Only accept the washed recyclable products Secure a storage place indoors


3-1. Black Soldier Fly (BSF)

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Lack of Knowledge on technology	Costs for establishing a facility	Residents may perceive the system as unsanitary and potentially health hazard	Acceptable
Applicable conditions for introducing practice/technology	Conduct of training 	May be funded by government and or private sector.	Awareness campaigns.	


3-2. Bokashi composting of food waste from restaurants and hotels

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Lack of Knowledge on technology	Costs for establishing the system.	Acceptable	Improper management may result to odor nuisance in the establishment.
Applicable conditions for introducing practice/technology	Conduct of training.	To be funded by the private sector.		Proper management and training.

3-3. Waste-to-Energy facility utilizing rice husks

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Can be installed only on rice producing areas.	Costs for Gasifiers.	Acceptable	Possible smoke emissions
Applicable conditions for introducing practice/technology	Install on rice producing areas	May be funded by government and or private sector.		Installation of APCQ 



3-4. Food Waste Recycling

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Lack of  wangay composting facilities.	Costs for collecting and transporting	Acceptable	Tendency to become nuisance if not properly managed.
Applicable conditions for introducing practice/technology	Establish linkages with piggeries and private composting facilities	May be funded by government and or private sector.		Proper management.

3-5. Ecobrick Movement

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Sturdiness of ecobrick material may be an issue.	Acceptable	Needs educating residents on the benefit of this system.	Acceptable
Applicable conditions for introducing practice/technology	To be used only on less load bearing structures.		Awareness campaigns	


3-6. Selling of recyclable wastes for tuition fee and school funding

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Identifying participating schools	Not all recyclables have market demand. 	Needs educating students on the benefit of this system.	Acceptable
Applicable conditions for introducing practice/technology	Course the implementation of program through DepEd.	Define materials that have market value.	Awareness campaigns	

3-7. Basuranihan Project

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Not all recyclables have market demand.	Acceptable	Needs educating residents on the benefit of this system.	Acceptable
Applicable conditions for introducing practice/technology	Define materials that have market value.		Awareness campaigns	


	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
practice/technology				
3-8. WISHCRAFT				
Concerns about introducing practice/technology	Technical aspect Identifying participating schools	Economic aspect Not all recyclables have market demand.	Cultural aspect Needs educating students on the benefit of this system.	Environmental aspect Acceptable
Applicable conditions for introducing practice/technology	Course the implementation of program through DepEd.	Define materials that have market value.	Awareness campaigns	
3-9. Plastic for Rice Program				
Concerns about introducing practice/technology	Technical aspect Acceptable	Economic aspect Sustainability issue. Availability of resources.	Cultural aspect Willingness to cooperate will depend on "what's in it for them."	Environmental aspect Acceptable
Applicable conditions for introducing practice/technology		Project to cover a certain period only.	Awareness campaign.	
3-10. Refuse derived paper and plastics densified Fuel				
Concerns about introducing practice/technology	Technical aspect Lack of processing facility.	Economic aspect Costs for establishment of facility.	Cultural aspect Acceptable	Environmental aspect Acceptable
Applicable conditions for introducing practice/technology	Open for Private proposals	Private sector funding.		
3-11. Waste bank (Bank Sampah)				
Concerns about introducing practice/technology	Technical aspect Needs careful planning, and consultation from various stakeholders	Economic aspect Not all recyclables have market demand.	Cultural aspect Needs cooperation of the residents.	Environmental aspect Acceptable
Applicable conditions for introducing practice/technology	Learn from the experiences of those who adapted the system.	Define materials that have market value.	Awareness campaigns	
3-12. Act on Promoting Green Procurement				
	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	(Implemented in the Country through Government procurement Policy) 	Acceptable	Acceptable	Acceptable
Applicable conditions for introducing practice/technology				

3-13. Smart Mobile Waste Transfer Centers

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Availability and adaptability of Technology.	Costs in adapting the technology	Acceptable	Acceptable
Applicable conditions for introducing practice/technology	Conduct of Feasibility Study.	May be funded by government or private sector		

3-14. Pant System

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Availability and adaptability of Technology. PE  as very little to no market value at present.	Costs in adapting the technology	Acceptable	Acceptable
Applicable conditions for introducing practice/technology	Conduct of Feasibility Study. Establish linkages with recyclers.	May be funded by government or private sector		

3-15. Recycle at H&M

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Voluntary initiative of private establishments	Costs in adapting the system.	Cooperation of the consumers	Acceptable
Applicable conditions for introducing practice/technology	Learning from the experiences of those who adapted the system.	May be funded by government or private sector	Awareness campaigns	

3-16. Tax Break for Repair

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Introducing the system needs careful planning, legislation, and consultation with various	Lost in revenue for the government.	Acceptable	Acceptable

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
	stakeholders			
Applicable conditions for introducing practice/technology	Learn from the experiences of those who adapted the system.	Conduct of financial feasibility study.		

3-17. Tax Break for Repair

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
	Introducing the system needs careful planning, legislation, and consultation with various stakeholders	Lost in revenue for the government.	Acceptable	Acceptable
Concerns about introducing practice/technology	Learn from the experiences of those who adapted the system.	Conduct of financial feasibility study.		

3-18. Resource Recycling and Reuse Act

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
	Lack of recycling systems and industries that recycles electronic wastes.	Costs of facilities and technology.	Acceptable	Acceptable
Applicable conditions for introducing practice/technology	Conduct of feasibility study and possible engagements with the private sector.	May be funded by government or private sector		

3-19. District Model of Waste as a Resource


	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
	-Intention of Community of RA9003, based composting. Implemented by some brgy's in the city. - Needs planning and establishing of systems and facilities.	Costs of facilities and transport vehicles for segregated collection.	Acceptable	Acceptable
Concerns about introducing practice/technology				
Applicable conditions for introducing practice/technology	Conduct of feasibility study and possible engagements with the private sector.	May be funded by government or private sector		

3-20. Model Ward Initiative


	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	- Implemented in the City through Lunhaw Awards -	Acceptable	Acceptable	Acceptable
Applicable conditions for introducing practice/technology				

4. Landfill

4-1. Fences, retaining walls

	Technical aspect 	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-implemented in the City SLF-	Acceptable	Acceptable	Acceptable
Applicable conditions for introducing practice/technology				

4-2. Daily Soil Cover

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-implemented in the City SLF- covering of soil is not done on a daily basis due to the 24 hr. operation of the landfill.	Costs of soil and covering operation.	Acceptable	Risk of long term exposure of wastes to the environment if not done properly 
Applicable conditions for introducing practice/technology	Intermittent covering is done	Funded by the City.		

4-3. Leachate Collection Pipes of Semi-aerobic landfill

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-implemented in the City SLF- Tendency of collection pipes to collapse and block the leachate collection and passage.	Costs of Pipes and leachate treatment systems.	Acceptable	Risk of leachate buildup and underground contamination if leachate pipes are damaged.
Applicable conditions for introducing practice/technology	Careful installation and passage by equipment. Regular monitoring of pipes.	Funded by city.		Regular monitoring

4-4. Gas Ventilation System of Semi-aerobic landfill

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-implemented in the City SLF- Tendency of collection pipes to collapse and block the leachate collection and air passage.	Costs of Pipes.	Acceptable	Risk of methane buildup in the landfill if pipes are damaged.
Applicable conditions for introducing practice/technology	Careful installation and passage by equipment. Regular monitoring of pipes.	Funded by city.		Regular monitoring

4-5. Surface lining system

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-implemented in the City SLF- Tendency of surface liners to break/damage.	Cost of liners.	Acceptable	Risk of underground contamination by leachate if liners are damaged.
Applicable conditions for introducing practice/technology	Careful installation and passage by equipment. Installation of protective layer or soil.	Funded by city.		Careful installation and passage by equipment. Installation of protective layer or soil.

4-6. Holding basin and Regulating pond for leachate

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-implemented in the City SLF- Heavy rainfall may overwhelm the system.	Cost of system and operational expenses.	Acceptable	Risk of overflowing to adjacent surroundings.
Applicable conditions for introducing practice/technology	Installation of leachate Treatment System/Facility. Installation of recirculation system.	Funded by city.		Installation of leachate Treatment System/Facility. Installation of recirculation system.

4-7. Leachate Treatment Facility

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Design of appropriate leachate Treatment System.	Cost of system and operational expenses.	Acceptable	Risk of contaminating adjacent aquifers if improperly treated leachate is released.
Applicable conditions for	Seek assistance from JICA	Funded by city.		Installation of appropriate



	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
introducing practice/technology	Experts.			leachate System/Facility. Treatment

5. Information, Education and Communication (IEC)

Example: Requirement to attend SWM course

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	<ul style="list-style-type: none"> Secure the teacher of SWM course 	<ul style="list-style-type: none"> Labor costs of the teacher of the SWM course Expenses related to the implementation of the SWM course 	<ul style="list-style-type: none"> Obligation of the target person to participate in the SWM course 	<ul style="list-style-type: none"> Acceptable
Applicable conditions for introducing practice/technology	<ul style="list-style-type: none"> Formulate the manual of the SWM course 	<ul style="list-style-type: none"> Secure a budget for implementing the SWM course or collect tuition fees when obtaining a license 	<ul style="list-style-type: none"> Identify the target person to participate in the SWM course and formulate the rules of participation obligation 	<ul style="list-style-type: none"> ---

5-1. Requirement to attend SWM course

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-Implemented in the City – 	Acceptable	Other attendees to the SWM lecture are only there for compliance purposes only. Actual compliance to proper SWM is still low.	Acceptable
Applicable conditions for introducing practice/technology			Strengthen enforcement and monitoring.	

5-2. Leaflet explaining waste segregation

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-Implemented in the City-	Acceptable	Low compliance despite the	Acceptable

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
practice/technology			leaflets.	
Applicable conditions for introducing practice/technology			Continuing campaigns coupled with awareness enforcement.	

5-3. Application for waste segregation

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Availability and adaptability of technology.	Costs in adapting the technology	Acceptable	Acceptable
Applicable conditions for introducing practice/technology	Conduct of Feasibility Study.	May be funded by government or private sector		

5-4. Collection bag for used paper

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Creation of demand for used paper.	Acceptable	Acceptable	Acceptable
Applicable conditions for introducing practice/technology	Engagement with private sector for establishing of demand.			

5-5. Live Green Conference

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-Previously implemented in the City- Part of the annual celebration of Eco-fest.	Acceptable	Acceptable	Acceptable
Applicable conditions for introducing practice/technology				


5-6. Zero Basura Olympics, “ZBO”

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-implemented in the City- Annual implementation of Lunhaw Awards.	Acceptable	Acceptable	Acceptable
Applicable conditions for				

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
introducing practice/technology				
5-7. Spo-GOMI				
	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-Previously implemented in the City- Part of the annual celebration of Eco-fest.	Acceptable	Acceptable	Acceptable
Applicable conditions for introducing practice/technology				
5-8. Plastics Smart				
	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-Implemented in the City through WWF -	Acceptable	Concern on Identifying various initiatives and strategies.	Acceptable
Applicable conditions for introducing practice/technology			Engaging participation of various stakeholders.	
5-9. Waste Wise Festival				
	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Acceptable	Acceptable	Acceptable	Acceptable
Applicable conditions for introducing practice/technology	Establishment of systems: segregation, collection, disposal.			
5-10. Zero Waste Switzerland				
	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Lack of effort from producers to retrieve wastes from their products in accordance to concept of circular economy.	Acceptable	Acceptable	Acceptable
Applicable conditions for	Engaging cooperation and			

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
introducing practice/technology	participation of various stakeholders especially manufacturers.			

5-11. Seoul Upcycling Plaza Center

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Formulation of concept. Identification of site.	Costs of establishment of museum 	Acceptable	Acceptable
Applicable conditions for introducing practice/technology	List and collect/gather products made from recycled materials.	May be funded by government or private sector		

6. Waste Analysis and Characterization Study (WACS)


6-1. WACS Study with a classification of the community and seasons (ASTM D5231)

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	Other aspects may not be applicable to own setting.	Acceptable	Acceptable	Acceptable
Applicable conditions for introducing practice/technology	Conduct study according to wet/dry seasons and according to rural and urban category.			

6-2. Characterization Study

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-Implemented in the City-	Acceptable	Acceptable	Acceptable
Applicable conditions for introducing practice/technology				

6-3. Regular study and disclosure of WACS data to the public

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
Concerns about introducing practice/technology	-Implemented in the City- 	Acceptable	Acceptable	Acceptable
Applicable conditions for				

	Technical aspect	Economic aspect	Cultural aspect	Environmental aspect
introducing practice/technology				

PROJECT ACTIVITY : 5th SUB-GROUP MEETING FOR PROJECT OUTPUT 4 (ENHANCEMENT OF NATIONAL GOVERNMENTS' AND TARGET LGU'S CAPACITY TO IDENTIFY ISSUES AND PROVIDE SUGGESTION/ RECOMMENDATION FOR THE OTHER SWM TECHNOLOGIES THAN WTE IS ENHANCED)

DATE/TIME : 27 October 2021, 9:00AM - 11AM (Philippine Time)

VENUE : Video Conference through Microsoft Teams

MATERIALS : <https://bit.ly/5thOP4SGMtg>

Agenda Topics	Issues/Discussions/Actions	Comments/Agreements/ Timelines	Required Actions/Responsible Agency/Person
<p>1.) Call to Order/Meeting Objectives/ Acknowledgement of Attendees and Adoption of Agenda (Ms. Elvira Pausing, EMB-SWMD-PMO)</p>	<ul style="list-style-type: none"> ● Ms. Elvira Pausing of EMB-SWMD-PMO commenced the 5th subgroup meeting for Project Output 4 when quorum was reached and all presenters for the meeting had signed in. ● Ms. Pausing presented the agenda and asked the subgroup members if anything else needed to be discussed. ● Ms. Roxanne Barcenas of EMB-SWMD-PMO was called on to acknowledge the presence of participants. 	<ul style="list-style-type: none"> ● Agenda was moved for adoption with no comments and modifications from the participants. 	
<p>2.) Review of the previous Sub-group meeting (Ms. Kyoko Kimura, JET)</p>	<ul style="list-style-type: none"> ● Ms. Kyoko Kimura of JET discussed the Booklet of Good Practices and Good Technology, under Activity 4-3 that was presented in the last 4th Subgroup Meeting. ● The Evaluation of Technology from Quezon City and Davao City were also shared briefly, sharing with the subgroup the progress of their assessments. Ms. Kimura noted that the objective of today's meeting is to hear the feedback of the subgroup on the output of the LGUs in preparation for the next step in Output 4. ● Lastly, Ms. Kimura shared Activity 4-5, where the LGUs will be sharing their final 	<ul style="list-style-type: none"> ● Ms. Kimura presented the timeline of the next steps which include: <ul style="list-style-type: none"> ○ Finalization of Activity 4-4 outputs of LGUs by end of November 2021 ○ Seminar under Activity 4-5 to be tentatively held in June 2022. 	

<p>3a1.) Evaluation Summary of the suitable technology by LGUs under Activity 4-4 - Davao City (Engr. Lakandiwa Orcullo)</p>	<p>assessments to the Evaluation of Technology through a seminar.</p> <ul style="list-style-type: none"> Ms. Kimura ends her presentation with enjoining the subgroup to listen and provide feedback to the LGUs as to how the LGUs can better adopt and implement their chosen technologies. 	<ul style="list-style-type: none"> Engr. Orcullo presented the Evaluation of Technology for Davao City for Activity 4-4, explaining the list of technologies that was found to be the best fit for Davao City, and assessing them in terms of technical viability, economic feasibility, cultural acceptability and environmental impact. 	
<p>3a.) Evaluation Summary of the suitable technology by LGUs under Activity 4-4 - Cebu City</p>		<ul style="list-style-type: none"> From the presentation of Engr. Orcullo, particularly on Intermediate Treatment technologies, Ms. Kimura inquired about how Davao City intends to increase their recycling capacity of organic waste to 15 tons per day. <ul style="list-style-type: none"> Engr. Orcullo responded that they have not yet finalized the technology, and are still weighing between BSF, composting, or other means, but currently favors more mechanical methods for processing the recycling of organic waste. Cebu City was not able to participate in the meeting, but Ms. Mallare of JET shared that Engr. Manatad has confirmed to be currently working on the Evaluation of Technology and is set to send it to JET within the day. Ms. Kimura noted that the presentation of Cebu City will be facilitated in the next subgroup meeting. 	
			<p>[Cebu City] To present their Evaluation of Technology in the 6th OP4 Subgroup Meeting.</p>

<p>3a.) Evaluation Summary of the suitable technology by LGUs under Activity 4-4 - Quezon City</p>		<ul style="list-style-type: none"> • Quezon City was not able to send participants to the meeting as well, but has allowed for JET to share with the subgroup the Evaluation of Technology they sent last September. • Ms. Kimura noted that the presentation of Quezon City will be facilitated in the next subgroup meeting. 	<p>[JET] To share the Evaluation of Technology of Quezon City</p> <p>[Quezon City] To present their Evaluation of Technology in the 6th OP4 Subgroup Meeting.</p>
<p>3b.) Recommendation of Japanese technology (Ms. Iku Sato, JET)</p>	<ul style="list-style-type: none"> • Ms. Iku Sato presented new technologies being implemented by Japanese Companies that the LGUs may opt to consider in the finalization of their Evaluation of Technology. 		<p>[LGUs] To review the Booklet of Waste Management Technology of Japanese Companies and include in their Evaluation of Technology.</p>

<p>4.) Wrap-up, Required Actions, and Agreements (Ms. Andrei Mallare, JET)</p>	<ul style="list-style-type: none"> ● Ms. Andrei Mallare of JET wrapped up the earlier discussions and reiterated the arrangements and timelines as agreed: ● Timeline of next steps include: <ul style="list-style-type: none"> ● Finalization of Activity 4-4 outputs by end of November 2021 ● Seminar under Activity 4-5 to be tentatively held in June 2022. ● [Cebu City] To present their Evaluation of Technology in the 6th OP4 Subgroup Meeting. ● [JET] To share the Evaluation of Technology of Quezon City ● [Quezon City] To present their Evaluation of Technology in the 6th OP4 Subgroup Meeting. ● [LGUs] To review the Booklet of Waste Management Technology of Japanese Companies and include in their Evaluation of Technology. 	<ul style="list-style-type: none"> ● No clarifications and/or alterations raised by the subgroup members 	
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5.) Way forward, Schedule of the next meetings

- Ms. Pausing presented the next schedule of meetings for 2021:

PROPOSED SCHEDULE OF MEETINGS
(Last quarter of CY 2021)

PROJECT OUTPUT	OCT	NOV	DEC
PMO (Monthly)	13	02	01
JCC (Semi-annual)		TBD	
ITWG (Quarterly)			
OP 1		04	
OP 2			
OP 3			
OP 4	27		
SEMINAR			TBD
Web-training		7days2hrs	

- Mr. Kamishita invited the subgroup members to attend the web training this November 2021. The formal invite shall be shared once the program and date has been finalized.
- Mr. Kamishita also noted that since Cebu City and Quezon City are still expected to present their Evaluation of Technology, another OP4 subgroup meeting shall be held in 2021.

Appendix 11-5: Sub-group Meeting for Output 4

11-5-6 : 6th SG4



6th Sub Group Meeting for

Output 4: Enhancement of The National Government's Capacity to identify issues and provide suggestions/recommendations for other SWM technologies other than WTE

18th February 2022 (Friday) 9:00 a.m.

The Technical Cooperation Project (TCP) for Capacity Development on Improving Solid Waste Management (SWM) through Advanced/Innovative Technologies Technologies

Review of the previous meeting

□ **Output 4:** National Government's and target LGUs' capacity to identify issues and provide suggestion/recommendation for other SWM technologies than WTE is enhanced.

□ Specific activities

- 4.1 Grasp the current situation by National SWM strategy and 10 year SWM plan in the target LGUs.
- 4.2 Identify the current issues for other SWM technologies in the target LGUs.
- 4.3 Collect the information of "Good practice/Good technology" of other SWM technologies in Japan/third world countries.

6th meeting

- 4.4 Summarize and provide suggestion/recommendation to improve utilization of other SWM technologies to target LGUs.
- 4.5 Seminar for disseminating suggestion/recommendation is held.

Review of the previous meeting

□ Schedule of Output4

Activities	Mar/'19 - Mar/'20	Apr/'20 - Mar/'22	Apr/'21 - Mar/'22
4.1			
4.2		Information Collection	Analysis
4.3			Presentation
4.4	situation and issues		
4.5			
Sub-Group MTG	1st ★	2nd ★★ 3rd ★★★ 4th ★★★ 5th ★★★ 6th ★★	
Main activity	<ul style="list-style-type: none"> • Grasp the current situation and identify the current issues by National SWM strategy and 10 year SWM plan in the target LGUs. 	<ul style="list-style-type: none"> • Collect the information of "Good practice/Good technology" of other SWM technologies in third countries. • Summarize and provide suggestion/recommendation to improve utilization to target LGUs. 	<ul style="list-style-type: none"> • Seminar for disseminating suggestion/recommendation is held.

Agenda

1. Activity 4-4
Summarize and provide suggestion/recommendation to improve utilization of other SWM technologies to target LGUs
2. Guide for activities 4-5

The result of Activity 4-4

The good practices/good technologies collected in Activity 4-3 is referred to.

Target LGUs characteristics to be considered in applying each technology;

The common characteristics of the 3 target LGUs:

- (1) One million or more population
- (2) Seeking application of WTE technologies for their SWM

Specific characteristics of each LGU:

- Quezon City: Consists mostly of urban areas with very few rural areas.
- Davao City: Large area, mostly occupied by rural and forest areas. Agriculture and industry in urban areas are existing as well.
- Cebu City: There are urban areas and rural/forest areas.

Activity 4-4

1. Cost recovery of SWM

	Charge on Waste
Applicable sections of the case studies	1-1. Charge on a waste bag designated by local government 1-2. No Segregation –No Sticker -No Collection Policy 1-3. Volume-based Fee System Using Designated waste Bags 1-8. Collection Fee for Tagged Sack of Waste
Technology points	<ul style="list-style-type: none"> • There are many municipalities that use these system, including Japan and the Philippines. • The purpose of introducing the system is not to collect fees, but rather to reduce waste.
Common points to note for LGUs	<ul style="list-style-type: none"> • Costs of the waste bags will be an additional burden for the families and even greater burden for low-income families. • Consultation on proper charging is necessary. • Needs convincing and educating residents of the benefits of the system. • Different types of waste bags were prepared to separate the proper waste to be brought to the WTE facility from other waste. • Since there is a concern that free-riding and illegal dumping will occur, the fee should be an amount that takes into account the acceptability of residents. • Need to consideration, such as free collection of recyclable materials.

Activity 4-4

1. Cost recovery of SWM

	Fee Collection
Applicable sections of the case studies	1-5. SWM cost allocated from general taxpayer 1-6. Garbage Fee Collection Attached to Public Utility Service Fee/Bill
Technology points	A method often used in Other Countries.
Common points to note for LGUs	<ul style="list-style-type: none"> • Consideration of charging fees in conjunction with electricity rates in relation to WTE generation. • Consideration of setting the collection rate by income of the citizens.
Points to note for each LGU	None.

Activity 4-4

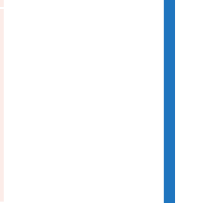
2. Collection and transportation

	Pick up place
Applicable sections of the case studies	2-1. Door-to-Door Collection 2-2. Station collection for recyclable waste
Technology points	<ul style="list-style-type: none"> • Door-to-Door and House-to-House system can help beautify the city and raise awareness of segregation by residents. On the other hand, it is not efficient as Station Collection because of taking time to collect. • Station Collection and Curbside Pick-Up are expected to shorten the collection time.
Common points to note for LGUs	<ul style="list-style-type: none"> • For individual collection, set up a trash bin in front of house to prevent scattering by birds and animals. • In urban areas, encourage users to manage their own waste collection sites, such as setting up waste collection points on the premises of condominiums. • In the case of Station Collection, the schedule of waste collection will be shown on a plate to inform residents of the disciplined waste collection.
Points to note for each LGU	<ul style="list-style-type: none"> • In areas with small populations, station collections are often employed for collection efficiency.

Activity 4-4

2. Collection and transportation

Collection of Recyclable materials	
Applicable sections of the case studies	2-3. Installation of Mini Recycling Centers 2-4. Recycling Drop Off Sites 2-5. Group Collection of Recyclable Waste
Technology points	<ul style="list-style-type: none"> • Mini Recycling Centers are easy to manage when set up inside government offices and public facilities. • In the case of Group Collection, it is necessary to foster a sense of collaboration in the local community. Coordinate with elementary school activities is recommended.
Common points to note for LGUs	• A collection facility for recyclable materials is often constructed into the WTE facility. The targets are clothes, toys, furniture, etc.
Points to note for each LGU	In rural areas, should be collected in groups or by the public.



Activity 4-4

2. Collection and transportation

Organic Waste Collection	
Applicable sections of the case studies	2-6. kitchen waste collection 2-7. Food Waste Truck Program 2-8. High-tech food waste recycling machines
Technology points	<ul style="list-style-type: none"> • As this initiative is based on composting and reuse, methods to prevent other waste from entering the system should be considered. • Business waste is easy to deal with because food waste are generated in large quantities.
Common points to note for LGUs	• Since food waste is low in calories and prevents combustion in the WTE, should be considered ways to reuse it as much as possible.
Points to note for each LGU	• Composting is difficult to implement in urban areas because it requires manpower, space, and time, and it is not possible to treat a large amount of waste at one time, but there is room to consider implementing it in schools and community units.



Activity 4-4

2. Collection and transportation

Transfer station	
Applicable sections of the case studies	2-9 and 2-10. Transfer Station
Technology points	<ul style="list-style-type: none"> • This facility is effective when the collection area is large and the distance to the intermediate treatment facility or disposal site is large. • It is also expected to reduce the number of collection vehicles and ease traffic congestion. • Consider whether it is necessary or not, based on the amount of waste accepted by WTE and the area of collection.
Common points to note for LGUs	None
Points to note for each LGU	None



Activity 4-4

2. Collection and transportation

Routing	
Applicable sections of the case studies	2-11. Truck Routing 2-12. Equipping Transporting Vehicles with GPS
Technology points	• Using real-time GPS on-board truck, route efficiency and collection route reconstruction.
Common points to note for LGUs	• It is expected to improve the efficiency of the number of trucks used and collection time.
Points to note for each LGU	There is room to restructure the current collection routes.

Activity 4-4

3. Intermediate treatment/3R

Recycling of Organic Waste	
Applicable sections of the case studies	3-1. Recycles of organic waste Black Soldier Fly 3-2. Bokashi composting 3-3. Waste-to-Energy facility utilizing rice husks 3-4. Recycles of organic waste Food Waste Recycling J-2. Waste biomass torrefaction J-3. Organic Waste Treatment System J-4. Disassembled food waste disposer "Shorio".
Technology points	<ul style="list-style-type: none"> Manual composting methods that do not require machines and methods that use machines are used depending on the conditions. Since food waste is low in calories and prevents combustion in the WTE, should be considered ways to reuse it as much as possible. Some composting methods require more manpower, time, and space. Insects and pest will be a problem for the residents. Need to build consensus with neighbors.
Common points to note for LGUs	
Points to note for each LGU	<ul style="list-style-type: none"> It is a prerequisite that separate collection is implemented. It is easier to start implementing mainly with business waste. Japanese company technology mentioned above prevents the problem of insects.

Activity 4-4

3. Intermediate treatment/3R

Promotion of recycling	
Applicable sections of the case studies	3-6. selling of recyclable wastes for tuition fee and school funding 3-7. Basuranihan Project 3-8. WISHCRAFT 3-9. Plastic for Rice Program 3-10. Recycling Drop off Sites, IEC, Promotion of recycle 3-12. Waste bank
Technology points	<ul style="list-style-type: none"> Provide incentives to residents to collect recyclable materials. Many of the initiatives are resident, but the government is responsible for the selection of recyclers and operating costs.
Common points to note for LGUs	<ul style="list-style-type: none"> If it is a school initiative, it is easy to conduct focus on children.
Points to note for each LGU	None

Activity 4-4

3. Intermediate treatment/3R

Plastic as fuel (RPF)	
Applicable sections of the case studies	3-11. Refuse derived paper and plastics densified fuel
Technology points	<ul style="list-style-type: none"> Solidification of combustible wastes as fuel. In some cases, private companies have entered the recycling industry.
Common points to note for LGUs	<ul style="list-style-type: none"> It is a condition that combustible waste (plastic and paper waste) is brought in a segregated manner. It is necessary to secure a stable place to receive the products.
Points to note for each LGU	<ul style="list-style-type: none"> It is important to secure recipients and should be checked the demand from nearby cement plants that can accept the products.



(GUUN Co.,Ltd Website)

Activity 4-4

4. landfill

Proper Management Landfill	
Applicable sections of the case studies	4-1. Fences, retaining walls 4-2. Daily Soil Cover 4-3. Leachate Collection Pipes of Semi-aerobic landfill 4-4. Gas Ventilation System of Semi-aerobic landfill 4-5. Surface lining system 4-6. Holding basin and Regulating pond for leachate 4-7. Leachate Treatment Facility
Technology points	<ul style="list-style-type: none"> All of these are basic technologies necessary for the proper management of landfill. Each municipality should set its own priorities and try to implement safe landfill management.
Common points to note for LGUs	<ul style="list-style-type: none"> Installation of fences and covering of soil is relatively easy to start. Separate the waste by characteristics, such as hazardous waste (medical waste).
Points to note for each LGU	<ul style="list-style-type: none"> Wastes with different properties, such as business and agricultural wastes, should be dumped in separate areas.

5. Information, education and communication (IEC)

Promotion of Segregation

Applicable sections 5-2. Leaflet explaining waste segregation of the case studies 5-3. Application for waste segregation

Technology points • It is essential to create a collection calendar and inform residents of the items to be sorted and the collection date.

Common points to note for LGUs • Such as bottles and cans, which cannot receive at the WTE facility, municipality should hold explanatory meetings for residents and thoroughly inform them of the situation.

Points to note for each LGU • In Davao, at the grassroots cooperative project, a calendar of waste collection was prepared. Municipality will try to aware to residents until they understand the necessity of the activities.



Waste Classification in Mandaue City



Kawasaki-Shi, Japan

6. Waste Analysis and Characterization Study (WACS)

Method and Utilization of WACS

Applicable sections 6-1. WACS Study with a classification of the community and seasons of the case studies (ASTMID5231)
6-2. Statewide Municipal Solid Waste (MSW) Characterization Study
6-3. regular study and disclosure of WACS data to the Public

Technology points • Conduct composition surveys four times a year and disclose them to residents.
• Identify the amount of waste generated for each composition of waste and confirm that the municipality's waste management strategy is showing results. Then, LGU can also set new plans.

Common points to note for LGUs • Need to implementation locations and implementers.

Points to note for each LGU • Conducted as part of research at universities and other research institutions

2. Starting of Activity 4-5

Activity 4-5

Seminar for disseminating suggestion/recommendation is held.

- In Activity 4-4, technologies other than WTE were evaluated by each LGU.
- Activity 4-5 is positioned as the culmination of Activities of Output 4
- The following will be presented by each LGU at the Dissemination Seminar.

Presentations at the seminar

➤ Current status and challenges of waste management in LGUs

1. Budget of Waste Management
2. Waste Generation Quantity and Quality
3. Collection and Transportation of Waste
4. Intermediate treatment facility /3R
5. Landfill
6. Education of Waste Management

➤ Future waste management plan based on the consideration of the technologies other than WTE

Appendix 12 - Seminars

12-1 : Kick-off Seminar

12-2 : 1st Dissemination Seminar

12-3 : 2nd Dissemination Seminar

12-4 : Final Seminar

Appendix 12-1: Kick-off Seminar

TECHNICAL COOPERATION PROJECT (TCP) FOR CAPACITY DEVELOPMENT ON IMPROVING SOLID WASTE MANAGEMENT (SMW) THROUGH ADVANCED/INNOVATIVE TECHNOLOGIES IN THE PHILIPPINES

KICK-OFF SEMINAR

27 FEBRUARY 2019, THURSDAY, 8:30AM-3:30PM

JOY-NOSTALG HOTEL AND SUITES MANILA

EMCEE: JOAN FRANCES FLORES (SWMD-PMO)

TOPIC	SPEAKER
<p>OPENING CEREMONIES</p> <p> Invocation</p> <p> National Anthem</p> <p>Welcome Remarks</p> <p>Opening Remarks</p>	<p>SWMD-PMO/Secretariat</p> <p>SWMD-PMO/Secretariat</p> <p>Engr. William P. Cuñado</p> <p>OIC-Director, EMB</p> <p>Mr. Yo Ebisawa</p> <p>Senior Representative</p> <p>JICA Philippine Office</p>
Project Overview: Technical Cooperation Project (TCP) for Capacity Development on Improving SWM Through Advanced/Innovative Technologies in the Philippines	Ms. Elvira S. Pausing Supervising EMS & Assistant Project Manager, EMB-SWMD/PMO
Denr Administrative Order 2019-21: Guidelines Governing Waste-To-Energy (Wte) Facilities for the Integrated Management of Municipal Solid Wastes	Engr. Nolan B. Francisco OIC-Chief, SWMD & Project Manager, EMB-SWMD/PMO
Updates n EMB Laboratory For Sampling of Dioxins and Furans	Engr. Jundy T. Del Socorro Chief, AQMS, EMB-EQMD
Government Controls on Waste-To-Energy (Wte) in Japan	Mr. Takahiro Kamishita JICA Expert Team
Public-Private Partnership (PPP) Implementation of Solid Waste Management (SWM) Projects	Ms. Justine E. Padiernos, OIC-Director III,PDS, PPP Center
Policy to Support the Renewable Energy Including Waste-To-Energy (WtE)	Ms. Ruby B. De Guzman Chief, Biomass Energy Management Division (BEMD)
Updates of Waste-To-Energy (WtE) Project in Quezon City	Ms. Andrea Valentine A. Villaroman LGU Quezon City
Updates on EMB Laboratory Capability for Dioxins and Furans Analysis	Ms. Ma. Fatima Anneglo R. Molina Chief, ERLSD, EMB
Outline of Waste-To-Energy In Japan	Mr. Satoshi Higashinakagawa Jica Expert Team
Closing Remarks	Engr. Reynaldo L. Esguerra Chief, Science and Research Specialist, Environment & Biotechnology Division, DOST-ITDI



PROJECT OVERVIEW
TECHNICAL COOPERATION PROJECT (TCP) FOR CAPACITY DEVELOPMENT ON IMPROVING SOLID WASTE MANAGEMENT (SWM) THROUGH ADVANCED/ INNOVATIVE TECHNOLOGIES

KICK-OFF SEMINAR

27 FEBRUARY 2020
 JOY-NOSTALG HOTEL AND SUITES, MANILA
 ORTIGAS CENTER, PASIG CITY ON

MS. ELVIRA S. PAUSING
 SUPERVISING EMS AND ASSISTANT PROJECT MANAGER
 SWMD-PROJECT MANAGEMENT OFFICE (PMO)

PROJECT BRIEF

- **Project Title:** Capacity Development on Improving Solid Waste Management through Advanced/ Innovative Technologies
- **Implementing Agency:** Japan International Cooperation Agency (JICA)
- **Executing Agency:** DENR, Lead Office: Environmental Management Bureau
- **Beneficiaries:** DENR-EMB (Central Office & Regional offices) & three (3) partner LGUs: Quezon City, Cebu City, Davao City
- **Project Duration:** Three (3) years

PROJECT BACKGROUND

- 04 April 2006: Signing of Agreement on Technical Cooperation between the Government of the Republic of the Philippines and the Government of Japan
- 28 July 2017: Signing of Minutes of Meeting between the Detailed Planning Survey Team and Authorities Concerned of the Government of the Philippines on Japanese Technical Cooperation for the Project
- 07 November 2017: Signing of Record of Discussions for the Project between DENR and JICA

GOAL: Improvement of Philippine Solid Waste Management (SWM) system through the adoption of Waste-to-Energy (WtE) and other SWM technologies

PURPOSE: National government and target LGUs' capacity for improving SWM utilizing WtE and other SWM technologies is enhanced.

Project Outputs :

Output 1	National Project Government's Capacity for Supporting and Coordinating of LGU's WTE Project is Enhanced.
Output 2	Target LGUs' Capacity for Planning, Evaluation, Formulation and Supervision of WTE Project is Enhanced.
Output 3	National Government's Capacity of Environmental Monitoring for WTE Project is Enhanced.
Output 4	National Governments and Target LGUs' Capacity to Identify Issues and Provide Suggestions/ Recommendations for SWM Technologies Other than WTE is Enhanced.

PROJECT OUTPUT 1: NATIONAL PROJECT GOVERNMENT'S CAPACITY FOR SUPPORTING AND COORDINATING OF LGU'S WTE PROJECT IS ENHANCED

Specific Activities	Approaches
<p>Activity 1.1 Preparation of BAT/BEP Guidelines based from the information of good practices and technologies of WTE in neighboring countries</p>	<ul style="list-style-type: none"> Collection and analysis of various data/information on good practices and WtE technologies, and samples of financial assistance scheme for WtE projects; and identification of design standard of WtE facility Technical evaluation of the BAT/BEP Guidelines Finalization of the BAT/BEP guidelines
<p>Activity 1.2 Study policies and mechanism to promote WTE in neighboring countries including cost sharing scheme</p>	<ul style="list-style-type: none"> Gathering and assessment of information on good practices and WtE technologies in Japan and other neighboring countries Preparation of survey sheet for distribution to target organizations Review of the financial assistance system of Japan for possible cost sharing scheme of WtE projects

PROJECT OUTPUT 1: NATIONAL PROJECT GOVERNMENT'S CAPACITY FOR SUPPORTING AND COORDINATING OF LGU'S WTE PROJECT IS ENHANCED (CONT.)

Specific Activities	Approaches
<p>Activity 1.3 Conduct seminar to disseminate the WTE technology</p>	<ul style="list-style-type: none"> Conduct of technical dissemination seminar on WtE technology Comparison of WtE technologies in Output 1 and other technologies in Output 4 and understanding the nature and characteristics of both technologies.
<p>Activity 1.4 Preparation of Draft Technical Standards for WTE facility focused on waste incineration with power generation</p>	<ul style="list-style-type: none"> Japan structural and maintenance standards for WTE facilities will be explained including examples of pollution control standards in other developed countries Assessment of the pollution control standards criteria and other relevant regulations in the Philippines Assessment of pollution control standards applied to LGUs compared to other countries. Drafting of technical standards for WTE facility focused on waste incineration in the Philippines

PROJECT OUTPUT 1: NATIONAL PROJECT GOVERNMENT'S CAPACITY FOR SUPPORTING AND COORDINATING OF LGU'S WTE PROJECT IS ENHANCED (CONT.)

Specific Activities	Approaches
<p>Activity 1.5 Preparation of Manual for management of bottom ash and fly ash from WtE facility</p>	<ul style="list-style-type: none"> Preparation of manual for management of incineration ash in parallel with the preparation of draft technical standards for WtE facility focused on waste incineration with power generation
<p>Activity 1.6 Preparation of Manual for Planning, Evaluation, Formulation, and Supervision of WTE project based on the information from Output 2 and neighboring countries, including evaluation criteria of EMB for 10-year SWM Plans</p>	<ul style="list-style-type: none"> Assessment of various manual for Planning Evaluation, Formulation, and Supervision of WTE project in the Philippines Manual for Evaluation shall serve as guidance tool for LGUs to evaluate WTE project proposals by private sector , harmonized with SWM systems of LGUs and consistent with the EMB's evaluation criteria for evaluating the 10-year SWM plans.

PROJECT OUTPUT 1: NATIONAL PROJECT GOVERNMENT'S CAPACITY FOR SUPPORTING AND COORDINATING OF LGU'S WTE PROJECT IS ENHANCED (CONT.)

Specific Activities	Approaches
<p>Activity 1.6 Preparation of Manual for Planning, Evaluation, Formulation, and Supervision of WTE project based on the information from Output 2 and neighboring countries, including evaluation criteria of EMB for 10-year SWM Plans (cont.)</p>	<ul style="list-style-type: none"> Manual on Formulation shall show the process of securing budget, selecting operator and concluding a contract for WTE project including lessons learnt considering critical points and issues on formulation of WTE projects in the target LGUs. Manual on Supervision shall serve as guidance tool for LGUs to supervise operators during construction and operation stages of WTE projects. Revision of the EMB's evaluation criteria for 10-year SWM Plan to include criteria concerning the WTE projects.
<p>Activity 1.7 Illustrate model procedures to introduce WTE facility in accordance with WTE guidelines including environmental and social aspects</p>	<ul style="list-style-type: none"> Model procedure to promote solicited/unsolicited WtE projects in the Philippines. Development of a Manual for LGUs to introduce WtE facility. Drafting of model process including the aspects of environmental and social considerations based from the DENR DAO 2003-30

PROJECT OUTPUT 2: TARGET LGUs' CAPACITY FOR PLANNING, EVALUATION, FORMULATION AND SUPERVISION OF WTE PROJECT IS ENHANCED

Specific Activities	Approaches
<p>Activity 2.1 Review current situation for introducing WTE in each target LGUs</p>	<ul style="list-style-type: none"> Interview of partner LGUs on the status of WtE projects Assessment of the WtE project status for planning, formulation, and implementation including private PPP proposals.
<p>Activity 2.2 Clarify the current waste flow/amount, and support to set-up the reduction target in existing MSWM 10-year plan of target LGUs</p>	<ul style="list-style-type: none"> Assessment of quantitative MSW treatment flow and total MSW quantity reduction target of the partner LGUs Updated 10-year SWM Plan that reflects the waste volume reduction target in each target LGU
<p>Activity 2.3 Evaluate the LGUs' land use plan for WTE projects</p>	<ul style="list-style-type: none"> Evaluation on the category of the LGUs' land use plan. Consistency of the land use plan of each of the LGUs and WtE facility location

PROJECT OUTPUT 2: TARGET LGUs' CAPACITY FOR PLANNING, EVALUATION, FORMULATION AND SUPERVISION OF WTE PROJECT IS ENHANCED (CONT.)

Specific Activities	Approaches
<p>Activity 2.7 Formulate the technical specifications of WTE facility for each target LGU</p>	<ul style="list-style-type: none"> Support from the experts in drafting the technical specifications of WtE facility Japan Guideline will be the basis of discussion for technical specification Drafting of technical specifications of WtE facility to achieve the waste reduction quantity target.
<p>Activity 2.8 Define the points and issues to be addressed in supervising WTE project</p>	<ul style="list-style-type: none"> Appropriate monitoring method for the supervision of WtE projects - in accordance with the Facility Plan and Technical Specifications formulated in activity 2.7

PROJECT OUTPUT 2: TARGET LGUs' CAPACITY FOR PLANNING, EVALUATION, FORMULATION AND SUPERVISION OF WTE PROJECT IS ENHANCED (CONT.)

Specific Activities	Approaches
<p>Activity 2.4 Analyze and verify the candidate WTE project selected from the existing FS, unsolicited/solicited proposal and others</p>	<ul style="list-style-type: none"> Review and analysis of existing FS and proposals of WtE FS & proposals will be provided by LGUs for review and verification
<p>Activity 2.5 Define the points and issues to be addressed for formulating WTE project</p>	<ul style="list-style-type: none"> Analysis, discussions, and sharing of issues and points to consider for WtE implementation in target LGUs Discussion and confirmation of the applicable support during the project implementation period with LGUs
<p>Activity 2.6 Define the proper responsibility of LGUs in promoting WTE project under PPP scheme</p>	<ul style="list-style-type: none"> Discussion with target LGUs to clarify their role and responsibilities for the WtE project under PPP Scheme Private partners in WtE projects shall be available and well equipped Target LGUs shall be responsible for monitoring and supervision of the projects

PROJECT OUTPUTS 3: NATIONAL GOVERNMENT'S CAPACITY OF ENVIRONMENTAL MONITORING FOR WTE PROJECT IS ENHANCED

Specific Activities	Approaches
<p>Activity 3.1 Review the current capacity and activities in Central and Regional EMB for monitoring/ analysis/QA/QC of Dioxins and Furans in ambient air, and other media (Soil/Surface water/Sediments)</p>	<ul style="list-style-type: none"> Review will cover 3 regional laboratories: DENR-EMB, Cebu City and Davao City Review results of monitoring of ambient air, emission gas and other media
<p>Activity 3.2 Analyze gaps between the present capacity of the central EMB and required capacity for proper monitoring/analysis/ QA/QC of Dioxins and Furans in ambient air, and other media (Soil/Surface water/Sediments) and formulate the training plan</p>	<ul style="list-style-type: none"> Gap analysis to compare the required capacity with the present capacity Gap analysis for each monitoring training plan Formulation of a training plan
<p>Activity 3.3 Prepare SOP for sampling, analyzing and QA/QC of Dioxins and Furans in ambient air and source emission gas</p>	<ul style="list-style-type: none"> Clarification on the operation procedure and establishment and operation of a quality system. Improvement of the SOP by the 3 regional laboratories

PROJECT OUTPUT 3: NATIONAL GOVERNMENT'S CAPACITY OF ENVIRONMENTAL MONITORING FOR WTE PROJECT IS ENHANCED (CONT.)

Specific Activities	Approaches
Activity 3.4 Conduct training of sampling, analysis and QA/QC of Dioxins and Furans in ambient air and source emission gas in central EMB	<ul style="list-style-type: none"> Conduct training of sampling, analysis and QA/QC of Dioxins and Furans Countermeasures to the issues from the experience of sampling/analysis/QA/QC will be reflected to further revise the SOP
Activity 3.5 Prepare Sampling Plan (Design) for the collection of D&F in ambient air samples	<ul style="list-style-type: none"> Conduct of sampling plan by the regional laboratories Formulation of sampling plan for both aspects of entire planning and individual planning
Activity 3.6 Implement sampling, analyzing and QA/QC of Dioxins and Furans in ambient air and source emission gas by central EMB at existing SWM facilities based on SOP in output 3.3.	<ul style="list-style-type: none"> Monitoring of emission gas will be conducted at a facility similar to WtE facility, as the facility would not be in operation within the project period.

PROJECT OUTPUT 4: NATIONAL GOVERNMENTS AND TARGET LGUs' CAPACITY TO IDENTIFY ISSUES AND PROVIDE SUGGESTIONS/ RECOMMENDATIONS FOR SWM TECHNOLOGIES OTHER THAN WtE IS ENHANCED

Specific Activities	Approaches
Activity 4.1 Grasp the current situation by National SWM strategy and 10 year SWM Plan in the target LGUs	<ul style="list-style-type: none"> Description of the strategy of WtE technology to the NSW Strategy Progress on drawing up the strategy and policy of WtE utilization
Activity 4.2 Identify the current issues for other SWM technologies in the target LGUs	<ul style="list-style-type: none"> Analysis of the current issues of other SWM technologies of the target LGUs Discussions on the points of other SWM technologies
Activity 4.3 Collect the information of "Good practice/Good technology" of other SWM technologies in Japan & other countries	<ul style="list-style-type: none"> Identification & collection of "Good practice/Good technology" on SWM of other countries Summary of suggestions/ recommendations for best practices and other SWM technologies other than WtE to target LGUs

PROJECT OUTPUT 3: NATIONAL GOVERNMENT'S CAPACITY OF ENVIRONMENTAL MONITORING FOR WTE PROJECT IS ENHANCED (CONT.)

Specific Activities	Approaches
Activity 4.4 Summarize and provide suggestions/recommendations to improve utilization of other SWM technologies to target LGUs	<ul style="list-style-type: none"> Recommendations to the target LGUs for other SWM technologies
Activity 4.5 Conduct seminar for disseminating suggestion/ recommendations on SWM technologies	<ul style="list-style-type: none"> Conduct dissemination seminar for SWM technologies Sharing of good practices and technologies Introduction of WtE after a comparative review of technologies

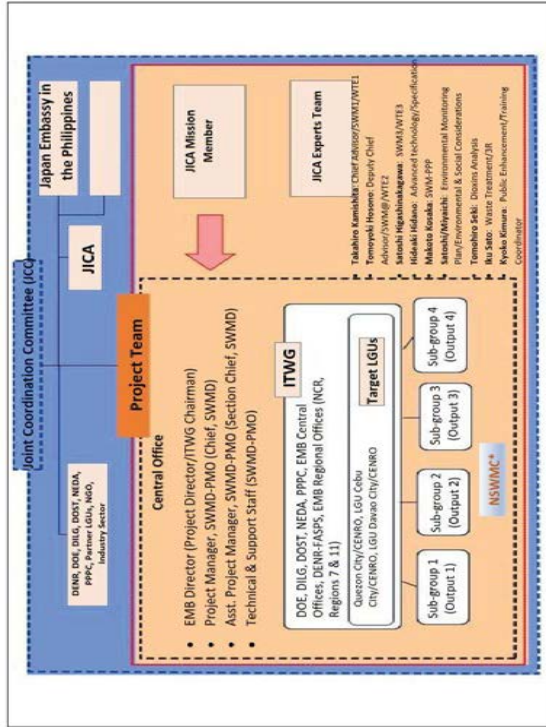
PROJECT OUTPUT 4: NATIONAL GOVERNMENTS AND TARGET LGUs' CAPACITY TO IDENTIFY ISSUES AND PROVIDE SUGGESTIONS/ RECOMMENDATIONS FOR SWM TECHNOLOGIES OTHER THAN WtE IS ENHANCED (CONT.)

Specific Activities	Approaches
Activity 4.4 Summarize and provide suggestions/recommendations to improve utilization of other SWM technologies to target LGUs	<ul style="list-style-type: none"> Recommendations to the target LGUs for other SWM technologies
Activity 4.5 Conduct seminar for disseminating suggestion/ recommendations on SWM technologies	<ul style="list-style-type: none"> Conduct dissemination seminar for SWM technologies Sharing of good practices and technologies Introduction of WtE after a comparative review of technologies

OTHER PROJECT OUTPUTS

- Support to organize JCC, ITWG, & Sub-group Meetings
- Publication of TCP Newsletters (twice a year) in DENR & JICA Websites, etc.
- Conduct of Seminars
 - Kick-off Seminars (4)
 - Technology dissemination seminar (1)
- Capacity assessment
 - Assessment of Social and organizational level (Checklist of JICA WtE guidelines)
 - Assessment of Individual level (Checklist containing necessary knowledge for national government and LGUs for utilization of WtE)
- Training in Japan: Scheduled in May 2020 and October 2021
- Approval of the WtE Guidelines – Approved in 26 November 2019
- Approval of the MOU between DENR and Target LGUs

PROJECT IMPLEMENTATION STRUCTURE (BASED FROM THE APPROVED SPECIAL ORDERS)



Source: Approved Special Orders for the Creation of Joint Coordination Committee (JCC), ITWG (Inter-agency Technical Working Group), Sub-groups & Project Management Office (PMO)

PROJECT SCHEDULE

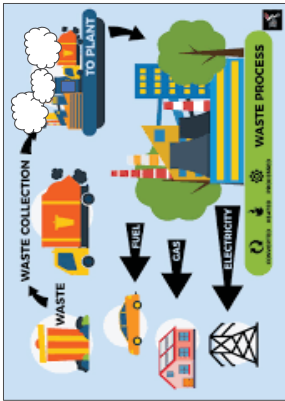
Activities	1 st Year Mar/'19 – Mar/'20	2 nd Year Apr/'20 – Mar/'21	3 rd Year Apr/'21 – Mar/'22
Output 1	<ul style="list-style-type: none"> Technical standards for WTE facilities Manual on bottom/fly ash management 	<ul style="list-style-type: none"> BAT/BEP Guidelines Evaluation criteria on 10-year SWM plans 	<ul style="list-style-type: none"> Manual for LGUs on WTE projects Illustrate model procedure for WTE
Output 2	<ul style="list-style-type: none"> Target setting for waste reduction Analysis on WTE projects in LGUs 	<ul style="list-style-type: none"> Technical specifications of WTE facilities in each target LGU 	
Output 3	<ul style="list-style-type: none"> Training plan for central EMB Laboratory 	<ul style="list-style-type: none"> SOP for DXNs Training 	<ul style="list-style-type: none"> Support sampling, analysis & QA/QC
Output 4	<ul style="list-style-type: none"> Grasp current situation & identify current issues 	<ul style="list-style-type: none"> Good practices & appropriate technologies 	<ul style="list-style-type: none"> Suggestions & recommendations

PROJECT SCHEDULE

Activities	1 st Year Mar/'19 – Mar/'20	2 nd Year Apr/'20 – Mar/'21	3 rd Year Apr/'21 – Mar/'22
JCC Meetings		Semi-annual	Semi-annual
ITWG Meetings	Quarterly	Quarterly	Quarterly
Sub-group Meetings	Monthly	Monthly	Monthly
Seminars	<ul style="list-style-type: none"> Kick-off Seminar (1) Technical Dissemination Seminar (1) 	<ul style="list-style-type: none"> Kick-off Seminars (3) Technical Dissemination Seminar (1) 	Project Final Seminar (1)
Training in Japan		Training (2)	

THANK YOU

Waste-to-Energy



Presented by:

Engr. Nolan B. Francisco
 OIC Chief, Solid Waste Management Division
 OIC Executive Director, NSWMC Secretariat

Publication of the Guidelines on Waste-to-Energy

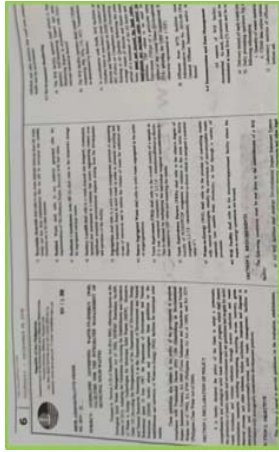
INQ

Philippine Daily Inquirer
 December 26, 2019



PHILIPPINE STAR

The Philippine Star
 December 26, 2019



Guidelines on Waste-to-Energy

- Guidelines Governing Waste-to-Energy (WtE) Facilities for the Integrated Management of Municipal Solid Waste
- Approved as **DENR Administrative Order (DAO) No. 2019-21** and signed by DENR Secretary Roy A. Cimatu on November 26, 2019.
- Published on December 26, 2019 in the Philippines Star and Philippine Daily Inquirer.
- Took effect on **January 10, 2020** (after 15 days of publication).



Legal Bases

Section 15 of Republic Act No. 9003 mandates the formulation and implementation, with public participation, a **National Solid Waste Management Framework** that shall consider and include:

Practical applications of *environmentally sound techniques of waste minimization* including **WASTE-TO-ENERGY GENERATION**, re-use and composting (Section 15 (h), RA 9003)



Legal Bases

NSWMC
Resolution
No. 669,
Series of
2016



Office of the President
NATIONAL SOLID WASTE MANAGEMENT COMMISSION
Department of Environment and Natural Resources
2nd Flr. HRDS Bldg., DENR compound, Visayas Avenue, Dilliman, Quezon City, 1100
Tel. Nos. (632) 920-2252 / 920-2279

NSWMC Resolution No. 669, Series of 2016

ADOPTING THE GUIDELINES GOVERNING THE ESTABLISHMENT AND OPERATION OF WASTE TO ENERGY TECHNOLOGIES FOR MUNICIPAL SOLID WASTES

WHEREAS, Section 2 of Republic Act No. 9003 declared the policy of the State to adopt a systematic, comprehensive and ecological solid waste management program which shall retain primary enforcement and responsibility of solid waste management with local



Republic of the Philippines
Department of Environment and Natural Resources
660 Alabang Village, Alabang, Muntinlupa City, Quezon City
Tel. Nos. (632) 8798-6426/6427, 8798-6423/24
Website: www.denr.gov.ph / E-mail: web@denr.gov.ph

NOV 2 6 2016

DENR ADMINISTRATIVE ORDER
NO. 2016-23

SUBJECT: **GUIDELINES GOVERNING WASTE-TO-ENERGY (WTE) FACILITIES FOR THE INTEGRATED MANAGEMENT OF MUNICIPAL SOLID WASTES**

Pursuant to Section 8 (f) of Republic Act (RA) 9003, otherwise known as the Ecological Solid Waste Management Act of 2000, NSWMC Resolution No.669, Series of 2016, Adopting the Guidelines Governing the Establishment and Operation of Waste-to-Energy Technologies for Municipal Solid Waste (MSW), Executive Order 192 (Providing the Guidelines for the Establishment and Operation of Waste-to-Energy and Natural Resources), Remaining it as the Department of Environment and Natural Resources (DENR) hereby adopts and promulgates these guidelines on the establishment and operation of Waste-to-Energy (WTE) facilities for municipal solid wastes.

These guidelines also adhere to the policy of the government to promote compliance with Presidential Decree (PD) 1546 (Establishing an Environmental Impact Statement System), RA 6969 (Toxic Substances and Hazardous and Waste Act of 1990), RA 8749 (Philippine Clean Air Act of 1999), and RA 9275 (Philippine Clean Water Act of 2004).

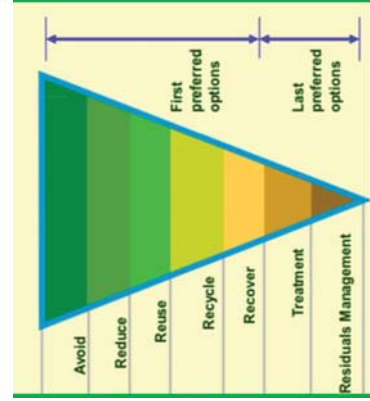


Solid Waste Management Division
DENR-Environmental Management Bureau

Salient Provisions of the WtE Guidelines

Section 1. Declaration of Policy

The Ecological Solid Waste Management program shall set guidelines and targets for solid waste avoidance and volume reduction before collection, treatment and disposal in appropriate and environmentally-sound solid waste management facilities in accordance with ecologically sustainable development practices



Sections of the Guidelines

1. Declaration of Policy
2. Objective
3. Scope and Coverage
4. Definition of Terms
5. Requirements
6. Operational Guidelines for the WtE Facility
7. Decommissioning or Abandonment
8. Fines and Penalties
9. Transitory Clause
10. Effectivity



Solid Waste Management Division
DENR-Environmental Management Bureau

Section 2. Objective

This Order is issued to provide guidelines on the **evaluation, establishment, operation and de-commissioning of waste-to-energy (WtE) facilities** for the integrated management of municipal solid wastes.



These guidelines cover the **requirements, and procedures on the establishment of WtE facilities** utilizing municipal solid wastes.

Section 3. Scope and Coverage



Section 5. Requirements

The following conditions must be met prior to the establishment of a WtE facility:

- a) All WtE facilities shall **undergo Environmental Impact Statement System** and secure all environmental permits, clearances and other requirements from concerned agencies prior to construction, set-up and operation of the facility;
- b) Documentation **for compliance with the requirements of PD 1586 shall include an environmental health risk assessment.**



Section 5. Requirements

- c) The host LGU including the LGUs where the source of the feedstock will originate from shall ensure that the plan to establish and/or utilize WtE facility is **integrated in their approved 10-year solid waste management plan** consistent with the provisions of RA 9003.
- d) The host LGU are **allowed to implement clustering and/or from partnerships with the private sector** in the establishment, construction and operation of the WtE facility.



Section 5. Requirements

- e) The proponent shall submit an **Environmental Technology Verification (ETV) Statement and Report** following the DOST ETV Protocol as per DENR-DOST Joint Administrative 2006-001.



Section 5. Requirements

- f) **The WtE facility owner shall:**
- i. Develop a **manual of operation and quality assurance and control** to be submitted to EMB for monitoring purposes.
 - ii. **Maintain, at the highest possible standards, a quality control/assurance systems** to demonstrate its ability to consistently provide products and services that meet applicable statutory and regulatory requirements.
 - iii. Implement and communicate a **detailed emergency response plan** to ensure effective and rapid containment and clean-up in the event of an emergency incident. The facility must be equipped with **adequate fire-fighting devices** certified by the Bureau of Fire Protection.



Section 5. Requirements

- f) **The WtE facility owner shall:**
- iv. Provide **appropriate personal protective equipment and medical care** in compliance with existing laws, rules and regulations to all personnel of the facility directly handling or exposed to waste materials, in-process materials and finished products.
 - v. **Ensure implementation of resource efficient and cleaner production program** that follows the waste management hierarchy of source reduction, recycling, treatment and safe disposal.



Section 5. Requirements

- f) **The WtE facility owner shall:**
- vi. Provide appropriate, recent and **state of the art pollution control and abatement facilities** to ensure that all emissions and effluents comply with relevant environmental standards.
 - vii. **Avail services of the EMB registered transporters and treatment, storage and disposal facilities** for any hazardous waste resulting from the operations of the WtE facility.



6.1 Waste Delivery Control

Acceptable Municipal Solid Waste for WtE Facility

The facility shall only accept source segregated biodegradables or residual wastes collected from households, MRFs, Residual Containment Areas (RCAs), Sanitary Landfills and other disposal facilities.

For unsegregated wastes resulting from calamities, flooding and clean up, the waste must undergo **pre-processing to achieve the quality and suitability as feedstock.**

The WtE facility shall document and maintain records indicating the quantity in weight, source and type of source-segregated wastes to be processed including the date and time received. (Annex A)



Section 6. Operational Guidelines for WtE Facility



6.2 Storage Facility

Appropriate storage facilities should be provided for source segregated wastes, in-process materials and any by-product from the WtE facility operation. Such storage shall institute measures to address the risks of potential explosion, combustion, corrosion, contamination, infection and odor emission that could pose potential hazard to human health and the environment.



6.3 Environmental Monitoring

- a. The WtE facility operator shall submit to EMB Regional Offices quarterly Self-Monitoring Report and semi-annual Compliance Monitoring Report in accordance with DAO 2003-27 and/or new relevant issuances thereof.



6.3 Environmental Monitoring

- c. In coordination with EMB, WtE facilities utilizing thermal process (**whether burn or non-burn**) must conduct sampling and analysis for dioxins and furans based on EMB Memorandum Circular No. 2007-003 (*Policy on Compliance and Permitting for Industrial Facilities Relating to Air Quality*) following the prescribed methodology; all average values of dioxins and furans measured over the sampling period of a minimum of six (6) hours and a maximum of eight (8) hours **must not exceed the limit value of 0.1 nanogram toxic equivalents per normal cubic meter (ng-TEQ/NCM)**. (For this guideline, TEF values to be used for calculation of Toxic Equivalents (TEQs) of a particular sample is based on the 1989 update of the United States Environmental Protection Agency (US EPA) adopting the 1989 International NATO/CCMS TEF values, otherwise represented as I-TEF).



6.3 Environmental Monitoring

- b. The WtE facility operator shall install **CEMS**, linked with the EMB, measuring PM, NO₂, CO, HCl, Temperature and other parameters as determined by Bureau.



6.4 Documentation and Data Management

All aspects of WtE facility operations must be well documented. As such, documents and records as listed below shall be maintained at least five (5) years and be made available for inspection:

- a. Delivery record of each waste material received in the facility
- b. Daily processing operation log sheet showing or attaching the following information:
 - i. Quantity of waste materials processed
 - ii. CEMS data online submission to EMB
- c. Laboratory analysis of effluent, source emission, fly ash and bottom ash.



6.3 Environmental Monitoring

- d. Effluents from WtE facilities must conform with DENR Administrative Order No. 2016-08 (Water Quality Guidelines and General Effluent Standards) and/or the latest relevant issuance thereof.



6.5 Social Accountability

The facility owner shall endeavor to establish partnership with stakeholders through education and training, infrastructure improvements, disaster risk reduction and management and such other social development activities.

The WtE facility shall maintain a Light-Emitting Diode (LED) or similar system/device display board, in front of its site and within view of the general public, containing updated information on its air emissions and effluent.



6.6 Interim Cease and Desist Order by the Secretary

Whenever there is an **exceedance of the emission standards** set by the Department or if there is **imminent threat to life**, public health, safety or general welfare, or to plant or animal life, an **interim order for the closure, suspension, or cessation of operations of the WtE facility may be immediately issued by the DENR Secretary or his authorized representative (Sec 45, RA 8749).**



6.6 Interim Cease and Desist Order by the Secretary (cont.)

The interim cease and desist order shall be immediately executory and shall remain in force and effect until the WtE operator has reduced the limit value of the dioxin and furans to 0.1 nanogram toxic equivalent per normal cubic meter (ng-TEQ/NCM), or until a temporary lifting order is issued by the Pollution Adjudication Board (PAB) or an injunctive writ is issued by a Court of Law. (Sec 1, Rule X, of PAB Resolution No. 1, Series of 2010)



Section 7. Decommissioning or Abandonment

A detailed Decommissioning/Abandonment Plan shall be submitted to the Bureau for approval at least one (1) year prior to the decommissioning or abandonment of the facility. The Plan shall include rehabilitation measures, clean-up activities, remediation of areas affected by the WtE facility and proposed alternative post land use of the area.



Section 8. Fines and Penalties

Fines and penalties for violating these guidelines shall be governed by pertinent provisions in Presidential Decree 1586 (Establishing an Environmental Impact Statement System), RA 6969 (Toxic Substances and Hazardous and Nuclear Wastes Act of 1990, RA 8749 (Philippine Clean Air Act of 1999), RA 9003 (Ecological Solid Waste Management Act of 2000), and RA 9275 (Philippine Clean Water Act of 2004).



Section 9. Transitory Clause

Any establishment operating a WtE facility using MSW as feedstock prior to the effectivity of this DAO shall be given **one (1) year to comply with all permitting requirements set forth provided, that such facility does not cause or pose imminent threat to property, public health and environment** as determined by DENR-EMB or other government agencies concerned.



Section 10. Effectivity

This guideline shall take effect fifteen (15) days after its publication in two (2) newspapers of general circulation and upon submission of a copy thereof to the Office of the National Administrative Registry (ONAR) at the University of the Philippines Law Center.



Updates on the EMB Capability for Sampling Dioxins and Furans

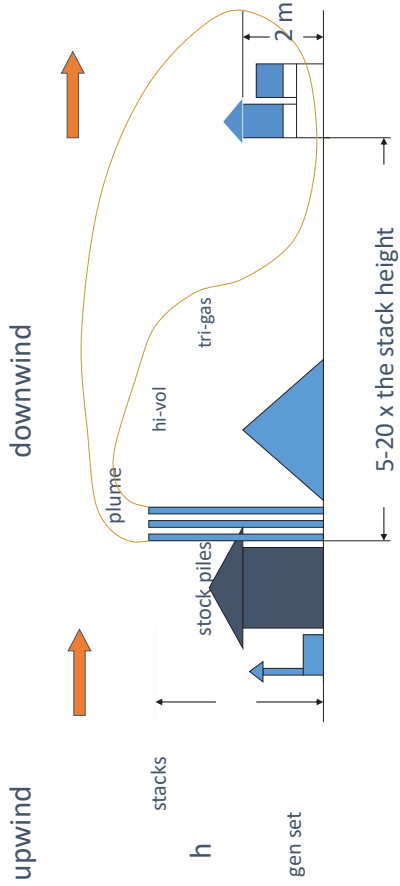
Jundy Tigley Del Socorro
 Air Quality Management Section

SECTION 19 STATIONARY SOURCE

Any trade, industry, process and fuel burning equipment or industrial plants emitting air pollutants shall comply with the National Emission Standards for Source Specific Air Pollutants (Table 2, DAO 2000-87)



EMISSION AND AIR QUALITY MONITORING



Distribution of mass in crosswind dimension (y) at a downwind distance (x)

Distribution of mass in vertical dimension (z) at a downwind distance (x) which includes the effect of surface reflection

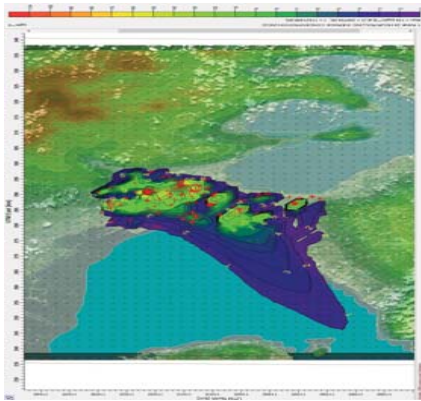
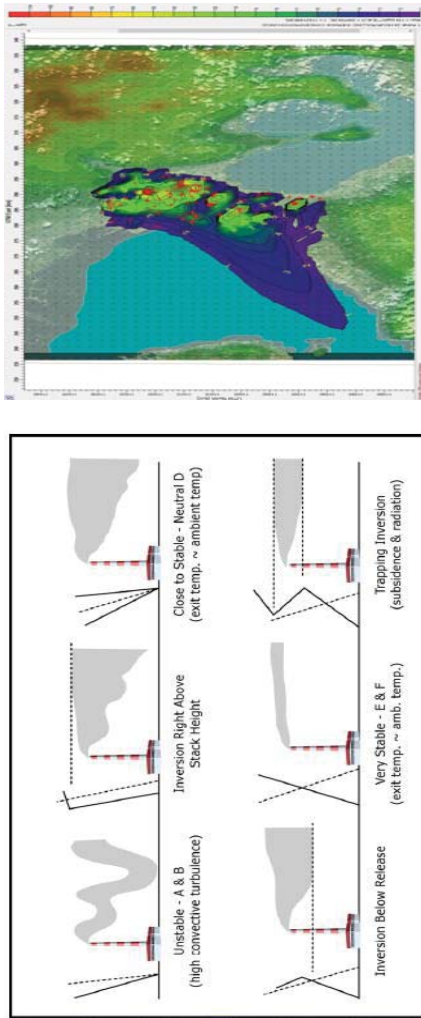
$$C(x,y,z) = \frac{Q}{2\pi\mu\sigma_y\sigma_z} \times e^{-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2} \left[e^{-\frac{1}{2}\left(\frac{z-H}{\sigma_z}\right)^2} + e^{-\frac{1}{2}\left(\frac{z+H}{\sigma_z}\right)^2} \right]$$

Distribution of mass in vertical dimension (z) at a downwind distance (x) which includes the effect of surface reflection

ENVIRONMENTAL MANAGEMENT BUREAU

National Emission Standards For Source Specific Air Pollutants (NESSAP) Section 19, RA8749

How does Meteorology Affects Air Pollutants



National Emission Standards For Source Specific Air Pollutants (NESSAP) Section 20, RA8749

Daily and Half Hourly Average Limits - Treatment Facilities Using Non-burn Technologies

Item	Daily Average Values	Half Hourly Average Values
Particulates (total dust)	10 mg/Ncm	30 mg/Ncm
Gaseous and vaporous organic substances, expressed as total organic carbon	10 mg/Ncm	20 mg/Ncm
Hydrogen chloride (HCl)	10 mg/Ncm	60 mg/Ncm
Hydrogen fluoride (HF)	1 mg/Ncm	4 mg/Ncm
Sulfur dioxide (SO ₂)	50 mg/Ncm	200 mg/Ncm
Nitrogen monoxide (NO) and Nitrogen dioxide (NO ₂), expressed as nitrogen dioxide for incineration plants with a capacity exceeding 3 tonnes per hour	200 mg/Ncm	400 mg/Ncm
Nitrogen monoxide (NO) and nitrogen dioxide (NO ₂), expressed as nitrogen dioxide for incineration plants with a capacity of 3 tonnes per hour or less	300 mg/Ncm	--
Ammonia	10 mg/Ncm	20 mg/Ncm

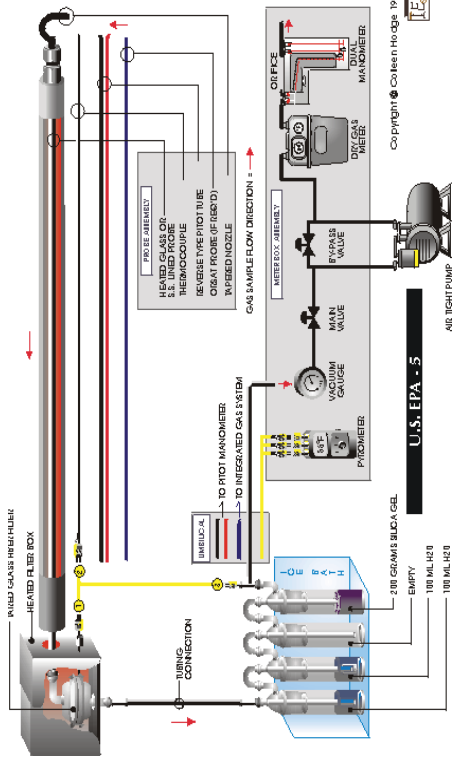
Item	Average Values*
Cadmium and its compounds, expressed as cadmium (Cd)	total 0.05mg/Ncm
Thallium and its compounds, expressed as thallium (Tl)	0.05 mg/Ncm
Mercury and its compounds, expressed as mercury (Hg)	total 0.5 mg/Ncm
Antimony and its compounds, expressed as antimony (Sb)	
Arsenic and its compounds, expressed as arsenic (As)	
Lead and its compounds, expressed as lead (Pb)	
Chromium and its compounds, expressed as chromium (Cr)	
Cobalt and its compounds, expressed as cobalt (Co)	
Copper and its compounds, expressed as copper (Cu)	
Manganese and its compounds, expressed as manganese (Mn)	
Nickel and its compounds, expressed as nickel (Ni)	
Vanadium and its compounds, expressed as vanadium (V)	
Tin and its compounds, expressed as tin (Sn)	
Dioxins and Furans	0.1 nanogram/Ncm

National Emission Standards For Source Specific Air Pollutants (NESSAP) Section 19, RA8749

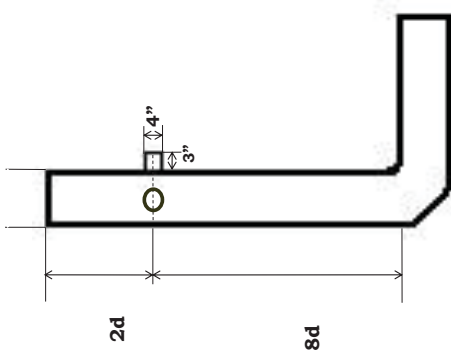
Table 2 National Emission Standards for Source Specific Air Pollutants (NESSAP)

POLLUTANT	STANDARD APPLICABLE TO SOURCE	MAXIMUM PERMISSIBLE LIMITS (MPL) (mg/Ncm)	METHOD OF SAMPLING*	METHOD OF ANALYSIS*	STANDARD APPLICABLE TO SOURCE	PERMISSIBLE LIMITS (mg/Ncm)	METHOD OF SAMPLING*	METHOD OF ANALYSIS*
Ammonia and its Compd.	Any source	10 as Sb	USEPA Method 1 through 5 or 29	AAS* or per sampling method	1) Manufacturing Process 2) Fossil fuel steam generators	NO _x 1,500 as NO _x 1,000 as SO ₂ 2,000 as NO ₂	USEPA Methods 1 through 7	Photo-optical method per sampling method
Acrylic acid and its Compd.	Any source	10 as A1	USEPA Method 1 through 29	AAS* or per sampling method	1) Existing Source 2) New Source 3) Other Air Pollution Sources	1,000 as SO ₂ 2,000 as NO ₂	USEPA Methods 1 through 7	Gravimetric per sampling method
Carbon Monoxide and its Compd.	Any source	500 as CO	USEPA Method 1 through 14 or 29	Oxalate Analysis or NDIR per sampling method	1) Existing Source 2) New Source 3) Other Air Pollution Sources	1,000 as NO _x 500 as SO ₂	USEPA Methods 1 through 7	Gravimetric per sampling method
Hydrochloric Acid and its Compd.	Any source other than manufacture of Aluminum from Alumina	100 as HCl	USEPA Method 1 through 14 or 29	AAS* or per sampling method	1) Manufacturing Process 2) Fossil fuel steam generators	150 100 150 200	USEPA Methods 1 through 7	Gravimetric per sampling method
Lead and its Compd.	1) Geothermal power plants 2) Testing source other than (1) and (2) Any trade, industry or process	7 as Pb	USEPA Method 1 through 14 or 29	AAS* or per sampling method	1) Existing Source 2) Manufacturing of Sulfuric Acid and Sulfonation 3) Fossil Fuel Combustion 4) Other Stationary Sources	200 as Pb	USEPA Methods 1 through 7	AAS* or per sampling method
Mercury	Any source	5 as elemental Hg	USEPA Method 1 through 14 or 29	AAS* or per sampling method	Any source	200 as P ₂ O ₅	USEPA Methods 1 through 7	Spectrophotometric per sampling method
Nickel and its Compd. Except Nickel	Any source	20 as Ni	USEPA Method 1 through 14 or 29	AAS* or per sampling method	Any source	100 as Zn	USEPA Methods 1 through 7	AAS* or per sampling method

US EPA Method-5 Isokinetic Sampling - Source Emission Testing Methodologies



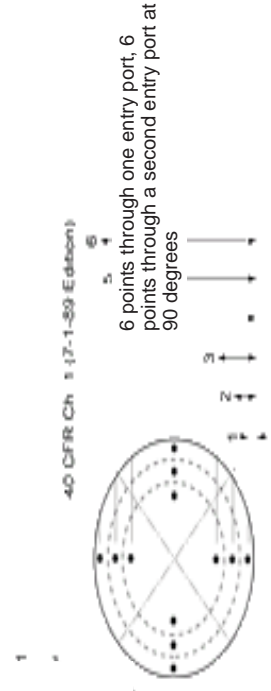
Stack Sampling Port Requirement



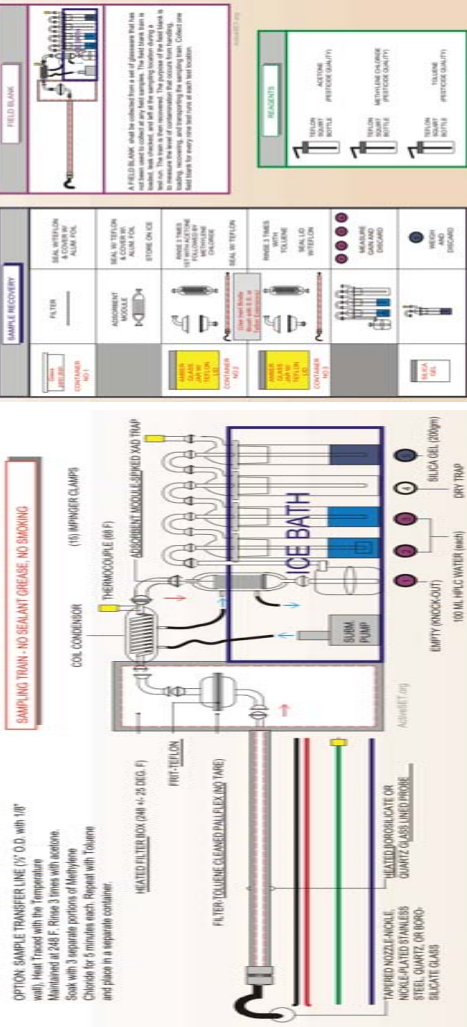
Location of the sampling port should be located at 8D downstream from obstruction (e.g. bend, control device, flue gas interference) and/or 2D from stack outlet. Number of sampling ports depends on the diameter of the smokestack and the location of the sampling port. 4 test ports are required for stacks with >2.0 meter diameter. While 2 test ports are required for stacks with <2 meter diameter.

EPA Method 1 Determining the locations and number of sampling points within a stack DETERMINING SAMPLE POINT DISTRIBUTION (CIRCULAR STACKS)

For circular ducts, you sample along two perpendicular diameters.
For example: when 12 sampling points



USEPA- METHOD 23



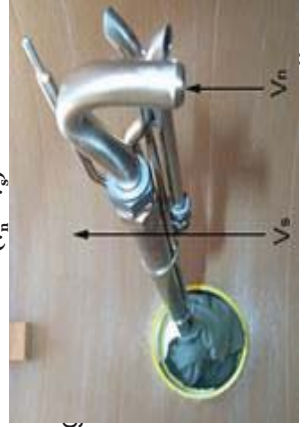
USEPA Methods CFR 40 Part 50 App. B

Definition of Isokinetic Sampling

Iso-kinetic
"iso" = equal and "kinetic" = motion

In practice:

The velocity of the gas sample (v_s) inside the nozzle is equal to the natural velocity (v_n) at which the gas moves up the stack ($v_n = v_s$)



- EPA Method 1**
Determining the locations and number of sampling points within a stack
- EPA Method 2**
Determining the velocity of the gas stream and the volumetric gas flow rate
- EPA Method 3**
Determining the dry molecular weight of the gas
- EPA Method 4**
Determining the moisture content of the gas
- EPA Method 5**
Determining particulate emissions

EPA Method 2
Determining the velocity of the gas stream and the volumetric gas flow rate



Pitot tube

Inclined manometer

Angle locator

Note: Purge pitot/sample lines then leak check the + & - side of the pitot tube before taking measurements (delta H)



TABLE 7.1- LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS (PERCENT OF STACK DIAMETER FROM INSIDE WALL TO TRAVERSE POINT)

Number of Traverse Points on a Diameter

Traverse Point Number on Diameter	2	4	6	8	10	12	14	16	18	20	22	24
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5	5.2
4	67.4	34.2	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9	7.3	6.9
5	61.4	39.6	26.6	20.6	17.5	15.4	13.8	12.4	11.3	10.4	9.7	9.2
6	56.6	44.4	30.6	23.6	20.5	18.4	16.8	15.4	14.3	13.4	12.7	12.2
7	52.6	49.6	34.6	26.6	23.5	21.4	19.8	18.4	17.3	16.4	15.7	15.2
8	49.4	54.4	38.6	29.6	26.5	24.4	22.8	21.4	20.3	19.4	18.7	18.2
9	46.6	59.6	42.6	32.6	29.5	27.4	25.8	24.4	23.3	22.4	21.7	21.2
10	44.4	64.4	46.6	35.6	32.5	30.4	28.8	27.4	26.3	25.4	24.7	24.2
11	42.6	69.6	50.6	38.6	35.5	33.4	31.8	30.4	29.3	28.4	27.7	27.2
12	41.4	74.4	54.6	41.6	38.5	36.4	34.8	33.4	32.3	31.4	30.7	30.2
13	40.6	79.6	58.6	44.6	41.5	39.4	37.8	36.4	35.3	34.4	33.7	33.2
14	40.2	84.4	62.6	47.6	44.5	42.4	40.8	39.4	38.3	37.4	36.7	36.2
15	40.2	89.4	66.6	50.6	47.5	45.4	43.8	42.4	41.3	40.4	39.7	39.2
16	40.2	94.4	70.6	53.6	50.5	48.4	46.8	45.4	44.3	43.4	42.7	42.2
17	40.2	99.4	74.6	56.6	53.5	51.4	49.8	48.4	47.3	46.4	45.7	45.2
18	40.2	104.4	78.6	59.6	56.5	54.4	52.8	51.4	50.3	49.4	48.7	48.2
19	40.2	109.4	82.6	62.6	59.5	57.4	55.8	54.4	53.3	52.4	51.7	51.2
20	40.2	114.4	86.6	65.6	62.5	60.4	58.8	57.4	56.3	55.4	54.7	54.2
21	40.2	119.4	90.6	68.6	65.5	63.4	61.8	60.4	59.3	58.4	57.7	57.2
22	40.2	124.4	94.6	71.6	68.5	66.4	64.8	63.4	62.3	61.4	60.7	60.2
23	40.2	129.4	98.6	74.6	71.5	69.4	67.8	66.4	65.3	64.4	63.7	63.2
24	40.2	134.4	102.6	77.6	74.5	72.4	70.8	69.4	68.3	67.4	66.7	66.2
% of Total stack Diameter from inside wall: 98.4, 92.3, 87.1, 82.0, 77.8, 73.6, 69.5, 65.4, 61.4, 57.4, 53.4, 49.4, 45.4, 41.4, 37.4, 33.4, 29.4, 25.4, 21.4, 17.4, 13.4, 9.4, 5.4, 1.4												
DRAW HORIZONTAL LINES THROUGH UPSTREAM AND DOWNSTREAM DIAMETERS AND USE THE HIGHER NUMBER OF POINTS.												

METHOD 2

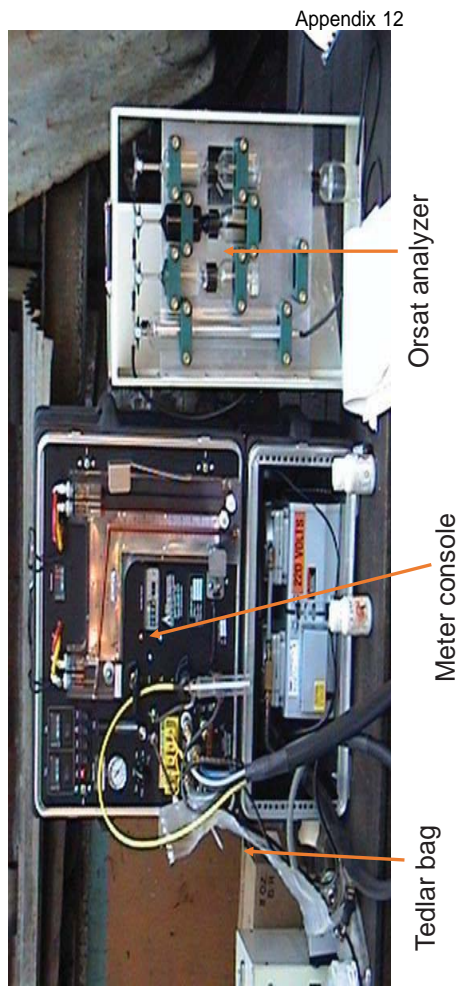
< 20°

EPA METHODS 1 & 2 GAS VELOCITY AND CYCLONIC FLOW CHECK

Traverse Point	Velocity Pressure (inches H ₂ O)	Temperature (Degrees C)	Angle Which Velocity Null (Degrees)
A-1	0.00	25.5	0.0
A-2	0.00	25.5	0.0
A-3	0.00	25.5	0.0
A-4	0.00	25.5	0.0
A-5	0.00	25.5	0.0
A-6	0.00	25.5	0.0
A-7	0.00	25.5	0.0
A-8	0.00	25.5	0.0
A-9	0.00	25.5	0.0
A-10	0.00	25.5	0.0
A-11	0.00	25.5	0.0
A-12	0.00	25.5	0.0
A-13	0.00	25.5	0.0
A-14	0.00	25.5	0.0
A-15	0.00	25.5	0.0
A-16	0.00	25.5	0.0
A-17	0.00	25.5	0.0
A-18	0.00	25.5	0.0
A-19	0.00	25.5	0.0
A-20	0.00	25.5	0.0
A-21	0.00	25.5	0.0
A-22	0.00	25.5	0.0
A-23	0.00	25.5	0.0
A-24	0.00	25.5	0.0
B-1	0.00	25.5	0.0
B-2	0.00	25.5	0.0
B-3	0.00	25.5	0.0
B-4	0.00	25.5	0.0
B-5	0.00	25.5	0.0
B-6	0.00	25.5	0.0
B-7	0.00	25.5	0.0
B-8	0.00	25.5	0.0
B-9	0.00	25.5	0.0
B-10	0.00	25.5	0.0
B-11	0.00	25.5	0.0
B-12	0.00	25.5	0.0
B-13	0.00	25.5	0.0
B-14	0.00	25.5	0.0
B-15	0.00	25.5	0.0
B-16	0.00	25.5	0.0
B-17	0.00	25.5	0.0
B-18	0.00	25.5	0.0
B-19	0.00	25.5	0.0
B-20	0.00	25.5	0.0
B-21	0.00	25.5	0.0
B-22	0.00	25.5	0.0
B-23	0.00	25.5	0.0
B-24	0.00	25.5	0.0
SUM	0.00	25.5	0.0
Average	0.00	25.5	0.0
Note:	LOPE @ 5-10°		



EPA Method 3
Determining the dry molecular weight of the gas



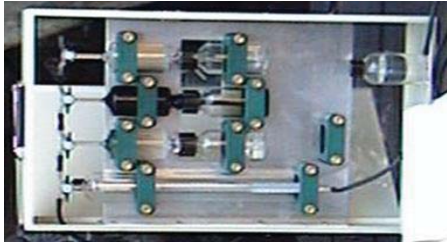
METHOD 3

METHOD 3 - FYRITE ANALYSIS FIELD DATA

Run No.	Date	Time of Day	Reading	Value	%CO ₂	%O ₂	Operator
1	11/20/11	11:30 AM	5.5	17.0	17.5	15.0	...
2	11/20/11	12:05 PM	6.0	14.0	17.5	15.0	...
3	11/20/11	12:45 PM	6.0	14.0	17.5	15.0	...
Avg			5.8	14.2	17.5	15.0	...



FYRITE



ORSAT

EPA Method 4

Determining the moisture content of the gas
initial & final weighting of impingers



METHOD 4 - MOISTURE ANALYSIS DATA SHEET

Run No.	Initial Weight (g)	Final Weight (g)	Moisture (g)
1	151.0	151.0	0.0
2	151.0	151.0	0.0
3	151.0	151.0	0.0
4	151.0	151.0	0.0
5	151.0	151.0	0.0
6	151.0	151.0	0.0
7	151.0	151.0	0.0
8	151.0	151.0	0.0
9	151.0	151.0	0.0
10	151.0	151.0	0.0

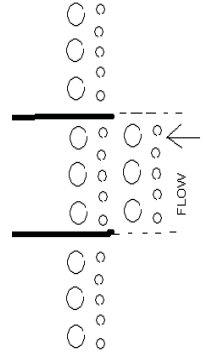
Note: Wipe the outside portion of the impingers before weighing.

METHOD 5 SAMPLING: EPA Method 5

Determining particulate emissions
To sample isokinetically, samples of gas must be drawn in at a velocity equal to the natural velocity at which the gas moves up the stack ($V_n = v_s$).
Sampling at a higher or lower rate than the gas velocity results in an under- or over-estimation of PM.

$$\Delta H = K \Delta P$$

differential pressure across orifice
differential pressure across pitot tube manometer



METHOD 5

ISOKINETIC FIELD DATA SHEET

Run No.	Time	Temp	Pressure	Flow Rate	PM Concentration
1	11:30 AM	17.0	1013.0	1.5	0.15
2	12:05 PM	14.0	1013.0	1.5	0.15
3	12:45 PM	14.0	1013.0	1.5	0.15
Avg					

$$\Delta H = K \Delta P$$

differential pressure manometer

$$\Delta H = K \Delta P$$

Where K = $\frac{846.72 D_p^2 \Delta H}{C_p (1 - B_{or}) M T_p}$

ISOKINETIC FIELD DATA SHEET

Flow will be maintained at a temperature of 20°C ± 1°C and above the condensation point of the gas.

LEAK RATE: 0.00057 m³/min

Temperature: 120 ± 140 °C

Pressure: 120 ± 140 °C

Flow Rate: 0.00057 m³/min

Appendix 12

SAMPLING ASSESSMENT TEAM (SAT)



DENR Accredited 3rd Party Stack Testers

List of Accredited Stack Testers

24 Firms
44 Teams

No. of Firm	No. of Teams	COMPANY	Contact Details	QA/QC MANAGER	TEAM LEADER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	1	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	1	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2	2	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
3	3	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	1	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2	2	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
3	3	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	1	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2	2	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
3	3	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	1	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2	2	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
3	3	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	1	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2	2	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
3	3	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	1	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2	2	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
3	3	GLOBAL ENVIRONMENTAL	No. 15 Barangay St., Pineda, Alabang City, Metro Manila Tel No. 8733355 Email: global_environmental@global.com	Ricardo C. Santiago	Enrico F. Quinsac	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

2004-2006 ADB Funded MMAQISDP Project Stack Testing and Training

Stack Testing Objectives

- Perform 960 facility surveys and provide necessary instruction to modify sources for testing (test ports, platforms, ladders)
- Perform 6,048 individual test runs (the equivalent of 960 sources) for PM, SOx, NOx, H2SO4, CO, H2S and metals
- Generate representative emission test data in comparison with the Philippine Clean Air Act standards
- Produce EPA-quality test reports suitable for EMB regulatory follow-up actions (NONC, Technical Conference, CAP)

Source: TRC, MMAQISDP EMB

2004-2006 ADB Funded MMAQISDP Project Stack Testing and Training

Project Accomplishments

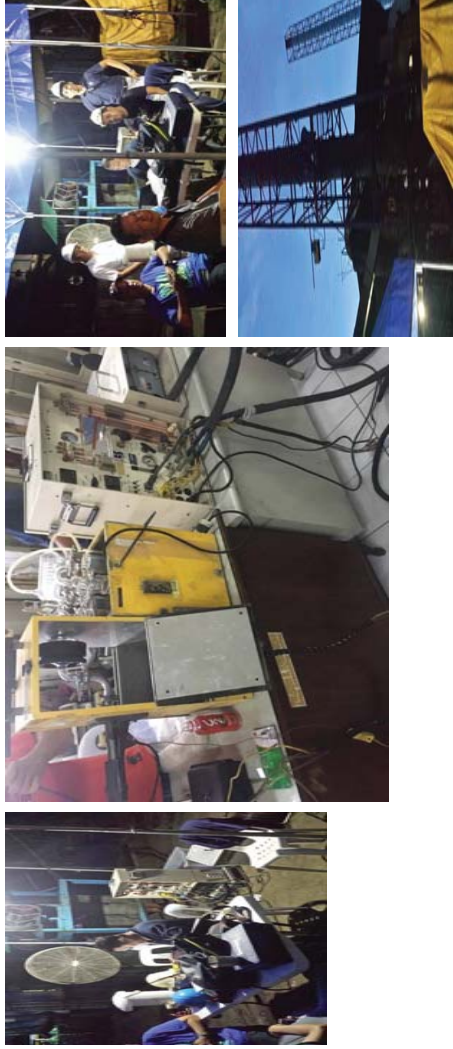
Specific Outputs	May 2004 – November 2006		
	Goals	Completed	% Target
Number of Stack Surveys	960	1,618	169%
Number of Test Runs	6,048	7,966	132%
Number of Equiv. Sources Tested (Number of Stacks)	960	1,264 (858)	132%
Number of Analyses	12,500	16,734	134%
Number of Test Reports (Number of Stacks Reported)	---	461 (850)	---
Stacks Failing the Standard	---	417	---

Source: TRC, MMAQISDP EMB

2004-2006 Method 23 MMAQISDP Training-
Navotas Power Barge



2016 EMB Method 23 Sampling in Bulacan

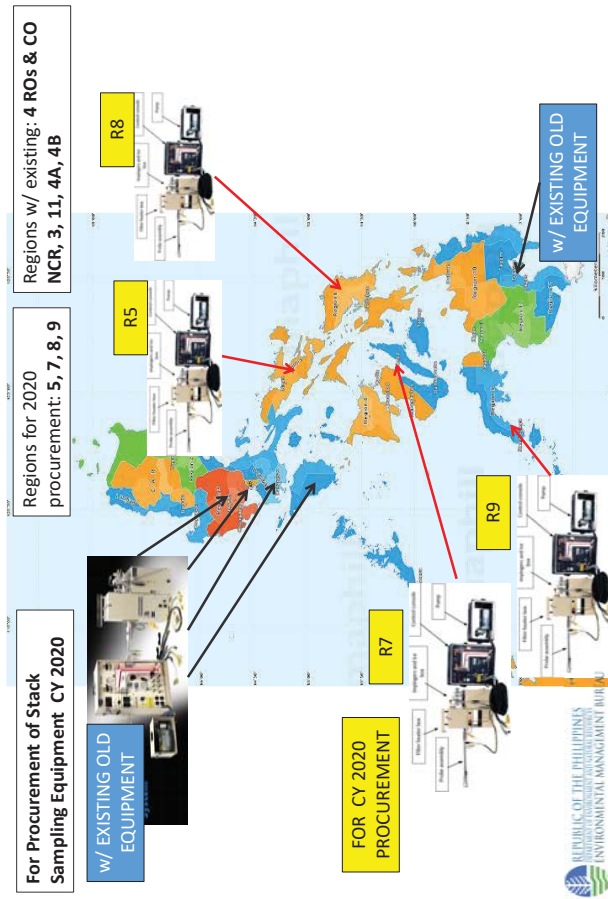
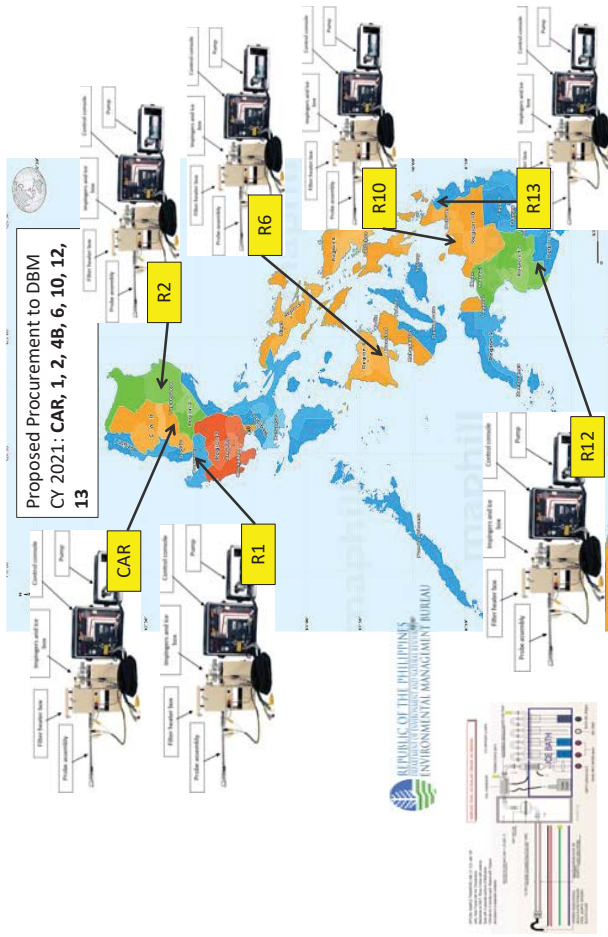


2017 Training Methods 23 – TO-09

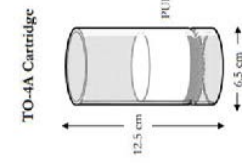
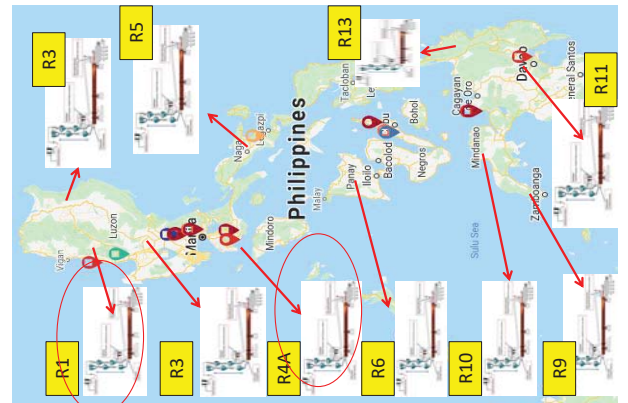
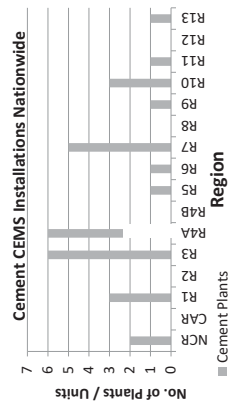


2020 Air Quality Program Strengthened Regional
Stack Monitoring





Cement Plants with & without Co Processing of Alternative Fuel and Raw Materials (AFRs)



Note: This method was developed using the PS-1 semi-volatile sampler provided by General Metal Works, Village of Cleves, OH as a guideline. EPA has experience in use of this equipment during various field monitoring programs over the last several years. Other manufacturers' equipment should work as well. However, modifications to these procedures may be necessary if another commercially available sampler is selected. * Manufacturers include: Tiesh Environmental, Anderson Instruments, and Thermo Environmental Instruments. Equipment specifications may vary by manufacture.

USEPA- TO-09 METHOD

National Ambient Air Quality Guideline Values and Standards

National Ambient Air Quality Standards for Source Specific Air Pollutants from Industrial Sources/Operations

Pollutants	Short Term ^a		Long Term ^b		Method of Analysis/Measurement
	µg/Nom	ppm	µg/Nom	ppm	
Suspended Particulate Matter ^c - TSP	230 ^d	24 hours	90	1 year ^e	Nephelometry / Impi Filter
PM-10	150 ^d	24 hours	60	1 year ^e	Methyl Orange
Sulfur Dioxide ^d	180	0.07 24 hours	80	0.03 1 year	Chromotropic Acid method or MBTH Colorimetric method
Nitrogen Dioxide	150	0.08 24 hours	80	0.03 1 year	Volumetric Titration with iodine solution
Photochemical Oxidants	140	0.07 1 hour	60	0.03 1 year	Methylene Blue
Ozone	60	0.03 8 hours	30	0.03 1 year	Grass-Satzman
Carbon Monoxide	35 mg/Nom	1 hour	10 mg/Nom	8 hours	4-Aminodipyrimine
Lead ^d	1.5	3 months ^d	1.0	1 year	Colorimetric-Parosulfine

Pollutants	Short Term ^a		Long Term ^b		Method of Analysis/Measurement
	µg/Nom	ppm	µg/Nom	ppm	
Amoniacs	500	0.01	50	0.01	Nephelometry / Impi Filter
Chlorine Dioxide	100	0.03	5	0.03	Methyl Orange
Chlorine and Chlorine compounds expressed as Cl ₂	50	0.04	30	0.04	Chromotropic Acid method or MBTH Colorimetric method
Hydrogen Chloride	200	0.13	30	0.13	Volumetric Titration with iodine solution
Hydrogen Sulfide	100	0.07	30	0.07	Methylene Blue
Nitrogen Monoxide	375	0.30	30	0.30	Grass-Satzman
Nitrogen Dioxide	250	0.14	60	0.14	4-Aminodipyrimine
Phenol	100	0.03	30	0.03	Colorimetric-Parosulfine
Sulfur Dioxide	470	0.18	60	0.18	Chromotropic-Parosulfine
Sulfuric Acid	340	0.13	60	0.13	Gravimetric
Suspended Particulate Matter - PM-10	300	--	60	--	Gravimetric
Ammony	0.02 mg/Nom	--	30	0.02 mg/Nom	AAAS ^g
Arsenic	0.02 mg/Nom	--	30	0.02 mg/Nom	AAAS ^g
Cadmium	0.01 mg/Nom	--	30	0.01 mg/Nom	AAAS ^g
Chromium	0.01 mg/Nom	--	30	0.01 mg/Nom	AAAS ^g
Albestos	Particulate Matter - (level 5 micro-gram in 10 mg water in 1 liter)	--	30	--	Light Microscopy
Sulfuric Acid	0.3 mg/Nom	--	30	--	Titration
Nitric Acid	0.4 mg/Nom	--	30	--	Titration

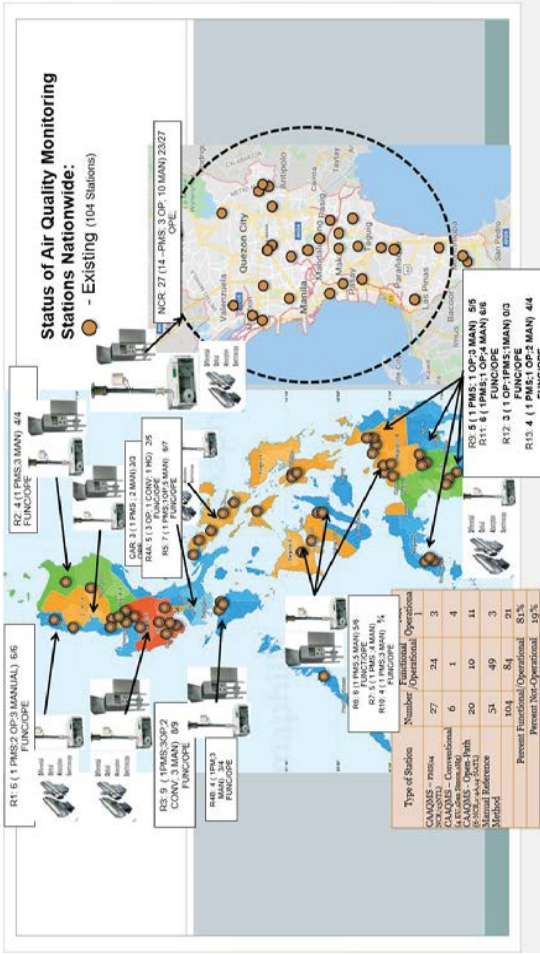
Way Forward

CY 2020 Proposed for procurement Method 1-5 Equipment with Method 23 components : 15 Ros only 4 ROs were approved.

CY 2021 Proposed for procurement 7 ROs for Method 1-5 Equipment while 6 ROs for Method 23 components with Cement CKC and WTEs using AFRs (3,4A,10,18,11,2) and 2 unit TO-09 DF Ambient Sampler

For procurement CY 2020 :

- 4 Units Method 1-5 Isokinetic Sampler
- 1 Unit Method 1-5 Isokinetic Sampler with Method 23 components for EMB Central Office



DIOXINS AND FURANS CEMS

6.3 Environmental Monitoring

- The WIE facility operator shall submit to EMB Regional Offices quarterly Self-Monitoring Report and semi-annual Compliance Monitoring Report in accordance with DAO 2003-27 and/or new relevant issuances thereof.
- The WIE facility operator shall install CEMS, linked with the EMB, measuring PM, NO_x, CO, HCl, Temperature and other parameters as determined by Bureau.

In coordination with EMB, WIE facilities utilizing thermal process (whether burn or non-burn) must conduct sampling and analysis for dioxins and furans based on EMB Memorandum Circular No. 2007-003 (Policy on Compliance and Permitting for Industrial Facilities Relating to Air Quality) following the prescribed methodology. All average values of dioxins and furans measured over the sampling period of a minimum of six (6) hours and a maximum of eight (8) hours must not exceed the limit value of 0.1 nanogram per normal cubic meter (ng-TEQ/NCM). From this guideline, TEQ values to be used for calculation of Toxic Equivalents (TEQs) of a particular sample is based on the 1989 update of the United States Environmental Protection Agency (US

Republic of the Philippines
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 Website: www.dear.gov.ph / E-mail: web@dear.gov.ph
 NOV 2 8 2018

DENR ADMINISTRATIVE ORDER
 NO. 2019 - 23
 SUBJECT: GUIDELINES GOVERNING WASTE-TO-ENERGY (WTE) FACILITIES FOR THE INTEGRATED MANAGEMENT OF MUNICIPAL SOLID WASTES

Pursuant to Section 8 (f) of Republic Act (RA) 9003, otherwise known as the Ecological Solid Waste Management Act of 2000, NSWMC Resolution No.069, Series of 2016, Adopting the National Solid Waste Management Commission Order No. 192, Adopting the National Solid Waste Management Commission Order 192 (Providing the Reorganization of the Department of Environment, Energy and Natural Resources; Renaming it as the Department of Environment and Natural Resources) dated 10 June 1987, the Department of Environment and Natural Resources hereby adopts and promulgates these guidelines on the establishment and operation of Waste-to-Energy (WTE) facilities for municipal solid wastes.

These guidelines also adhere to the policy of the government to promote compliance with Presidential Decree (PD) 1586 (Establishing an Environmental Protection Fund for Hazardous and Toxic Substances and Hazardous and Nuclear Wastes Act of 1990), RA 9290 (Philippine Clean Air Act of 1999), and RA 9275 (Philippine Clean Water Act of 2004).

Source: TRC, MMAQISDP EMB

USEPA Methods Performance Specification (PS) CFR 40 Part 60 App. B

Title 40 CFR Appendix B to Part 60

PS #	Title
PS-1	Opacity
PS-2	Sulfur Dioxide and Nitrogen Oxide
PS-3	Oxygen and Carbon Dioxide
PS-4	Carbon Monoxide
PS-4A	Carbon Monoxide
PS-4B	Carbon Monoxide and Oxygen
PS-5	Total Reduced Sulfur
PS-6	Flow Rate
PS-7	Hydrogen Sulfide
PS-8	Volatile Organic Compounds
PS-8A	Total Hydrocarbon
PS-9	Gas Chromatographic
PS-11	Particulate Matter
PS-12A	Mercury

Performance specifications are used for evaluating the acceptability of the Continuous Emission Monitoring System (CEMS) at the time of or soon after installation and whenever specified in the regulations.

For the official version of the performance specifications, please see the [Code of Federal Regulations](#), Appendix B to Part 60—Performance Specifications.

PS-12B	Mercury (Sorbent Trap)
PS-15	Extractive Fourier Transform Infrared Spectroscopy
PS-16	Predictive Emissions Monitoring Systems
PS-18	Gaseous Hydrogen Chloride

CEMS - AMESA

Sampling System Design:

- Automated isokinetic sample collection onto an exchangeable adsorption-resin-filled cartridge.
- The AMESA system consists of a titanium sampling probe, heat exchanger, a cartridge unit as a collection point, and a control cabinet.
- Samples (resin cartridges) have to be shipped to and analyzed by an offsite laboratory
- Not a true continuous dioxin/furan measurement but an integrated "batch" sample
- Sample durations range from every 6 hours up to four weeks
- Similar to EPA Method 23 but no condensate samples collected

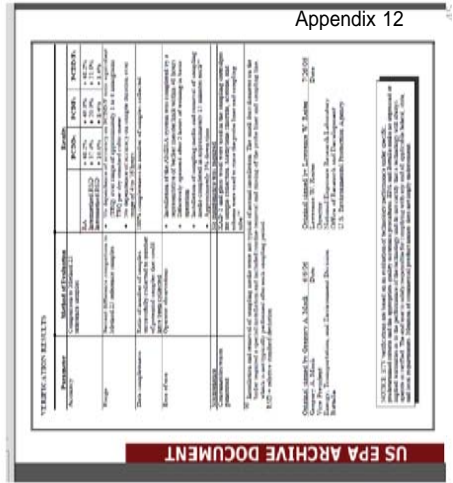
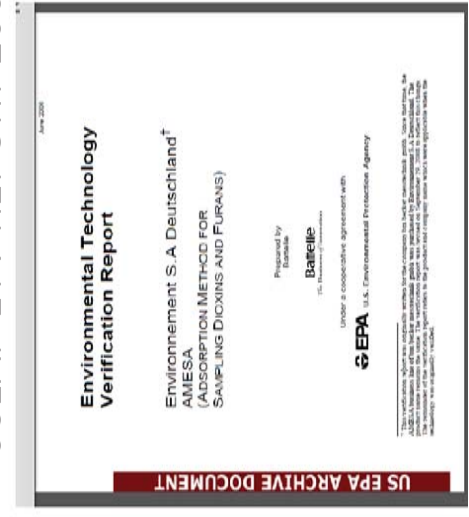
CEMS - AMESA

Adsorption Method for Sampling of Dioxins and Furans (AMESA) is an automatic system for *continuous* monitoring of emissions of dioxins and furans from industrial processes which require official approval in compliance with environmental regulations

A sample is continuously extracted from the gas stream being monitored using a titanium probe, which is water-cooled to below 70 °C. The sample flow rate is automatically adjusted to ensure isokinetic sampling (the velocity of gas entering the sampling system is equal to the velocity of the gas in the system under test). The sample gas is drawn through a quartz wool pre-filter and then across a cartridge filled with resin, such as XAD 2. The sample gas is also cooled to below 5 °C to condense and remove water vapour. All system parameters are recorded digitally during sampling. The resin cartridge and the condensate are removed at the end of a monitoring period, and the contents are analysed to determine levels of dioxins and furans.¹

SOURCE: Meyer J, Linemant H, Becker E, Renschler W, Josten W, Witzling P, Gesthal B, May-Jun 2000. "Certification of a long-term sample system for PCDFs and PCDDs in the flue gas from industrial facilities". *Chemosphere*. 40 (9):1101-1025-1027

USEAP ETV REPORT 2006



AMESA Evaluation

The EPA ETV test was conducted at EPA's Research Triangle Park (RTP), North Carolina, campus over a period of two weeks in September 2005.

- Method is not approved for compliance measurement in USA (as Relative Accuracy vs M23 was only about 50%)

In addition to this ETV verification test, ENVEA group lists other evaluations of the AMESA system have been completed.

- AMESA system was approved by the German Technical Inspection Authority (TÜV) in 1997,
- Received the MCerts certification in October 2005,
- Participated in a performance test for the Taiwanese EPA in 2001.

Source: TRC, MMAQISDP EMB

Recommendations

1. Procurement of Isokinetic Sampler to ROs without samplers
2. Procurement of Method 23 components to ROs with Isokinetic Samplers
3. Further Training on both Method 1-15 and Method 23 , TO-09 when equipments are procured
4. Dioxin and Furan Emission Inventory and Dispersion Modeling Training for ROs

Thanks for Your Attention!



Lets All
Act to Clean
the Air



Contact Information

- Telephone: (632) 927-15-17 / (632) 928-3725
- E-mail: mail@emb.gov.ph
- Website: <http://www.emb.gov.ph>



Technical Cooperation Project for Capacity Development through Improving Solid Waste Management through Advanced/Innovative Technologies

Governmental Control in WTE
<Comparison between PHL/JPN>

27 February, 2020

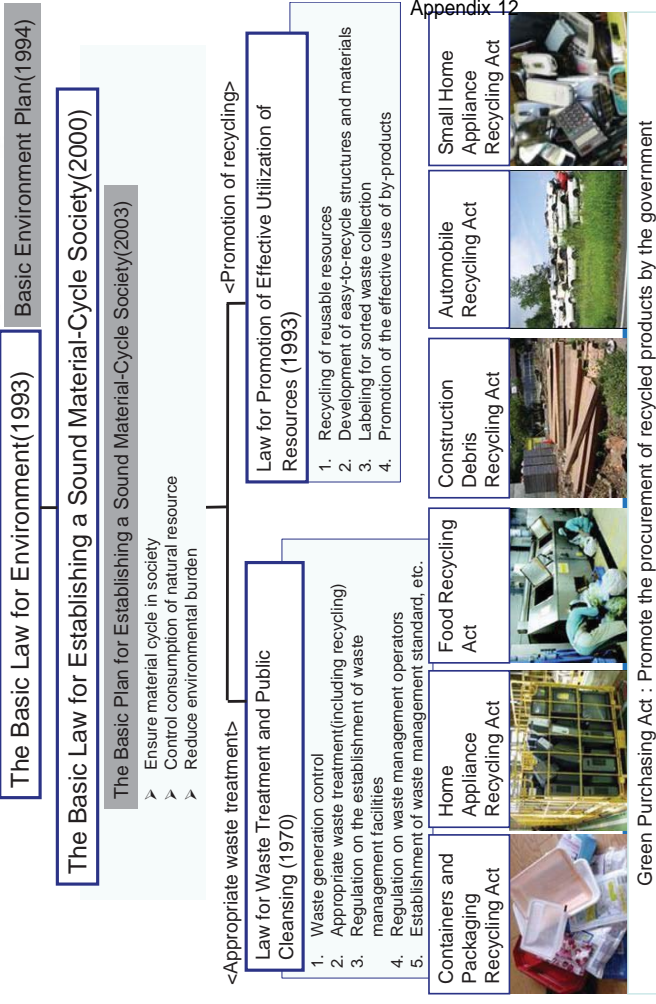
1. Role of National and Local Government for SWM/WTE (in JPN)

National Gov. (MOEJ)	<p>Issues laws and standards for regulating SWM such as;</p> <ul style="list-style-type: none"> - Law of Waste Treatment and Public Cleansing (Structural/Operational Standard of WTE/SLF, Ash disposal, etc.) - Relevant Pollution Control Acts (Air, Water, Noise and Vibration, Dioxins, etc.), - Subsidy to LGUs to promote/control proper SWM using WTE,
Prefecture Gov.	<ul style="list-style-type: none"> - Prefecture Master Plan for MSW Treatment, - Clustering Plan for MSWM Facilities, - Permitting Facility Basic Plan and Study on Living Env. Impact (or EIA),
Local Gov.	<ul style="list-style-type: none"> - Master Plan for MSW Treatment and its implementation, - Formulate WTE Facility Basic Plan (Solicited Approach), - Environmental Impact Assessment (EIA) Study - Procurement of WTE Facility (thru EPC, DBO or other PPP schemes), - Operation and Monitoring of WTE Facility,

Governmental Control in WTE
<Comparison between PHL/JPN>

1. Role of National and Local Governments for SWM/WTE
2. Three layers of WTE Quality Control in Japan
3. Type of Waste to be fed to WTE
4. What are TCP doing?

1. Role of National and Local Government: Legislation in Japan for Environment and Sound Material Cycle Society



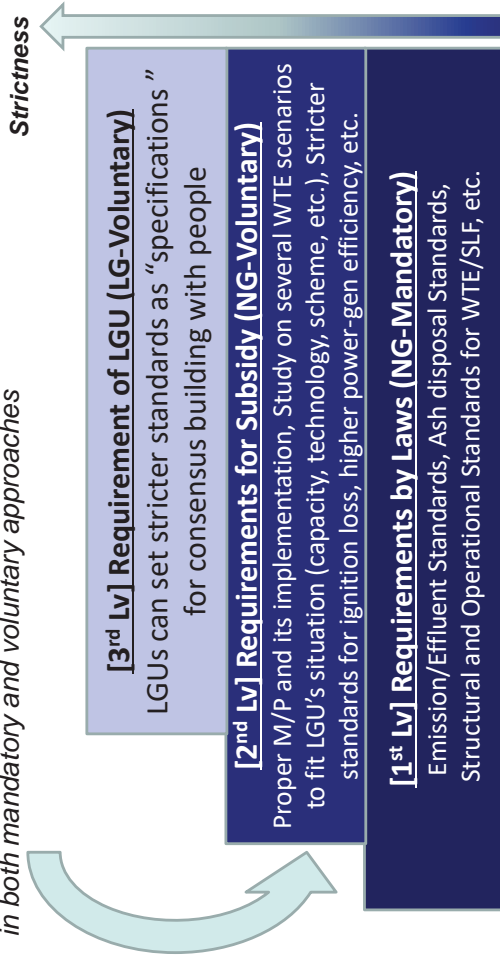
1. Role of National Government for SWM/WTE (in PHL)

National Gov. (DENR) (NSWMC)	<p>Issues laws and standards regulating SWM such as;</p> <ul style="list-style-type: none"> - RA9003 (Responsibilities, Structural Standard of SLF, etc.) - RA6969 (Category of Hazardous waste, and its safely disposal), - Relevant Pollution Control Acts (Air, Water, Noise, etc.), - WTE Guidelines (Resolution 669, NSWMC) + DENR AO (2019-21)
Provincial Gov.	<ul style="list-style-type: none"> - Provincial Master Plan for MSW Management, - Clustering Plan for common MSWM Facilities,
Local Gov.	<ul style="list-style-type: none"> - Master Plan for MSW Management and its implementation, - Procurement of WTE (BOT or other PPP in unsolicited approach), - Environmental Impact Assessment Statement (EIS) for WTE, - Operation and Monitoring of WTE Facility,



2. Three layers of WTE Quality Control in Japan

NG controls WTE specifications of LGUs in both mandatory and voluntary approaches



3. Type of Waste to be fed to WTE

WTE and Waste segregation in LGs in Japan

Waste acceptable for WTE in Philippines

Section 6.1, DENR AO (2019-21)

1. The WTE facility shall **only accept source segregated** biodegradable waste and residual waste collected from households, MRFs, Residual Containment Area (RCAs), Sanitary Landfills and other disposal facilities.



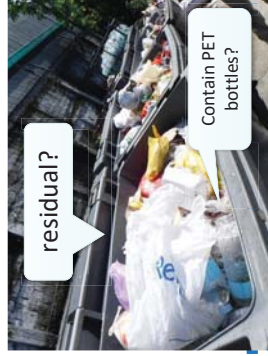
About 35% of facility generates electricity (more than 1,000 of waste combustion facilities are being operated in Japan)



3. Type of Waste to be fed to WTE

LGUs have difficulties of source segregation

1. LGUs and Brgys require segregation to people/business based on RA9003
2. Complete segregation at source is not realistic!
 - Actual segregated **waste** at source **is different from waste** segregated for WACS **very common** even in other countries.



9

3. Type of Waste to be fed to WTE

LGU to decide the types of waste for WTE

1. Resources from waste can be recovered/ utilized, with the conditions below
 1. Sufficient **market/Industry** to **support** recycling/demand (private business), or
 2. LGU can **afford to shoulder the cost** to sustain recycling activities (private business)
2. LGU shall clarify characteristic of waste for WTE with project proponent,
 1. LGU gets sanitary condition of its jurisdiction
 2. The proponent verifies feasibility of the project



10

4. What are TCP doing?

Under Project Output1

- To study present regulatory framework for WTE plan/installation/operation,
- To study/propose additional national standards (if necessary),
- To prepare “Procedural Manual from Planning to Scrapping WTEs” sake for LGUs based on Japanese example,

Under Project Output2

- To evaluate WTE project(s) if it is appropriate for LGU
- To obtain lessons/knowledge to be incorporated in the procedural manual under Output1

Thank you for your attention!

Policies on Renewable Energy and Promotion of Waste-to-Energy (WTE) in the Philippines

Technical Cooperation Project for Capacity Development on Improving Solid Waste Management through Advanced/Innovative Technologies

Kick Off Seminar
27 February 2020

ENGR. RUBY B. DE GUZMAN

Chief, Biomass Energy Management Division
Renewable Energy Management Bureau
DEPARTMENT OF ENERGY



Policy Directions

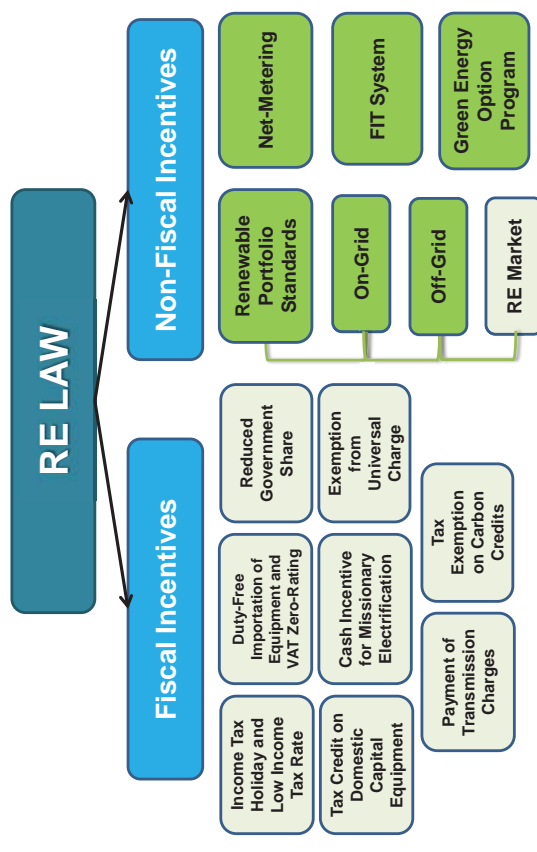
- Accelerate the exploration and development of renewable energy resources
 - ✓ achieve energy self-reliance
 - to reduce the country's dependence on fossil fuels
 - minimize the country's exposure to price fluctuations
 - ✓ adoption of clean energy to mitigate climate change
 - ✓ promote socio-economic development in rural areas
- Increase the utilization of renewable energy by providing fiscal and non fiscal incentives

R. A. No. 9513: The Renewable Energy Act of 2008



Accelerate the development of the country's renewable energy resources by providing fiscal and non-fiscal incentives to private sector investors and equipment manufacturers / suppliers.

Incentives under the RA 9513



RE Act Policy Development Mechanisms

- ❑ **On-Grid Renewable Energy Development**
 - ❖ Net-Metering for Renewable Energy
 - ❖ Feed-In Tariff (FIT) System
 - ❖ Renewable Portfolio Standards (RPS) Rules for On-Grid
 - ❖ Green Energy Option Program
 - ❖ Renewable Energy Market
- ❑ **Off-Grid Renewable Energy Development**
 - ❖ Minimum RE Generation Capacities (RPS Off-Grid Rules)

RE Policy Mechanisms

Feed-in Tariff System (FIT)

RESOURCE	INSTALLATION TARGET	ERC APPROVED FIT RATES	WITH CERTIFICATE OF ENDORSEMENT TO ERC	INSTALLATION TARGET BALANCE
	Capacity (MW)	(PhP / kWh)	No. of Projects Capacity (MW)	Capacity (MW)
Hydro	250	5.90	5 34.60	125.79 <i>As of 31 December 2019</i>
		5.8705***	1 8.50	
		TBD	6 81.11	
Wind	200	8.53	3 249.90	6.10
		7.40**	3 144.00	
Solar	50	9.68	6 108.90	-
		8.69**	17 417.05	
Biomass	250	6.63	12 117.351	29.435 <i>As of 13 December 2019</i>
		6.5969***	4 14.564	
Ocean	10	Deferred	10 88.65	-
TOTAL	1,410.00		67 1,264.625	

* - Additional installation targets
 ** - FIT rates for the respective additional installation targets (W-ERCRes14, 2015; S-ERCRes6, 2015)
 *** - Degressed FIT rates (H&S-ERCRes1, 2017)

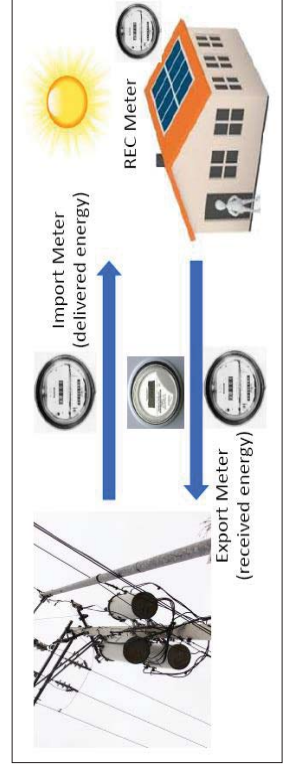
RE Act Policy Development Mechanisms

- ❑ **On-Grid Renewable Energy Development**
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- ❑ **Off-Grid Renewable Energy Development**
 - ❖ Minimum RE Generation Capacities (RPS Off-Grid Rules)

RE Policy Mechanisms

Net-Metering Rules and Interconnection Standards

- Facilitate customer to produce its own electricity supply up to 100 kW
- Connection/Sale of Customers' RE Generation to the Grid
 - **ERC Res. No. 09, s. 2013, Signed: 27 May 2013**
- As of **31 December 2019**, a total of **3,132 Qualified End-Users** were registered with **total rated capacity of 25,256.50 kW**



RE Policy Mechanisms

Renewable Portfolio Standards (RPS)

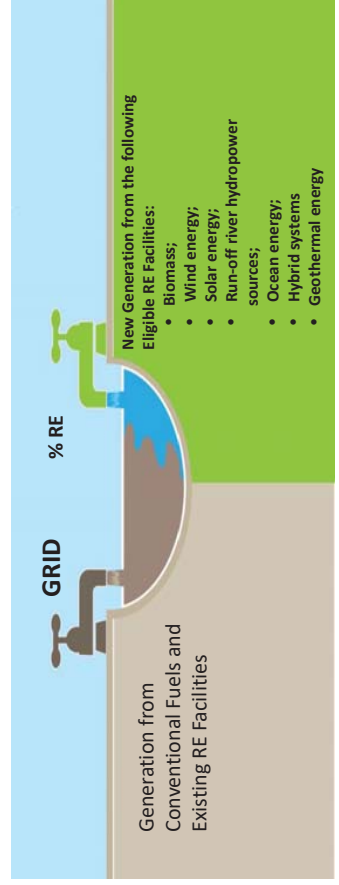
On-Grid Compliance Year: Starting 2020

Department Circular No. DC2017-12-0015

Date signed: 22 December 2017

Effectivity Date: 31 December 2017

- Conducted eleven (11) Focus Group Discussions (FGD) on RPS requirements and compliance level of On-Grid Mandated Participants in 2019



RE Policy Mechanisms

Renewable Portfolio Standards

Off-Grid

Department Circular No. DC2018-08-0024

Date signed: 24 August 2018

Effectivity Date: 29 September 2018

- Facilitated the conduct of Workshop on Simplified Planning Tool (SPT) on March 26-27, 2019 at the DOE AVR
- Gathered inputs from EPIMB and RERCD for the preparation of the following:
 - ✓ List of off-grid mandated participants
 - ✓ Initial calculation of Off-Grid RPS Requirements at 1%



RE Policy Mechanisms

Green Energy Option Program (GEOP)

Department Circular No. DC2018-07-0019

Date signed: 18 July 2018

Effectivity Date: 22 August 2018

- Conducted Public Consultations for the draft DC on:
 - ✓ Cebu City (June 18, 2019)
 - ✓ Davao City (June 27, 2019)
 - ✓ Batangas City (July 11, 2019)
 - ✓ Clark, Pampanga (July 25, 2019)



Finalization and Issuance of the Draft Department Circular entitled, **“Guidelines Governing the Issuance of Operating Permits to Renewable Energy Suppliers under the Green Energy Option Program”**

RE Policy Mechanisms

Renewable Energy Market

Department Circular No. DC2019-12-0016

Date signed: 04 December 2019

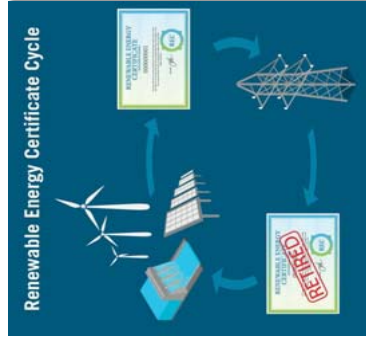
Effectivity Date: 04 January 2020

- This establishes a market for the trading of RE Certificates (RECs) between and among trading participants.
- The Philippines Renewable Energy Market System (PREMS) was launched on December 17, 2019

Future Activities:

Conduct of IECs in collaboration with PEMC

- ✓ PREMS
- ✓ REM Rules



New Policy Initiatives

Green Energy Tariff Program (GETP)

- To facilitate the procurement of supply from RE projects through a competitive process of compliance with the requirements under the RPS and provide a guide for pricing and contractual terms for direct procurement of supply of RE under the GEOP
- Draft Department Circular**
 - Public Consultations on:
 - ✓ November 6, 2019 – Hotel Elizabeth, Baguio City;
 - ✓ November 13, 2019 – Bai Hotel, Mandaue City, Cebu
 - ✓ December 6, 2019 – DOE, Taguig City

New Policy Initiatives

Executive Order No. 30, Series of 2017 (Energy Projects of National Significance)

- Creating the Energy Investment Coordinating Council (EICC) in order to streamline the regulatory procedures affecting energy projects
- Declares energy projects as projects of national significance
- **DOE** to chair the EICC and shall be composed of **DENR, NEA, NGCP, NPC, TransCo, DOF, DOJ, DOTr, HLURB, Palawan Council for Sustainable Development** and other agencies deemed necessary by the council.
- **Implementing Rules and Regulations (IRR)**
 - Department Circular No. DC2018-04-0013
 - Signed: 25 April 2018
 - Published: 04 May 2018 (Manila Tribune and Business World)
 - Effectivity: 19 May 2018

New Policy Initiatives

Department Circular No. DC2019-10-0013:

“Omnibus Guidelines Governing the Award and Administration of Renewable Energy Contracts and the Registration of Renewable Energy Developers”.

▪ **Section 4.2.1**

The RE Applicant must be a Filipino or, if a corporation, must be a Filipino corporation duly registered with the Securities and Exchange Commission (SEC), with at least sixty percent (60%) of its capitalization duly owned and controlled by Filipinos, **unless the application is for biomass development and/or uses waste-to-energy technology, in which case, the 60% Filipino capitalization requirement shall not apply.** This provision shall retroact to all RE Applications for biomass resource development and utilization that are being evaluated prior to the effectivity of this Circular.

New Policy Initiatives

Republic Act No. 11234 “EVOSS Act”

- *“An Act Establishing the Energy Virtual One-Stop Shop for the Purpose of Streamlining the Permitting Process of Power Generation, Transmission and Distribution Projects”*
- Otherwise known as the “Energy Virtual One-Stop Shop (EVOSS) Act”

a)	b)	c)
Recognize the legal effect, validity, and enforceability of electronic documents submitted in relation to applications for permits and/or certifications necessary for, or related to, applications for power generation, transmission, or distribution projects.	Provide an online payment system for all fees imposed for applications for permits and/or certifications necessary for, or related to, applications for power generation, transmission, or distribution projects.	Provide a secure and accessible paperless processing system through which proponents may: <ol style="list-style-type: none">1) Obtain the list of all electronic documentary requirements, corresponding fees and permitting process for all concerned Government agencies and entities2) Prepare, submit, process, and receive actions on all submitted electronic documentary requirements;3) Monitor and inquire on the status of ongoing applications for permits and/or certifications necessary for, or related to, applications for power generation, transmission, or distribution projects;4) Calculate, pay, and settle all appropriate fees electronically, and5) Submit complaints concerning inaction on submitted electronic documents.

Waste-to-Energy (WTE) Development

Section 30 of RA 9513: Adoption of WTE Technologies

- The DOE shall, where practicable, **encourage the adoption of waste-to-energy facilities** such as, but not limited to, biogas systems. The DOE shall, in **coordination with the DENR**, ensure compliance with this provision.

WASTE-TO-ENERGY TECHNOLOGIES

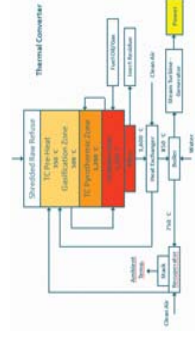
- systems which convert **biodegradable materials** such as, but not limited to, animal manure or agricultural waste, into useful energy through processes such as **anaerobic digestion, fermentation, and gasification, among others**, subject to the provisions and intent of **RA 8749 (Clean Air Act) and RA 9003 (Ecological Solid Waste Management Act)**



Anaerobic Digestion



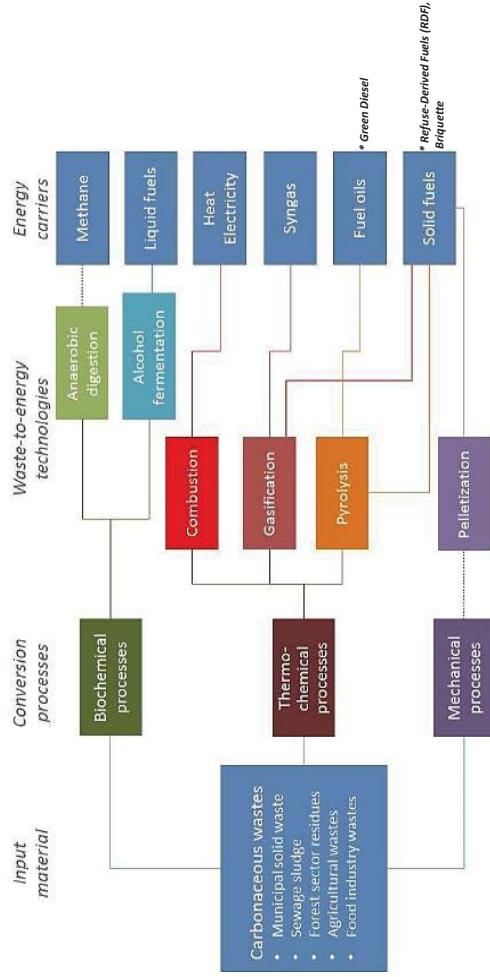
Methane Recovery



Thermal Conversion

Waste-to-Energy (WTE) Development

Waste-to-Energy Technologies



Reference: Caló, Antonia & Pongrácz, Eva. (2013). The role of smart energy networks to support the application of waste-to-energy technologies. *Pollack Periodica*. 9. 61-73. 10.1556/Pollack.9.2014.5.7.

Waste-to-Energy (WTE) Development

DOE's Thrust on WTE

- ✓ The Department is pushing for the promotion and development of WTE technologies in the country as these address MSW generation and disposal.
- ✓ No objection on "incineration" technology provided that toxic emissions should be properly addressed by state of the art emission control and capture technologies with continuous emission monitoring system.

Municipal Solid Waste (MSW) as an RE Resource

- Existing RE Resources under the RA 9513 may be expanded through the identification and recognition of other emerging RE technologies such as MSW, among others.
 - ✓ **MSW is generated as a result of human consumption and use of mass produced and manufactured consumer goods.** Clearly, MSW is, therefore, intertwined with the existence of modern human society and for as long as people continue to live and enjoy the goods and amenities that a modern civilization provides, MSW, both organic and inorganic, will be produced. In fact, their quantity will only increase as the human population also grows. In short, it is an energy resource that is practically inexhaustible, sustainable and available over an indefinite period of time.
- Given this simple scenario, **MSW is classified as an RE resource** under the RA 9513 and its IRR as referring to **energy resources that do not have an upper limit on the total quantity to be used; and are renewable on a regular basis, and whose renewal rate is relatively rapid to consider availability over an indefinite period of time.**

LEGISLATIONS: 18th Congress

Senate

Bill No.	Title	Filed By
363	An Act Establishing a National Energy Policy and Regulatory Framework for Facilities Utilizing Waste-to-Energy Technologies	Senator Sherwin T. Gatchalian
401	An Act Allowing the Use of Waste-to-Energy Technology in Electricity, Fuel and Heat Generation and for Other Purposes	Senator Francis N. Tolentino
1011	An Act Amending Republic Act No. 7160, Otherwise Known as the Local Government Code of 1991, for the Purpose of Enhancing the Power of Local Government Units in Waste Management and For Other Purposes	Senator Francis N. Tolentino

LEGISLATIONS: 18th Congress

House of Representatives

Bill No.	Title	Filed By
933	An Act Promoting and Permitting the Use of Waste-to-Energy Technology, Amending for this Purpose Republic Act No. 8749, Otherwise Known as the Clean Air Act of 1999	MAGDALO Party-List Representative Hon. Manuel DG. Cabochan
3174	An Act Allowing the Use of Waste-to-Energy Technology in Electricity, Fuel and Heat Generation and for Other Purposes	Representative Abraham "Bambol" N. Tolentino
3423	An Act Establishing a National Energy Policy and Regulatory Framework for Facilities Utilizing Waste-to-Energy Technologies	Representative Alfred Vargas
4419	An Act Promoting the Use of Waste-to-Energy, Amending for the Purpose Republic Act No. 8749, Otherwise Known as the Clean Air Act of 1999	Representatives David "Jay-Jay" C. Suarez and Anna Marie Villaraza-Suarez
5706	An Act Promoting and Establishing the Use of Waste to Energy Technologies and Facilities as an Alternative Source of Renewable Energy Technologies and For Other Purposes	Representative Eric L. Olivarez

Summary of Registered WTE Power Plants/Projects

Landfill Gas Extraction			
Commercial	Company/Project Name	Capacity	Status
	Montalban Methane Power Corporation's Landfill Methane Recovery and Power Generation Facility	8.19 MW	Operational
	Pangea Green Energy Philippines, Inc.'s Landfill Methane Recovery and Power Generation Facility	1.5 MW	Operational
	TOTAL	9.69 MW	
Fuel Production Facility			
Commercial	Company/Project Name	Capacity	Status
	FDR-Integrated Resource Recovery Management, Inc.'s Refused Derive Fuel (RDF) Generation Facility	300 MT/day	Operational
	Green Alternative Technology Specialist, Inc.'s Refuse-Derived Fuel (RDF) Processing Plant	350 MT/day	Operational
	Vistagreen Corporation's MSW Briquette Fuel Production Facility	30 MT/day	Newly Registered
	TOTAL	680 MT/day	

Summary of Registered WTE Power Plants/Projects

Thermal Conversion

Commercial	Company/Project Name	Capacity	Location	Feedstock	Status
	Green Atom Renewable Energy Corporation's WTE Plant Project	6 MW	Laoac, Pangasinan	Municipal Solid Waste	For development
	Satrap Power Corporation's Biomass/WTE Power Plant Project	6 MW	Mabalacat, Pampanga	Municipal Solid Waste	For development
		6 MW	San Jose, Batangas	Municipal Solid Waste	For development
		10 MW (3-MW WTE)	Santa, Ilocos Sur	Municipal Solid Waste	For development
	AustWorks Corporation's WTE Plant Project	5.22 MW	Puerto Princesa, Palawan	Municipal Solid Waste	For development
	CJ Global Green Energy Philippines Corp.'s WTE Project	20 MW	Naga, Camarines Sur	Municipal Solid Waste	For development
	SATRAP Power Corporation's WTE Plant Project	3.78 MW	Bacnotan, La Union	Municipal Solid Waste	Newly Registered
	W2W Angeles City, Inc.'s WTE Plant Project	11.1 MW (10-MW Gasification)	Angeles City, Pampanga	Municipal Solid Waste	Newly Registered
	TOTAL	60 MW			

Own-Use

Company/Project Name	Capacity	Location	Feedstock	Status
Waste and Resources Management, Inc.'s WTE Plant Project	100 kW	Trece Martires, Cavite	Tobacco Waste, Food Waste, Waste Paper	On-going construction

Summary of Registered WTE Power Plants/Projects

Anaerobic Digestion (BIOGAS)

Commercial	Company/Project Name	Capacity	Location	Feedstock	Status
	Green Future Innovations Inc.'s Biomass Cogeneration Power Plant	19 MW (3-MW Biogas)	San Mariano, Isabela	Distillery Waste	Under maintenance
	Far East Alcohol Corporation's Biogas Power Plant Project	2.4 MW	Apalit, Pampanga	Waste Molasses	Operating for Own-Use
	Asian Carbon Neutral Power Corporation's Biogas Power Plant	2 MW	Tarlac City, Tarlac	Animal Waste	Operational
	Biotech Farms, Inc.'s Biogas Power Plant	12.39 MW	Banga, South Cotabato	Animal Waste	Operational
	First Quezon Biogas Corporation's Biogas Power Plant Project	1.2 MW	Candelaria, Quezon	Animal Waste	On-going construction
	W2W Angeles City, Inc.'s WTE Plant Project	11.1 MW (1.1-MW Biogas)	Angeles City, Pampanga	Municipal Solid Waste	Newly Registered
	TOTAL	22.09 MW			

Summary of Registered WTE Power Plants/Projects

Anaerobic Digestion (BIOGAS)					
Own-use					
Company/Project Name	Capacity	Location	Feedstock	Status	
Cavite Pig City Inc.'s Cavite Pig City Biogas Power Plant	1 MW	Gen. Trias, Cavite	Animal Waste	Under Rehabilitation	
FDR Integrated Resource Recovery Management, Inc.'s Biogas Power Plant	0.624 MW	Naga City, Cebu	Municipal Solid Waste	Operational	
Marcela Farms Incorporated's Biogas Power Generation Project	0.56 MW	Cortes, Bohol	Animal Waste	Operational	
Emperador Distillers, Inc.'s Biomass Power Plant Project	9.2 MW (4.2 MW Biogas)	Balayan, Batangas	Waste Water	Operational	
TOTAL	6.384 MW				

Landfill Gas-Fired Power Plants



14.8-MW Montalban Methane Power Corporation
Landfill Methane Recovery and Power Generation Facility



1.5-MW Pangaea Green Energy Philippines, Inc. Landfill Methane
Recovery and Power Generation Facility

RDF Production Facilities



300 MT/day Refused Derive Fuel Generation Facility
FDR-Integrated Resource Recovery Management, Inc



350 MT/day Refuse-Derived Fuel (RDF) Processing Plant Project
Green Alternative Technology Specialist, Inc.

Biogas Power Plants



624-kW FDR-IRRMI Dry Anaerobic Digestion Biogas Power Plant (own-use)



Way Forward



Finalize NREP 2020-2040



Implement Omnibus Guidelines and Procedures Governing the Award and Administration of RESCs consistent with EVOSS / ARTA / EO 30



Enforce RE Policy Mechanisms and Planned Strategies and Programs

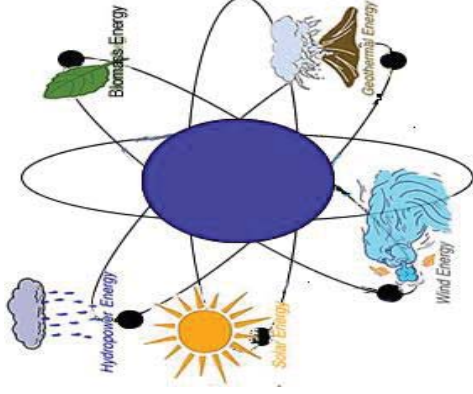
- RPS Rules for On-Grid and Off-Grid / RE Market / GEOP
- Enhanced Net Metering / Competitive RE Zones / GETP / Localized RE Planning
- OCSP



Develop Studies on Waste-To-Energy (WtE) and Off-Grid RE Development Plan

In Closing ...

Why Go For Renewable Energy?



- They are inexhaustible (unlike fossil fuels).
 - Wind, Solar, Biomass, Geothermal and Hydro, all of which occur naturally on our planet.
- They are clean energy and non-polluting.
- Reducing problems on waste
- Many forms do not emit any greenhouse gases or toxic waste in the process of producing electricity.
- Can be relied on for the long-term.
- Cost-effective and efficient.

Thank You!



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PPP CENTER'S ASSISTANCE IN STRUCTURING SOLID WASTE MANAGEMENT PPP PROJECTS



Presentation Outline

PPP's as Part of the Infrastructure Development

PPP Center: Programs and Services

Key Considerations in SWM PPP Projects



PPP Program for Infrastructure Development

0-10 POINT SOCIOECONOMIC AGENDA

Accelerated Infrastructure Development

Infrastructure spending of 7% of GDP by 2022



Financing and Implementation

Delivery Mechanisms

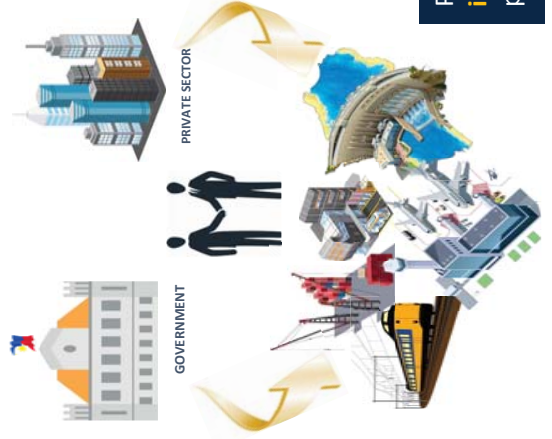
Government Financing
General appropriations, corporate funds

Government Borrowings
Domestic & foreign debt, official development assistance (ODA)

Private Sector Financing
Public-Private Partnership (PPP)



PPP Concept



PPP is a **contractual arrangement** between the government and a private sector entity targeted towards **financing, designing, implementing and operating infrastructure facilities and services.**

PPP emphasizes **Value for Money** – focusing on *better service delivery, optimal risk allocation, reduced costs,* and possible generation of additional revenues for the government.

PPP is geared for both sectors to gain **improved efficiency** in project implementation processes **to deliver services to the public.**



Eligible Types of PPP Projects



- Highways/Roads
 - Railroads & Railways
 - Ports
 - Airports
 - Transport Systems
 - Power Generation
 - Telecommunications
 - ICT Systems/Facilities
 - Agriculture
 - Canals, Dams, Irrigation
 - Water Supply
 - Land Reclamation
- Solid Waste Management
 - Tourism Facilities
 - Education
 - Health Facilities
 - Industrial & Tourism Estates
 - Markets, Warehouses, Slaughterhouses
 - Housing, Government Buildings
 - Climate change mitigation/adaptation infrastructure projects
 - Other Infrastructure/ Development Projects



PPP Center - Mandates



The PPP Center facilitates the implementation of the country's PPP Program. It serves as a central coordinating and monitoring agency for all PPP projects in the country.

Projects, Policy & Capacity



Presentation Outline

PPPs as Part of the Infrastructure Development

PPP Center: Programs and Services

Key Considerations in SWM PPP Projects

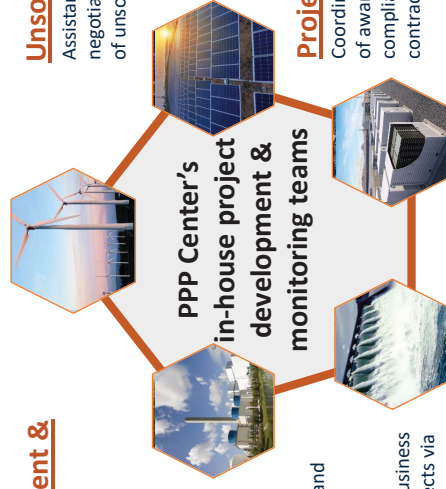


PPP Center - Support in Projects

Project Development & Procurement

Assistance in the review and/or development of feasibility studies and tender documents; and advisory services from project approval to procurement.

- **PDMF** Project Development and Monitoring Facility
- **Business Case** In-house conduct of business case for selected projects via Technical Assistance Agreement (TAA)



Unsolicited Proposals

Assistance in the evaluation, negotiation and management of unsolicited proposals

Project Monitoring

Coordination and monitoring of awarded projects to ensure compliance with the contractually agreed terms



PPP Center - Support in Projects via PDMF

The **Project Development and Monitoring Facility (PDMF)** is a **USD 104.5 million revolving fund** managed by the PPP Center to enhance the investment environment for PPP and to develop a robust pipeline of viable and well-prepared PPP infrastructure projects



Project Preparation & Transaction Advisory

- Solicited mode**
- Conduct of feasibility study
 - Project structuring
 - Preparation of tender documents
 - Management of bid process
 - Assistance until financial close
- Unsolicited mode**
- Evaluation and negotiation of unsolicited proposals
 - Assistance in management of Swiss Challenge until financial close

Probity Advisory

- Examination of bid documents
- Assessment of and advisory on probity issues

Independent Consultant

- Monitoring of construction and/or O&M
- Certification of compliance with technical requirements and design

PDMF - Support for Local PPP Projects

Additional funding to PDMF

PDMF Committee for Local PPP Projects

Local PDMF Panel



Additional **USD 2.5M** foreign counterpart funding to support local PPP projects

NEDA Undersecretary and Assistant Secretary for Regional Development and NEDA Regional Directors as representatives to the PDMF Committee to provide **local perspective** in the evaluation of projects for funding support

Access to a **pool of experts** specializing in the development of local PPP projects, particularly resilient and environmentally sustainable projects, and climate change adaptation and disaster risk management projects



PPP Center - Support in Capacity Building



Conduct of **trainings and seminars** depending on the development needs and requirements of the implementing agency

- Introduction to PPP concepts or PPP 101
- Concept note formulation
- Project prioritization
- Management of unsolicited proposals
- Financial and economic analysis of PPP projects



PPP Center - Support in Policies



Presentation Outline

PPPs as Part of the Infrastructure Development

PPP Center: Programs and Services

Key Considerations in SWM PPP Projects

Key Considerations in SWM PPP Projects

- SWM Solution**
- Reduction of the volume of waste by waste segregation, recycling, and composting;
 - Sanitary Landfill;
 - Waste-to-Energy

- Service Delivery Model**
- Public-Private Partnership
 - Joint Venture
 - Traditional Procurement

- Project Scope & Structure**
- Scale of the project
 - Risk allocation
 - SWM hierarchy (waste reduction, recycling and reuse)
 - Bundled vs. unbundled value chain with respect to collection, transportation, storage, treatment, and disposal

Key Considerations in SWM PPP Projects

- Value for Money**
- Economic benefits (cost savings, direct and indirect benefits)
 - Competition during tender or procurement process

- Legal Framework**
- BOT Law
 - Joint Venture
 - Local PPP Code/Ordinance

- Procurement Mode**
- Solicited: government can set terms based on its priorities but has to spend time and resources on project development
 - Unsolicited: government can save on project development cost but has to spend time and resources in evaluation and negotiation, and deal with information asymmetry

Key Considerations in SWM PPP Projects

- Commercial Considerations**
- Project site
 - WTE technologies
 - KPIs and performance standards
 - Environmental and social factors

- Technical Considerations**
- Investment requirements
 - Repayment scheme to the private sector (sale of power, tipping fee, etc.)
 - Length of contractual agreement
 - Requirement of government subsidies or contractual guarantees
 - Renewable energy incentives

- Power Component**
- Sale of power
 - Relevant permits, approvals and procurement processes
 - Power Supply Agreement



For further information, please visit:
www.ppp.gov.ph



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Public-private-partnership-
Center-of-the-philippines



ppppinas



Quezon City Integrated Solid Waste Management Facility Project

WASTE-TO-ENERGY PROJECT IN QUEZON CITY

PPP-SC and TWG-WTE

1. City Mayor
2. Majority Floor Leader, QC Council
3. City Administrator (Chairman, PPP-SC)
4. City Attorney (PPP-SC Secretariat)
5. City Planning and Development Officer
6. City Treasurer
7. Representative from QC City Development Council

PPP Selection Committee (PPP-SC)

TWG Secretariat

Technical Working Group (TWG)

Technical

1. EPWMD (Chair, TWG)
2. Head, SWMO-MMDA
3. DENR-EMB
4. NSWMC
5. DOSI-ITDO

Financial & Commercial

1. Representative, City Treasurer's Office
2. Representative, QC City Development Council
3. Representative, City Planning and Development Office

Legal

1. Co-Chair, TWG
2. Representative, Office of the Majority Floor Leader
3. Representative, City Legal Department
4. Certified PPP Expert

Third Party Consultants:

1. **PPP Center – Transaction Adviser** with support from **ADB Consultants:**
 - Cruz Marcelo Tenefancia - Legal Adviser
 - Mr. Prakash Rao & Mr. Vaughn Montes - Financial Advisers
 - Mr. Manuel Omedas - Technical Adviser
 - Ms. Pura Pedrosa - Environmental Expert
2. **KPMG – Independent Valuator**
3. **JICA** as resource agency

Unsolicited PPP Process

Stage One

Stage Two

Stage Three

Unsolicited PPP Process

Stage One

UNSOLICITED PROPOSAL

1. Proponent submits Feasibility or Project Study to the QC-PPP-SC
2. PPP-SC conducts initial evaluation and determine eligibility of the Proponent
3. If complete, PPP-SC recommends issuance of Certificate of Acceptance/Non-Acceptance to the City Mayor
 - Certificate of Acceptance should indicate the confirmation of the Proponent as "Original Proponent"

Unsolicited PPP Process

Stage Two

DETAILED NEGOTIATIONS

1. The Parties (Original Proponent and the PPP-SC) shall negotiate and agree on the **Terms** and **Conditions** of the PPP Project concerning its technical and financial aspects
 - Focus on project scope, implementation arrangements, Reasonable Rate of Return and other parameters, T&C of Draft Contract
2. If Negotiations is successful, the PPP-SC and authorized signatory of the Original Proponent shall issue a Signed Certification (Joint Certification) of Detailed Successful Negotiations

Unsolicited PPP Process

Stage Three

SWISS CHALLENGE PROPER

1. PPP-SC shall prepare the Tender Documents and shall be approved by the City Mayor before the publication of the Invitation for Comparative Proposals
2. A Pre-Bid Conference shall be conducted
3. Comparative Proposals by Challengers shall be evaluated in Three Stages: Qualification Documents, Technical Proposal, Financial Proposal
4. If the City, determines that an offer by a Challenger is superior than that of the Original Proponent, the Original Proponent shall be given the Right to match such superior/advantageous offer
5. Upon determination of winner in the Comparative Proposals, the PPP-SC shall recommend the issuance of a Notice of Award to the winner of the Swiss Challenge Process

DAVAO CITY WASTE-TO-ENERGY PROJECT



DAVAO CITY, PHILIPPINES

TOTAL LAND AREA : 244,000 hectares

Built-up : 15.06%

Agricultural : 46.38%

Forest & Conservation : 38.56%



DAVAO CITY, PHILIPPINES

DAVAO PROFILE

Land Area : 244,000 hectares

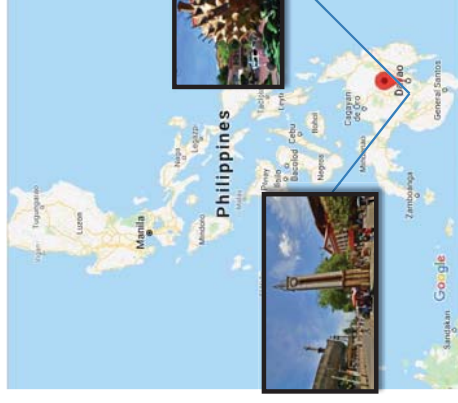
Population : 1,745,667 (2018 data)

Economic : Highly Urbanized City

Climate : Mild Tropical and outside of Typhoon Belt

Location : Lying in the grid squares of 6 58' to 7 34' N latitude, and 125 14' to 125 40' E longitude

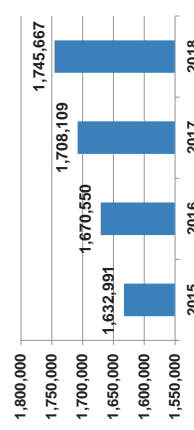
Home to 11 Ethnolinguistic Tribes



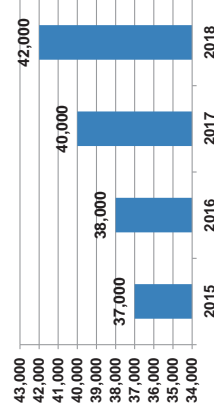
DAVAO CITY, PHILIPPINES

DAVAO PROFILE

Increase in population Projected based on 2015 Census

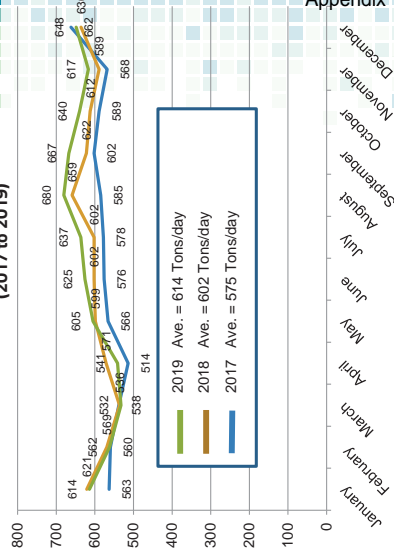


Increase in business establishments (2015 - 2018)



SOLID WASTE PROFILE

SOLID WASTE DISPOSAL AT SANITARY LANDFILL (TONS PER DAY) (2017 to 2019)



Appendix 1

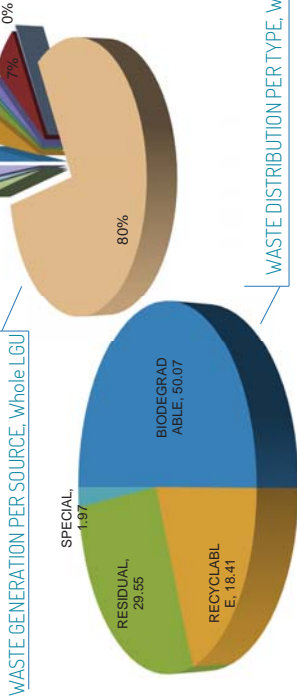


DAVAO CITY, PHILIPPINES

SOLID WASTE PROFILE

WASTE ANALYSIS & CHARACTERIZATION STUDY, 2017

- Average per capita generation = 0.58 kg/day
- 2018 Average waste generation, entire LGU (182 brgy's) = 1,012 tons per day
- 2018 Ave. Waste generation, col. Area (112 brgy's) = 853 tons per day
- 2018 Ave. Disposal in the SLF = 602 tons per day
- 2018 Diverted wastes (junkshops, composting and etc.) = 251 tons per day



5

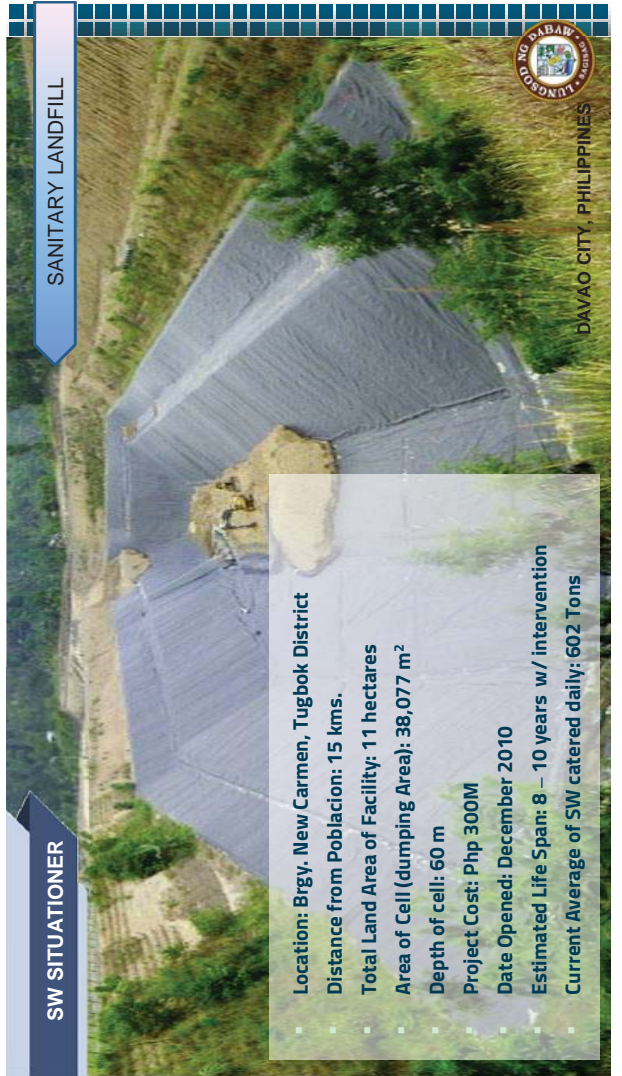
Projected Waste Generation of Residential and Non-Residential Sources in Collection Area (in kg per day)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Total Waste Generation at Collection Area	834,767	853,121	892,162	931,018	987,948	1,023,310	1,085,074	1,106,152	1,163,345	1,185,099	1,206,852
Total Biodegradable	50%	417,383	426,561	446,081	465,509	493,974	542,537	553,076	581,672	592,549	603,426
Total Residual	29%	242,082	247,405	258,727	269,995	286,505	314,671	320,784	337,370	343,679	349,987
Total Recyclable	19%	158,606	162,093	169,511	176,893	187,710	206,164	210,169	221,036	225,169	229,302
Total Special Waste	2%	16,695	17,062	17,843	18,620	19,759	20,466	21,701	22,123	23,267	24,137

6

DAVAO CITY, PHILIPPINES

SW SITUATIONER



- Location: Brgy. New Carmen, Tugbok District
- Distance from Poblacion: 15 kms.
- Total Land Area of Facility: 11 hectares
- Area of Cell (dumping Area): 38,077 m²
- Depth of cell: 60 m
- Project Cost: Php 300M
- Date Opened: December 2010
- Estimated Life Span: 8 – 10 years w/ intervention
- Current Average of SW catered daily: 602 Tons

DAVAO CITY, PHILIPPINES

SW SITUATIONER

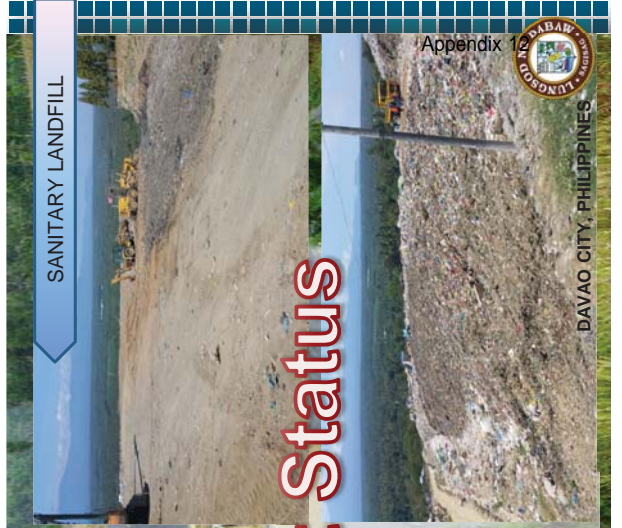


Current Status

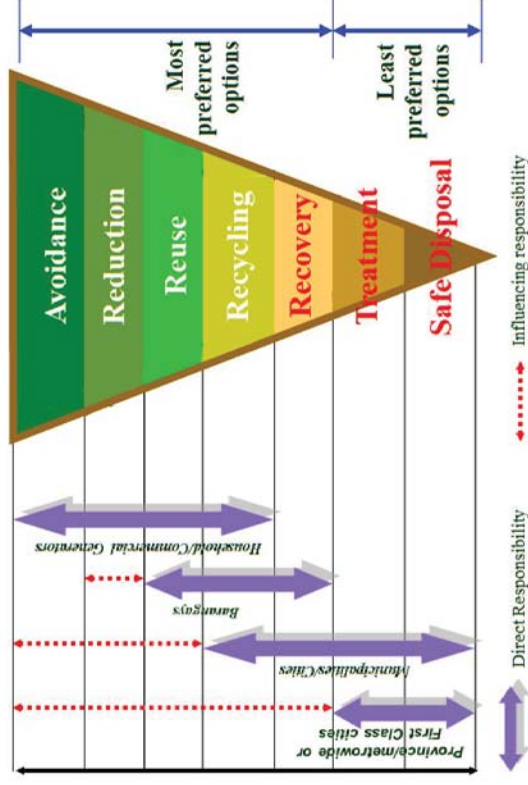
Appendix 1

DAVAO CITY, PHILIPPINES

SANITARY LANDFILL



SANITARY LANDFILL



DAVAO CITY 10-YEAR SOLID WASTE MGT. PLAN (2016-2027)

VISION: A healthy and safe environment in Davao City is sustained for present and succeeding generations through reduction of waste generation and increased resource recovery including ENERGY recovery.

Overall policy of RA 9003 based on waste management hierarchy

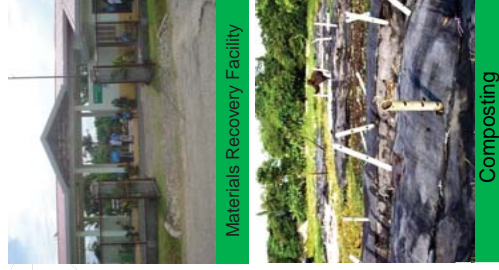
MAXIMIZATION OF RESOURCES

ROLES & RESPONSIBILITIES

- Section 23. Roles and Responsibilities of Barangays.**
- Section 28. Materials Recovery Facility (MRF) and Buy-back Centers in barangays.**
- Section 24. Composting by Barangays.**
- Section 25. Composting by Households.**
- Section 26. Composting by Establishments.**

CITY ORDINANCE 361-10

"Davao City Ecological Solid Waste Management Ordinance"



WASTE MINIMIZATION

Section 34.

AWARENESS CAMPAIGNS



Special Collection:
P5,000 per truckload
Tipping Fee:
P3.00 per kilo
Per Ordinance No. 0291-17 or
"The 2017 Tax, Revenue Code
of Davao City"

Section 21.

**IMPOSITION OF SPECIAL COLLECTION
AND TIPPING FEES FOR LARGE
GENERATORS OF WASTES
(3 cu.m. or more)**



**CITY ORDINANCE
0361-10**

**"Davao City Ecological
Solid Waste Management
Ordinance"**



Section 41.

**INCENTIVES AND REWARDS
SYSTEM**



DAVAO CITY, PHILIPPINES

SEGREGATION

**ESSENTIAL COMPONENTS FOR
SUSTAINABLE WASTE
SEGREGATION**



**DEMAND
For
Recyclables**

**SWM
Facilities**

**Segregated
Collection**

POLICIES

**Segregation
@ Source**



Market Value

Recycling Facilities, MRF,
Composting, SLF, WTE

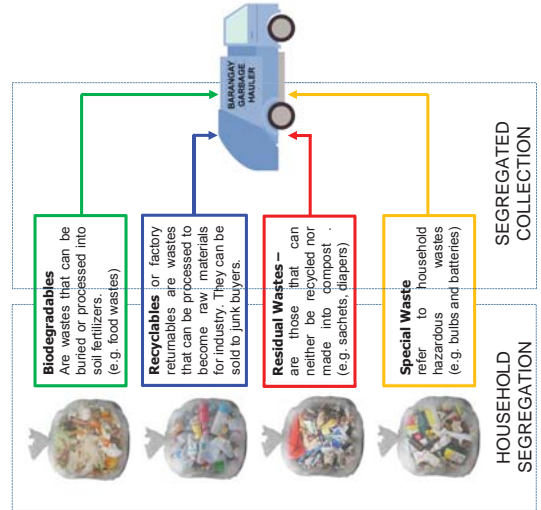
Use of separate collection schedules
and/or separate Vehicles

RA 9003 and C.O 0361-10

Per section 10 of C.O. 0361-10

DAVAO CITY, PHILIPPINES

Overview of Proposed Barangay Segregated Collection



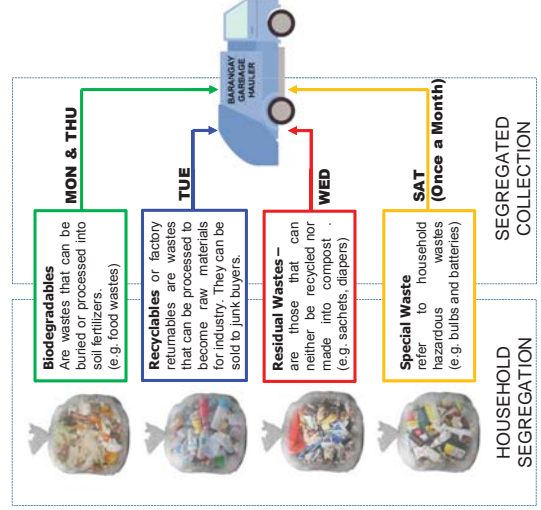
ACTION PLAN

To utilize Barangay-administered Compactor trucks to be procured by the city and administered by the barangays to facilitate accountability and ownership.

Interior areas including subdivisions, puroks and sitios will be collected by the barangay through per household or sidewalk collection. Collection Pts can only be established when necessary. (i.e. Pathways)

Major thoroughfares, national roads, major commercial areas will be collected by the City through sidewalk collection. No collection pts on these areas.

Overview of Proposed Barangay Segregated Collection

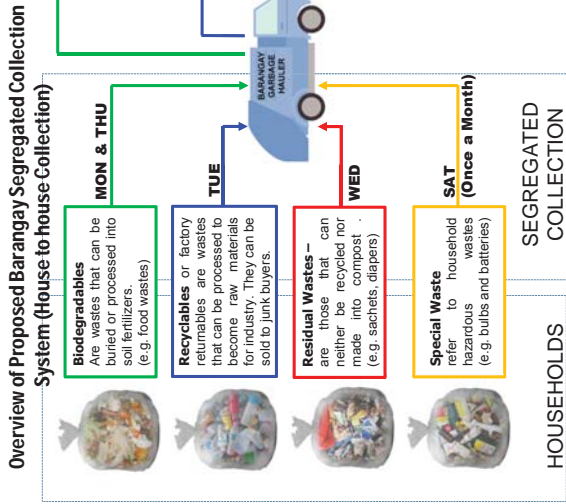


ACTION PLAN

Collection will utilize the 6-wheeler compactor trucks (5-Tonner)



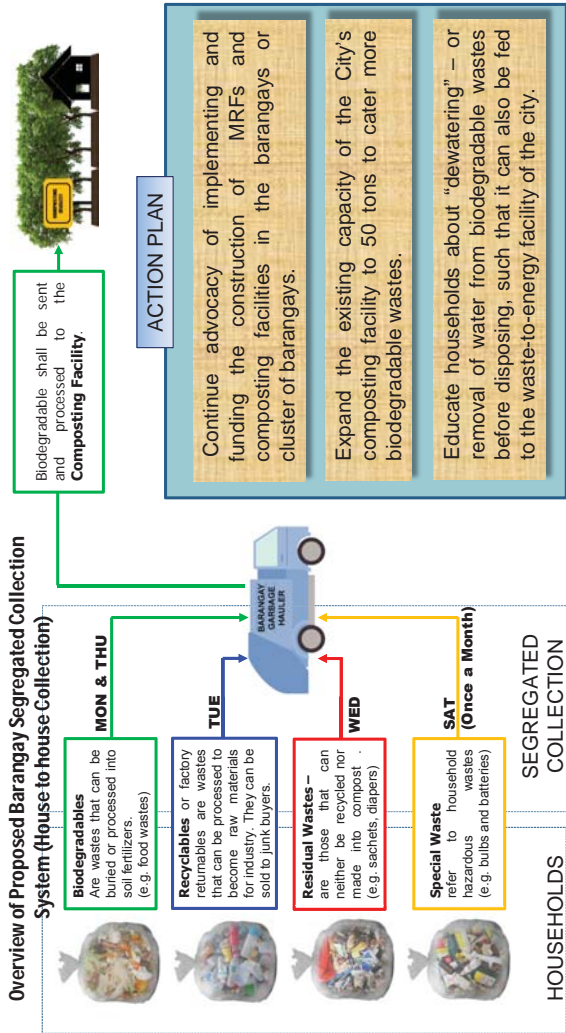
Using these vehicles, barangays should establish their collection schemes and schedules for each type of waste.



ACTION PLAN

Continue advocacy of implementing and funding the construction of MRFs and composting facilities in the barangays or cluster of barangays. Establish Central MRF.

Promote private recycling facilities. Recommend an ordinance on "extended producer responsibility" to impose accountability on manufacturers to retrieve some of the wastes of their product as part of their corporate social responsibility (Concept of circular economy).

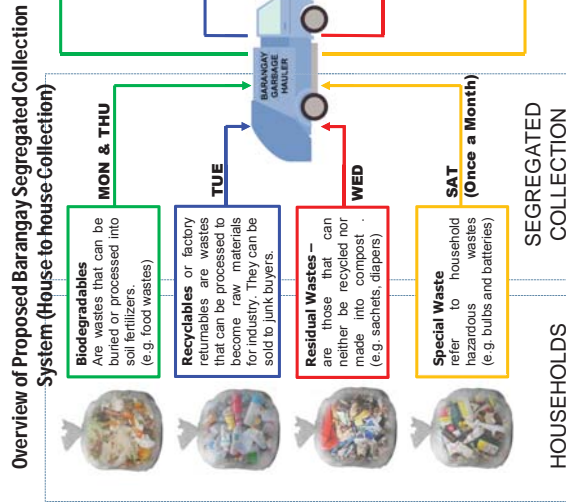


ACTION PLAN

Continue advocacy of implementing and funding the construction of MRFs and composting facilities in the barangays or cluster of barangays.

Expand the existing capacity of the City's composting facility to 50 tons to cater more biodegradable wastes.

Educate households about "dewatering" – or removal of water from biodegradable wastes before disposing, such that it can also be fed to the waste-to-energy facility of the city.



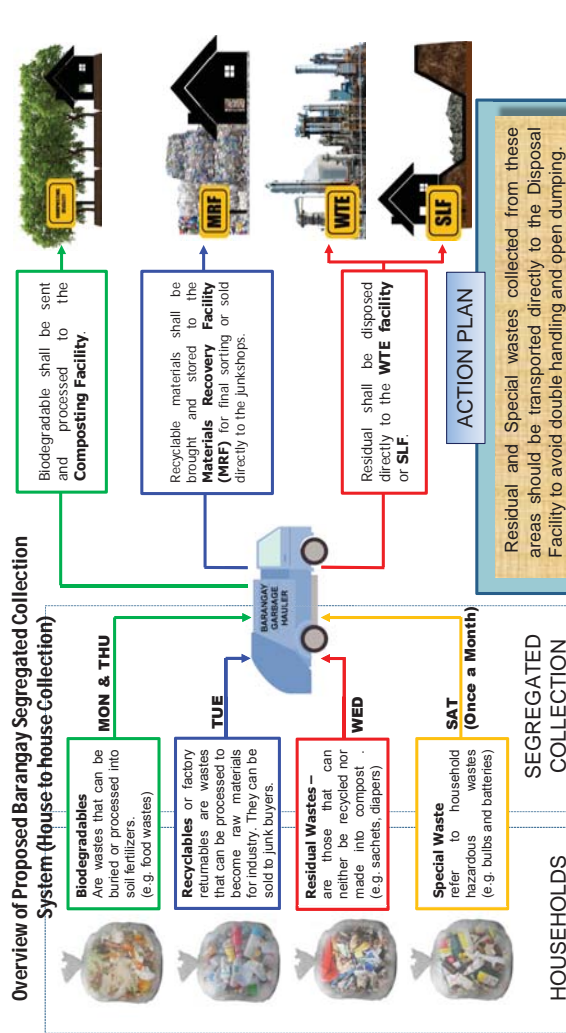
ACTION PLAN

Construct a Household hazardous waste Containment/Treatment facility and establish a collection system for special wastes in the city and in barangays.

5. Hazardous waste treatment (final case)
Batteries, condensers and others

encapsulating special wastes (bulbs, batteries, broken thermometers and etc.) in a used plastic drum covered with cement before disposal to the landfill.

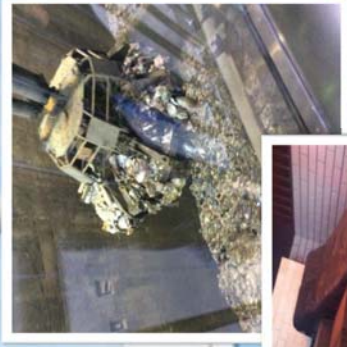
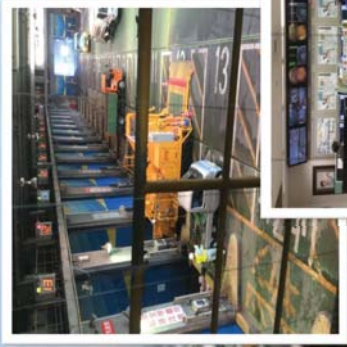
Special wastes shall be disposed directly to the **City's Central Storage Facility for Hazardous Wastes**.



ACTION PLAN

Residual and Special wastes collected from these areas should be transported directly to the Disposal Facility to avoid double handling and open dumping.

Project for the Construction of Waste-to-Energy Facilities in Davao City



OUTLINE OF THE PROPOSED PROJECT

- Waste-to-Energy (WtE) - refers to the process of converting wastes with various technologies, usually the conversion of non-recyclable waste materials into useable heat, electricity, or fuel through a variety of processes.
- It is a widely used technology worldwide esp. with developed countries.
- Purpose of the Project

To minimize the volume of solid waste disposed in the landfill (90% reduction rate) and mitigate environmental load by waste disposal through introduction of Waste-to-Energy Technology which simultaneously realizes reduction of waste volume and energy utilization.

OUTLINE OF THE PROPOSED PROJECT

- Expected benefits in introducing WtE to the City
 - Short-term benefits
 - Extending the life of landfill; and
 - Improving sanitary and environment condition
 - Medium and long-term benefits
 - Reduction of greenhouse gases (CO₂ and CH₄) in comparison with the current landfill emission;
 - Expansion of business opportunities and creating new jobs through the WtE; and
 - Utilization of additional 11 megawatt of power derived from WtE.

“Project for the Construction of Waste-to-Energy Facilities in Davao City”

BACKGROUND:

- 2015 – Japan International Cooperation Agency (JICA) started the “Collaboration Program with the Private Sector for Disseminating Japanese Technology”
- Feasibility Study on Waste-to-Energy



“Project for the Construction of Waste-to-Energy Facilities in Davao City”

BACKGROUND:



Nov. 17, 2016

- Signing of Green Sister City Agreement by both parties on November 17, 2016 and November 28, 2017 in Davao City and Kitakyushu City respectively.

2016 – Viability of Waste-to-Energy Facility in the City was concluded per JICA study



Nov. 28, 2017

DAVAO CITY, PHILIPPINES



“Project for the Construction of Waste-to-Energy Facilities in Davao City”

BACKGROUND:



Nov, 2017

2017 – Davao City submitted its intention to seek Japanese Assistance (Financial & Technical) for establishment of WtE.

- Learning visits of Davao City Government to City of Kitakyushu on best practices of solid waste mgt.



May, 2017

2018 – Exchange of Notes between Philippines and Japan was signed and executed, whereby a grant of Php 2.5 Billion was made for the Project,



March 20, 2018

DAVAO CITY, PHILIPPINES



“Project for the Construction of Waste-to-Energy Facilities in Davao City”

MILESTONES IN THE IMPLEMENTATION OF THE PROJECT

- ✓ Adopting Waste-to-Energy (WtE) as part of City's 10-yr. Solid Waste Management Plan (2018 – 2027).
- ✓ Creation of “Waste-to-Energy – Project Management Team” through Executive Order No. 18. (City Admin., CEO, City Legal Office, CPDO, City Budget Office, CENRO)
- ✓ Approval of Local Ordinance adopting the Japanese Waste-to-Energy Technology as part of the Solid Waste Management Initiatives of the City
- ✓ Provision of WtE Facility Site.
- ✓ Signing of MOA between the Dept't of Finance and Crown Agents – a commissioned procurement agent by the Government of Japan/Ministry of Foreign Affairs, a Japanese company, to oversee the implementation of the project, in partnership with Phil. Govt. entities.

PROPOSED DAVAO CITY WASTE-TO-ENERGY FACILITY

- Capacity: 600 Tons/day
- Power Generation: 11.1 MW



Kogasaki Waste-to-Energy Plant in Kitakyushu

DAVAO CITY, PHILIPPINES



“Project for the Construction of Waste-to-Energy Facilities in Davao City”



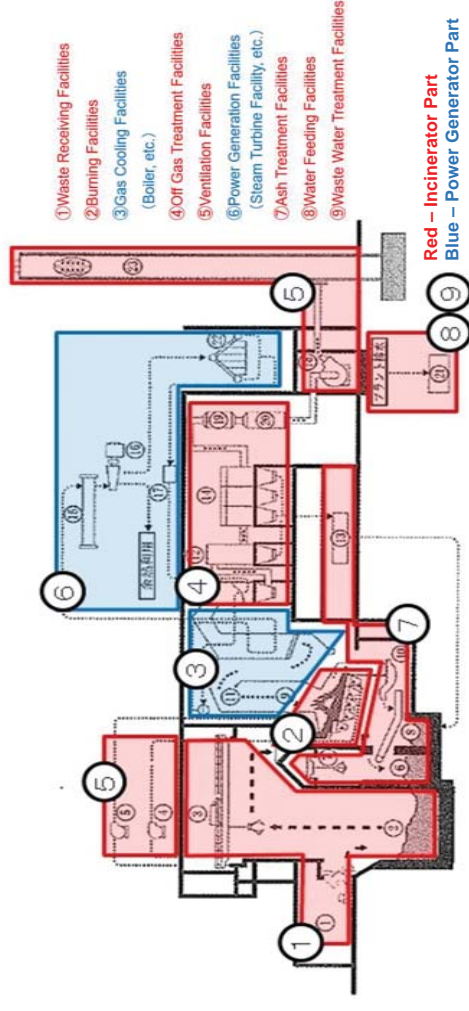
Appendix 1

DAVAO CITY, PHILIPPINES



PROPOSED PROJECT SCHEME (OVERVIEW):

- Php 2.5 Billion will fund **ONLY** the **INCINERATOR PART** of the WTE Facility
- The same being a grant, the facility will be owned by the Philippine government or Davao City.
 - (Note: The SPC pays a nominal fee/rent to Davao City)
- A Special Purpose Company (SPC) shall invest on the **POWER GENERATOR PART** of the facility
- The design, construction, operation, and maintenance (estimated at 20 years) of the **ENTIRE WTE Facility (BOTH INCINERATOR and POWER GENERATOR)** will be done by the SPC.
 - Note: Must utilize Japanese Technology



- Davao City provides for the land/site, supplies solid waste into facility and pays an agreed **TIPPING FEE** (currently at Php 600.00/ton), which constitutes as income of the **SPC**
- **Note: Actual operations of a WTE will only be an estimate of 320 days in a year, 45 days of no operation is for periodic shutdown or preventive maintenance, and other related works)**
- Davao City takes care/spends for garbage/waste hauling to the facility as well as hauling out of the ash from the facility to a sanitary landfill
 - **Note: Between 5% to 10% of the 600 tons waste/day will be ash, or 30 to 60 tons**
- Davao City must maintain a heating/calorific value of its waste at 1,800 kcal/kg. JICA study data shows Davao had an average of 1,938 kcal/kg

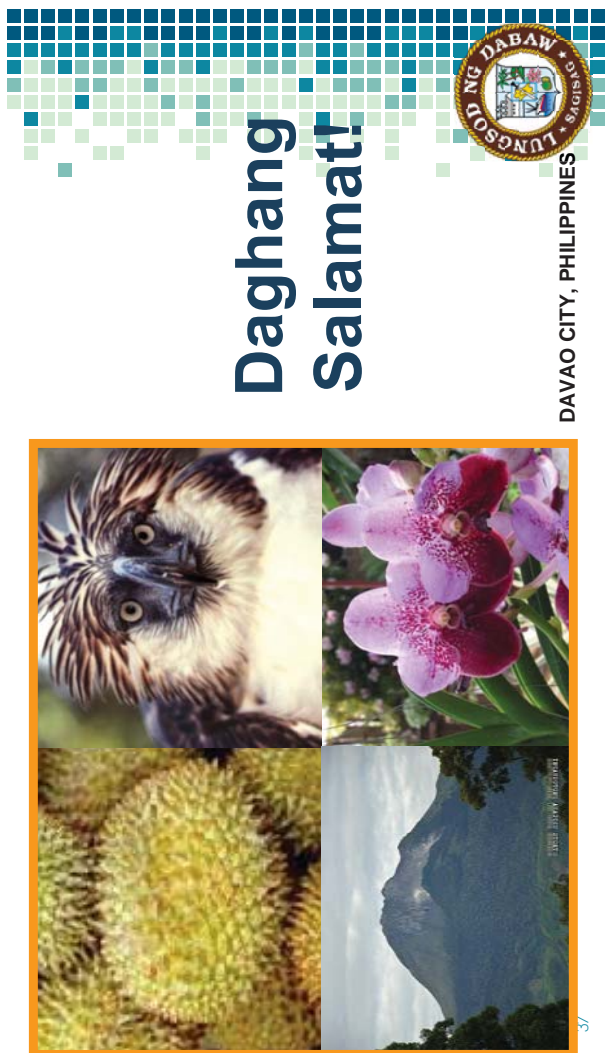
- Energy generated is supplied/sold to the grid or electricity provider/s, which constitutes as income of the SPC

Note: The current proposal necessitates that the Feed-In Tariff (FIT) Rate (Php 6.63/kWh) for Biomass is applied. If FIT is not applied, tipping fee may increase
Update: DOE has informed that the said preferential rate will not be granted as it will expire by the end of 2019.

- Government of Japan/Ministry of Foreign Affairs commissioned a procurement agent, Crown Agents, a Japanese company, to oversee the implementation of the project, in partnership with Phil. Govt. entities (i.e. DOF and Davao;)
 - **Update: The City is awaiting for the confirmatory FS conducted by consultants hired by Crown Agents**

- In sum two (2) biddings will be made:

- 1. Selection of Legal, financial and technical consultants, and
- 2. For the SPC who will be responsible for the design, construction, operation, and maintenance of the WTE Facility



SUMMARY OF METHODS AND SAMPLE HANDLING PROCEDURES USED BY THE EMB – CENTRAL OFFICE LABORATORY FOR DIOXINS AND FURANS ANALYSIS

ENVIRONMENTAL MANAGEMENT BUREAU (EMB)
ENVIRONMENTAL RESEARCH AND LABORATORY SERVICES DIVISION
26 February 2020

What are Dioxins?

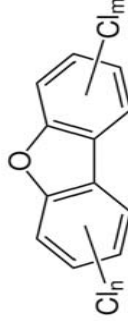
Dioxins is the term used for the family of structurally and chemically related *polychlorinated dibenzo para dioxins* (PCDDs) and *polychlorinated dibenzofurans* (PCDFs).

Polychlorinated Dibenzo-p-dioxins (PCDDs)



75 species

Polychlorinated Dibenzofurans (PCDFs)



135 species

What are Dioxins?

- Certain dioxin-like polychlorinated biphenyls (PCBs) with similar toxic properties are also included under the term “dioxins”.

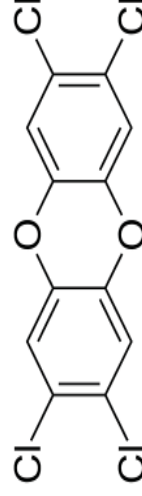
Co-planar Polychlorinated Biphenyls (co-planar PCBs or dioxin-like PCBs)



12 species

Toxicity of Dioxins

- The toxicity varies substantially among the different PCDD/PCDF congeners.
- It is generally accepted that only 17 out of the 210 PCDD/F congeners are toxic.
- The most studied and most toxic of all dioxins is **2,3,7,8-Tetrachlorodibenzo-p-dioxin.**



Toxicity of Dioxins

To facilitate risk assessment and regulatory control of exposure to Dioxins, the concept of toxic equivalency factors (TEFs) has been developed.

TEFs are estimates of the toxicity of dioxins relative to the toxicity of 2,3,7,8-TCDD which is assigned a TEF of 1.

Reference: I-TEF – "Interim procedures for estimating risks associated with exposures to mixtures of PCDD/Fs" + update USEPA publication EPA/625/3-89/016(1989)

Dioxin Compounds	International (I – TEF)
2,3,7,8-TCDD	1.0
1,2,3,7,8-PeCDD	0.5
1,2,3,4,7,8-HxCDD	0.1
1,2,3,6,7,8-HxCDD	0.1
1,2,3,7,8,9-HxCDD	0.1
1,2,3,4,6,7,8-HpCDD	0.01
OCDD	0.001
2,3,7,8-TCDF	0.1
1,2,3,7,8-PeCDF	0.05
2,3,4,7,8-PeCDF	0.5
1,2,3,6,7,8-HxCDF	0.1
1,2,3,7,8,9-HxCDF	0.1
2,3,4,6,7,8-HxCDF	0.1
1,2,3,4,6,7,8-HpCDF	0.1
1,2,3,4,7,8,9-HpCDF	0.01
OCDF	0.001

Toxicity of Dioxins

Sample of Toxicity Equivalents (TEQ) Calculation

The individual concentrations are multiplied by their corresponding TEFs and then summed together to give a Toxic Equivalency (TEQ).

Dioxin Compounds	Mass Concentration (ng)	International (I – TEF)	TEQ Concentration (ng TEQ)
2,3,7,8-TCDD	2	1.0	2.0
1,2,3,4,7,8-HxCDD	35	0.1	3.5
OCDF	12	0.001	0.012
TOTAL			5.512

Toxicity of Dioxins

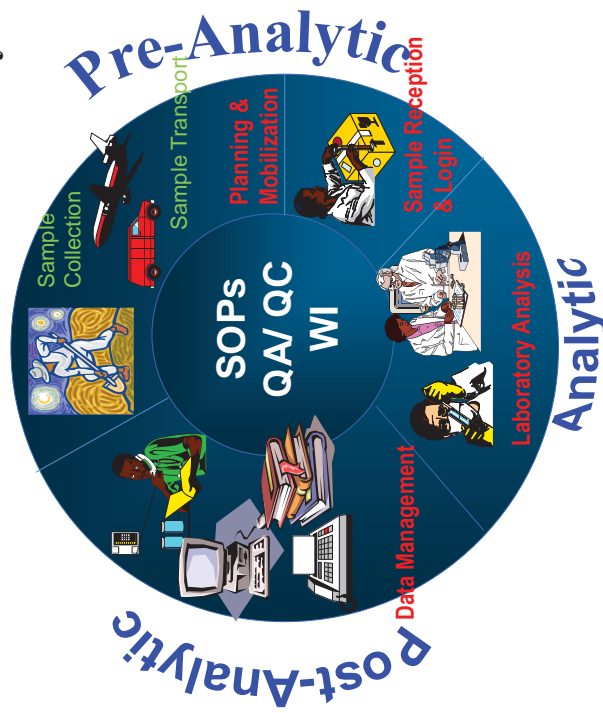
Toxicity of Dioxins is expressed as **Toxic Equivalents (TEQs)**

TEQs are calculated values that allow us to compare the toxicity of different combinations of dioxins and dioxin-like compounds.

A TEQ is calculated by multiplying the amounts of each dioxin compound by its corresponding TEF and then summing the results.

$$TEQ = \sum (PCDD_i \times TEF_i) + \sum (PCDF_i \times TEF_i)$$

EMB Central Office Laboratory



Pre-Analytic

Provide information to clients which is critical to successful project completion

- details of the lab's sample requirements

- weights and volumes
- containers
- preservatives
- holding time




EMB Central Office Laboratory
DENR Compound, Vissayas Avenue, Diliiman, Quezon City
Tel. Nos. (632) 426-4332; 426-4340

DIOXINS SAMPLE HANDLING GUIDE

The results of any test procedure is fully dependent on the condition of the sample on which it is performed. The primary objective in sampling is to collect a portion of material in a small enough quantity to be conveniently transported to and handled in the laboratory, while still accurately representing the material being tested.

This sampling guide presents considerations and suggestions. This material should be further supplemented by a proper review of relevant reference materials and by direct contact with EMB laboratory technical personnel.

The EMB Laboratory provides the sampling medium required in air analysis and the sample container required in other analyses. Field samplers are advised to coordinate with the EMB laboratory personnel at least seven days before sampling.

(a) Adsorbent resins (e.g. XAD2) and Polyurethane foam (PUF) plugs should be certified clean by the EMB laboratory. Filters (e.g. glass fiber, quartz fiber) should be cleaned and conditioned by the EMB laboratory prior to use.

Sample bottles, new or used, must be washed with detergent and water, and solvent rinsed. Amber glass containers with solvent-rinsed Teflon lined caps should be used for liquid, and solid samples.

(b) After sampling, filters should be placed in the original packaging used by EMB Lab. Adsorbent modules must be tightly capped, labeled, covered with solvent-rinsed aluminum foil and stored in ice at < 4°C but not frozen.

Solid samples should be kept in the dark at < 4°C from the time of collection until receipt at the laboratory.

Fish and tissue samples collected in the field should be wrapped in aluminum foil, and must be maintained at temperature less than 4°C from the time of collection until receipt at the laboratory.

(c) Seal sample containers well.
(d) Label all sample containers clearly with non-removable markings.

(e) Complete Chain of Custody Form with all information requested.

(f) Pack the samples carefully in a transport cooler or box, to avoid sample loss due to leakage or breakage, and transport the samples to the laboratory without delay.

References: USEPA Methods 1613, 231/23A, TO-9A.

SUMMARY OF SAMPLE HANDLING REQUIREMENTS

Sample Type	Container Type*	Minimum Sample Size	Preservation	Holding Time
Stationary source emission				
- XAD2 cartridge tube	Capped with aluminum foil, Sealed with Teflon & covered with aluminum foil	n/a	Less than 4°C not frozen	30 days
- Glass fiber filter	Petri dish sealed with Teflon & covered with aluminum foil	n/a	Less than 4°C not frozen	30 days
- Solvent rinses	Amber glass jar	n/a	Less than 4°C not frozen	30 days
Ambient air				
- PUF cartridge	Capped with Teflon end caps, covered with aluminum foil & placed in aluminum or stainless steel shipping container	n/a	Less than 4°C not frozen	7 days
- quartz fiber filter	Petri dish or aluminum foil	n/a	Less than 4°C not frozen	7 days
Aqueous	Amber glass bottle	1000 mL	Less than 4°C not frozen	7 days
Sediments/ Soil	Amber glass jar	100 grams	0°C to 4°C	7 days
Fish tissue samples	Amber glass jar	500 grams	< -10°C	1 year
			0°C to 4°C	7 days
Whole fish	Wrapped in aluminum foil	1 kilogram	< -10°C	1 year
			0°C to 4°C	7 days

*All materials used as sample container must be cleaned according to the requirements of the method.

Pre-Analytic

- Provide supplies - pre-cleaned sample containers, preservation reagents



DIOXINS IN AMBIENT AIR:

- ✓ Adsorbent Cartridges (PUF) spiked with surrogates (isotopically labelled PCDDs & PCDFs solutions) ~ for field blank; sample/s
- ✓ Quartz fiber filters in petri dish sealed with Teflon tape
- ✓ Transportation cooler
- ✓ Chain of Custody form



Pre-Analytic

DIOXINS IN SOURCE EMISSIONS:

- ✓ Adsorbent Cartridge (XAD2) spiked with surrogates(isotopically labelled PCDDs & PCDFs solutions) ~ for field blank; sample/s
- ✓ Glass fiber filters in petri dish sealed with Teflon tape
- ✓ Cleaned, solvent rinsed Amber glass bottles
- ✓ Wash bottles with solvents (Acetone, Dichloromethane, Toluene)
- ✓ Transportation Cooler
- ✓ Chain of Custody



Pre-Analytic

DIOXINS IN AQUEOUS SAMPLES:

- ✓ Cleaned, solvent rinsed Amber glass bottles (1L) with fluoropolymer caps or aluminum covered caps
- ✓ Sulfuric acid solution and Sodium hydroxide solution (for adjustment of sample pH to 7-9)
- ✓ Transportation Cooler (samples must be maintained at 0-4°C)
- ✓ Chain of Custody

Pre-Analytic

DIOXINS IN SOILS AND SEDIMENTS:

- ✓ Cleaned, solvent rinsed amber wide-mouthed jars (250mL) with fluoropolymer caps or aluminum covered caps
- ✓ Transportation Cooler (samples must be maintained at 0-4°C)
- ✓ Chain of Custody



Pre-Analytic

DIOXINS IN BIOTA (e.g. FISH)

- ✓ Cleaned, solvent rinsed aluminum foil
- ✓ Transportation Cooler (samples must be maintained at 0-4°C)
- ✓ Chain of Custody



Pre-Analytic

Sample Receiving and Registration

To improve the overall quality of the analytical process, the EMB CO Laboratory must do all it can to receive appropriate, applicable, defensible samples.

Crucial step in ensuring that laboratory analysis will proceed according to plan in a timely and proficient manner.

A. Chain of custody verification

B. Physical inspection of the condition of the sample and check if the following requirements are met:

- ✓ Holding Time
- ✓ Sample volume
- ✓ Bottle or container type
- ✓ Preservative
- ✓ Sample Label



Pre-Analytic

C. Registration of samples into a master log and assigning of unique laboratory identification codes

D. Perform sample pre-handling when necessary (compositing/ preservation)

E. Store samples appropriately

Analytical Procedures

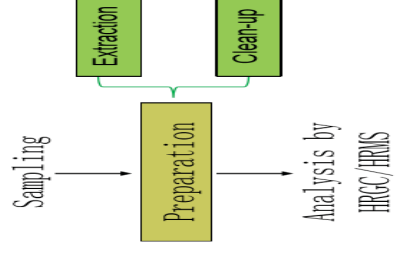
Dioxins Analytical Method References

- **EPA Method 23:** Determination of Polychlorinated Dibenzop-dioxins and Polychlorinated Dibenzofurans from Municipal Waste Combustors
- **EPA Compendium Method TO-9A:** Determination Of Polychlorinated, Polybrominated And Brominated/Chlorinated Dibenzop-Dioxins And Dibenzofurans in Ambient Air
- **EPA Method 1613B:** Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS in water, soil, sediment, sludge, tissue, and other sample matrices

Analytical Procedure

Dioxins Analysis generally involves:

- ❖ **Extraction** - to isolate the desired compound/s from a solid or a liquid mixture using a suitable solvent
- ❖ **Cleanup** – used to remove interferences and high boiling material that may result in errors in quantitation, false positives or false negatives, rapid deterioration of expensive capillary columns; instrument downtime caused by cleaning and rebuilding of detectors and ion sources
- ❖ **Concentration** – use to reduce extract volumes to increase analytes' signals
- ❖ **Determination by High Resolution Gas Chromatograph – High Resolution Mass Spectrometer (HRGC-HRMS)**



Extraction Techniques

1. Liquid-Liquid Extraction

A measured volume of aqueous sample (about 1L) is serially extracted with methylene chloride using a separatory funnel.



Extraction Techniques

2. Solid Phase Extraction

A measured volume of sample is extracted by passing it through the solid-phase extraction medium (disks or cartridges), which is held in an extraction device designed for vacuum filtration of the sample.

Dioxins are eluted from the solid-phase media using an appropriate solvent which is collected in a receiving vessel. The resulting solvent extract is dried using sodium sulfate and concentrated.



Extraction Techniques

3. Soxhlet Extraction

The solid sample is placed in an extraction thimble or between two plugs of glass wool, and extracted using an appropriate solvent in a Soxhlet extractor for 16 hours at 3 cycles/ hour.



Extraction Techniques

4. Automated Soxhlet Extraction

Solid samples (e.g., soil/sediment/ fly ash samples) are air dried and ground or chemically dried with anhydrous sodium sulfate.

The prepared sample is extracted using an appropriate solvent in the automated Soxhlet.



Extraction Techniques

5. Pressurized Fluid Extraction

The extraction cell containing solid samples (e.g., soil/sediment/ XAD2 emission samples) is heated to the extraction temperature, pressurized with inert gas and extracted with an appropriate solvent for 15 minutes.



Cleanup Techniques

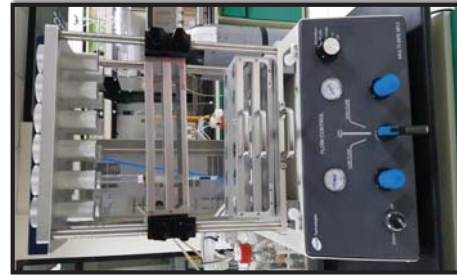
• Gel Permeation Chromatography

- for the removal of low volatility, high molecular weight interferences, such as lipids, pigments, proteins, humic acids and plasticizers.
- failure to remove these interfering compounds can shorten column lifetime and increase analytical downtime



Cleanup Techniques

- Column Cleanups



Concentration Techniques

- Rotary Evaporation

A rotary evaporator is a specially designed instrument for the evaporation of solvent (single-stage or straight distillation) under vacuum.

The evaporator consists of a heating bath with a rotating flask, in which the liquid is distributed as a thin film over the hot wall surfaces and can evaporate easily. The evaporation rate is regulated by the heating bath temperature, the size of flask, the pressure of distillation and the speed of rotation.



Concentration Techniques

- XcelVap Evaporation System

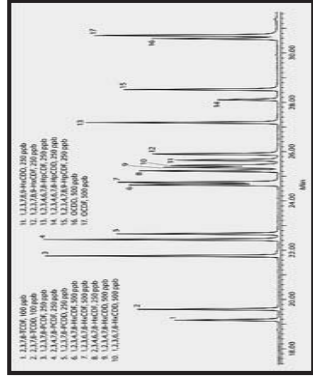
The XcelVap uses nitrogen to blow into the evaporation tubes to create a vortex Motion. The heat is applied to the evaporation tubes by direct contact with a heated water bath.

A fan evacuates the vapors which can be vented through an exhaust system to a laboratory hood.

The vapor contains too much nitrogen and water vapor for the solvent to be effectively recovered. No external motion is applied, but the gas introduced through the small nozzles, into the tube creates a vortex motion



Determination by HRGC-HRMS



The final analysis of PCDD/PCDF and co-planar PCBs is by HRGC-HRMS. The data are processed and chromatograms are printed using the JEOL JMS-800D proprietary software system (DioK).

Data Processing and Calculations

Average Relative Response Factor

$$RRF_i = \frac{1}{n} \sum_{j=1}^n \frac{A_{ij} m_a^*}{A_j^* m_i}$$

Concentration of PCDDs and PCDFs

$$C_i = \frac{m_i^* A_i}{A_i^* RRF_i m_{std}}$$

Where:

$A_{i,j}$ = Integrated ion current of the two ions characteristic of compound i in the j th calibration standard.

A_j^* = Integrated ion current of the two ions characteristic of the internal standard i in the j th calibration standard.

A_i = Integrated ion current of the two ions characteristic of compound i in the sample.

A_i^* = Integrated ion current of the two ions characteristic of internal standard i in the sample.

m_{std} = Mass of compound i in the calibration standard injected into the analyzer, pg.

m_a = Mass of recovery standard in the calibration standard injected into the analyzer, pg.

m_i = Mass of surrogate compound in the calibration standard, pg.

Reporting of Results

Dioxin Compounds Analyzed

2,3,7,8-TCDD

1,2,3,7,8-PeCDD

1,2,3,4,7,8-HxCDD

1,2,3,6,7,8-HxCDD

1,2,3,7,8,9-HxCDD

1,2,3,4,6,7,8-HpCDD

OCDD

2,3,7,8-TCDF

1,2,3,7,8-PeCDF

2,3,4,7,8-PeCDF

1,2,3,6,7,8-HxCDF

1,2,3,7,8,9-HxCDF

2,3,4,6,7,8-HxCDF

1,2,3,4,6,7,8-HpCDF

1,2,3,4,7,8,9-HpCDF

OCDF

The report will contain the concentration for all toxic PCDDs (7) and PCDFs (10).

Reporting Units:

Ambient air – picogram (pg)

Emission samples- nanogram (ng)

Fish – picogram per kilogram (pg/kg)

Sediment/ Soil - picograms per gram (pg/g)

Aqueous samples - picograms per litre (pg/L)

Toxic Equivalents (TEQs) will also be reported.

Reporting of Results

Dioxin Compounds	Mass Concentration (ng)	International (I – TEF)	TEQ Concentration (ng TEQ)
2,3,7,8-TCDD	2	1.0	2.0
1,2,3,4,7,8-HxCDD	35	0.1	3.5
OCDF	12	0.001	0.012
Total	49		5.512

Total amount released, quantity for each individual dioxin congeners, and Toxic Equivalents (TEQs) will be reported.

References

- US EPA Compendium Method TO-9A
- US EPA 40 CFR Appendix A-7 to Part 60, Test Method 23
- Dioxins Analysis Unit, National Measurement Institute, NSW Australia

Quality Control

1. Use of method blanks – to check for lab contamination
2. Addition of standards (surrogate, internal standards, precision and recovery standards)

Method 1613	Method 23	Method TO-9A	Purpose
	Surrogate standards	Sampling standard	Check recovery of sampling
Labeled-compound spiking	Internal standard	Extraction standard	Checking extraction recovery
Clean-up standard	Alternative standard		Check the recovery of cleanup procedure
Internal standard	Recovery standard	Recovery standard	Check standard recovery between extraction and analysis

Surrogates – compounds similar in chemical composition to the target analytes

Thank You!

Technical Cooperation Project for Capacity Development on Improving Solid Waste Management through Advanced/Innovative Technologies

Outline of WTE in Japan

27 February, 2020

JICA Expert Team

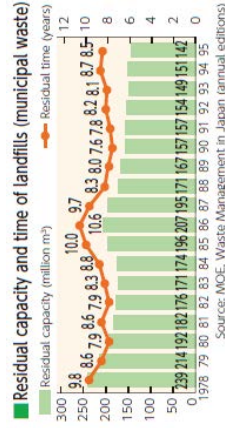
Background of WTE in Japan

-Necessary of SWM with no landfill capacity-

- After world war II, solid waste increase rapidly and it is necessary to keep clean surrounding environment
- There is no enough space for construction of landfill site in Japan, especially in Tokyo and Osaka.



Source:100-year History of Cleaning Operations in Tokyo

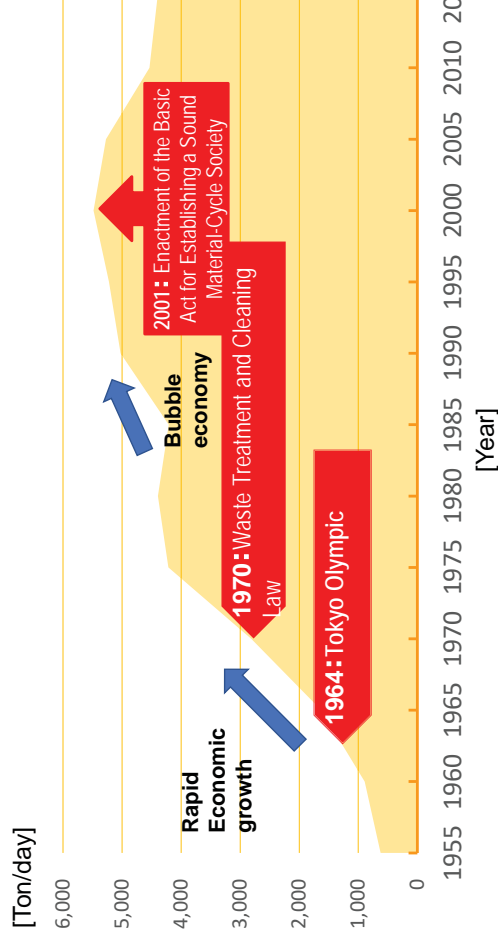


Source: MOE, Waste Management in Japan (annual editions)

1. Background of WTE in Japan
2. Collection system with consideration of WTE plants
3. Disposal method of residual from WTE plants

Background of WTE in Japan

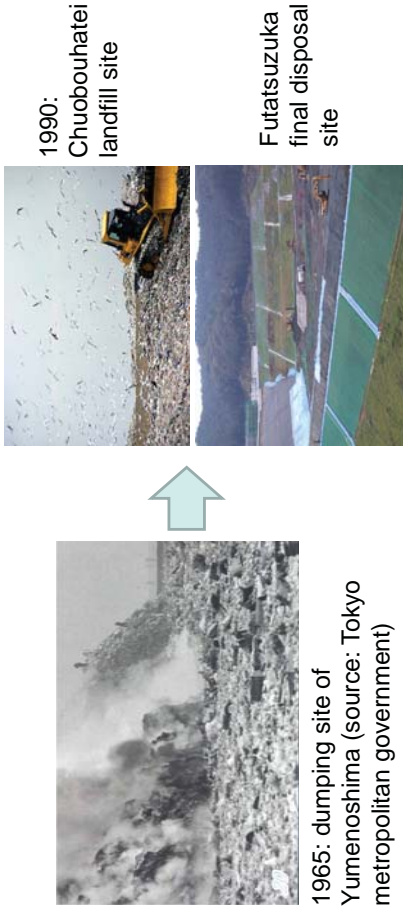
- Historical Trend of waste generation in Japan -



Source: Prepared by JET based on the information of MOE

Background of WTE in Japan

- Historical improvement of final disposal sites in Japan -



1965: dumping site of Yumenoshima (source: Tokyo metropolitan government)

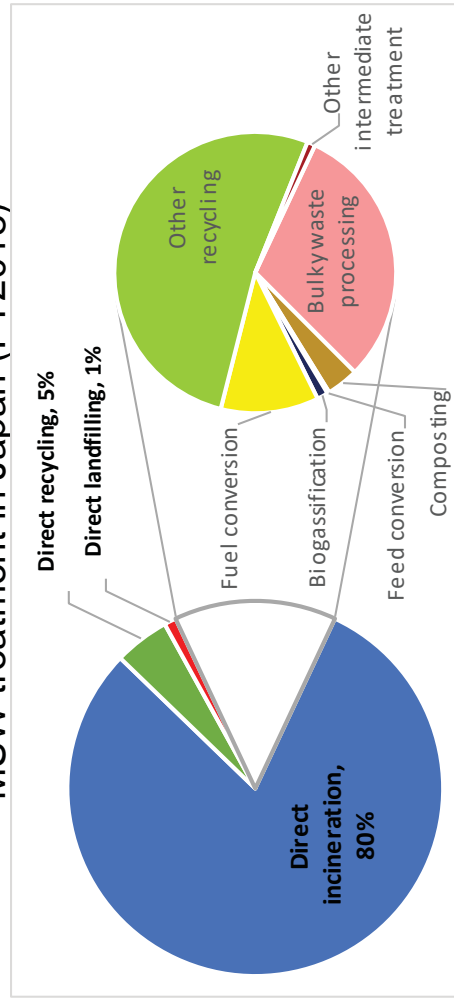
1990: Chuobouhatei landfill site

Futatsuzuka final disposal site

5

Background of WTE in Japan

- MSW treatment in Japan (FY2018) -



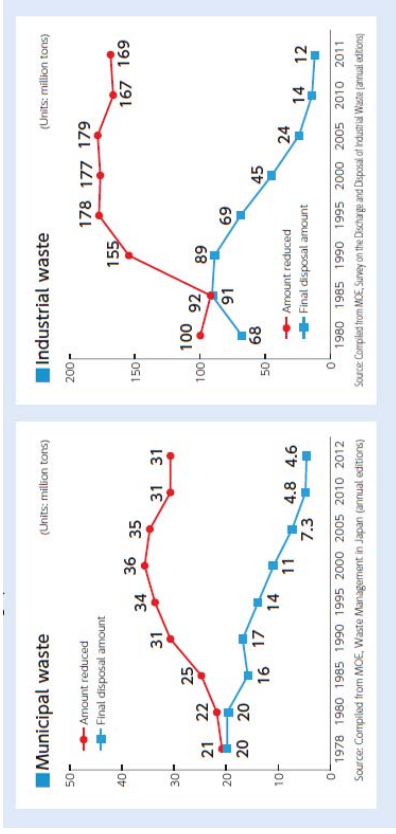
- **80% of MSWM in Japan is incinerated.**
- WTE plants also accepts residual from the other intermediate treatment facilities.

Source: https://www.env.go.jp/recycle/waste_tech/jp/jpan/index.html

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Background of WTE in Japan

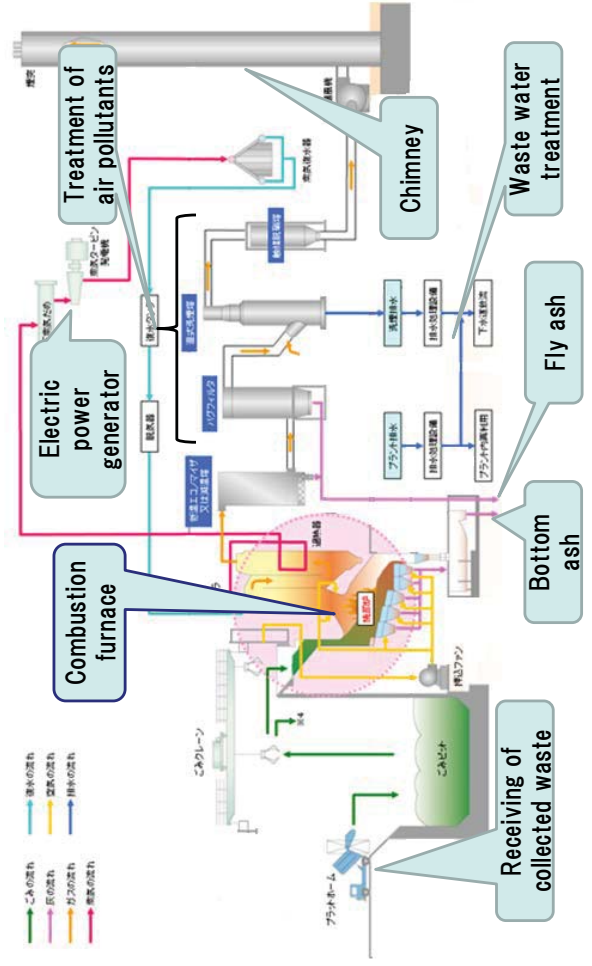
- Waste diversion from landfill -



- Final disposal amount is decreasing by reuse, reduce, recycling and intermediate treatment including incineration

6

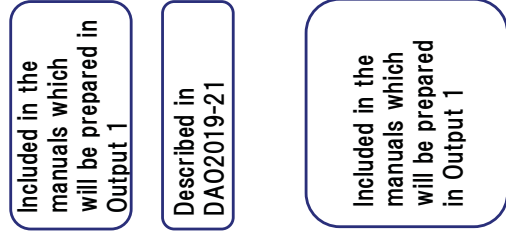
Overall system of typical WTE (by incineration) facility



Appendix 12

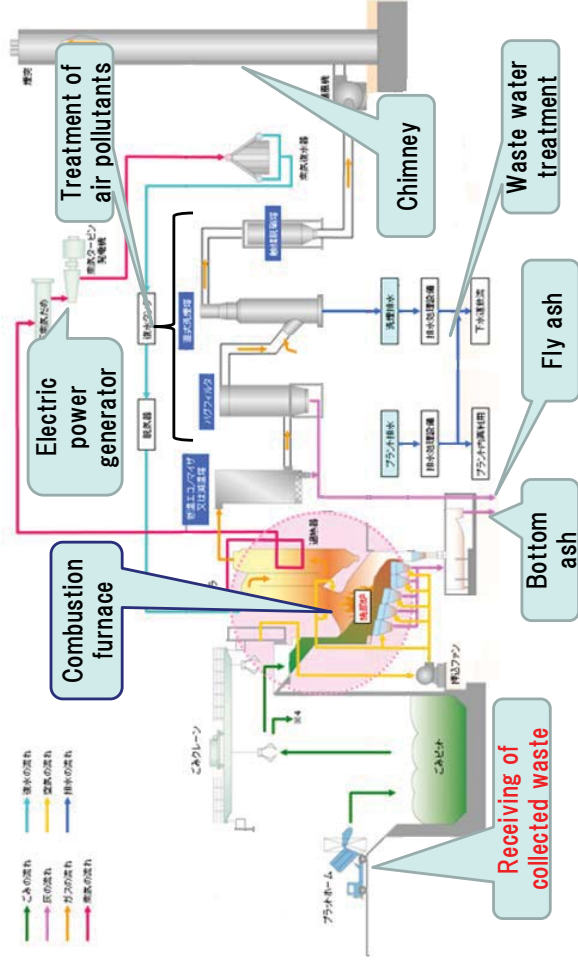
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- Structure and operational standard for WTE is necessary.
- Emission standard for air pollutants and effluent standard for wastewater is necessary
- Quality control of receiving waste is also necessary
- Procedure manual for bottom ash and fly ash is also necessary



Collection and transportation with consideration of WTE

- Separation of combustible waste and non-combustible waste (recyclable waste, bulky waste, etc)
- Separation of hazardous waste
- Mixed collection of combustible waste



Examples in Japan

Kawasaki City (the city has WTE)

- Population : 1.5 million people
- Area : 145 km²
- Main SWM system : Incineration with energy recovery and landfill of incineration ash with recycle of noncombustible waste
- 85% of waste is diverted from landfill



Source: <https://www.kanaioco.jp/article/entry-94868.html>

Shibushi city (the city does not have WTE)

- Population : 32,200 people
- Area : 290 km²
- Main SWM system : Recycle and composting with source separation by putting the name on the waste package plastic landfill after the diversion of recyclable and compostable waste
- 75 % of waste is diverted from landfill



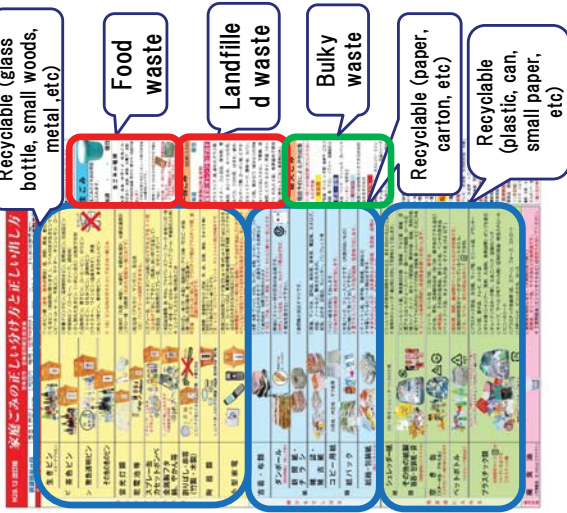
Source: <http://www.city.shibushi.lg.jp/docs/2014020600025/>

Separation of waste in Kawasaki and Shibushi

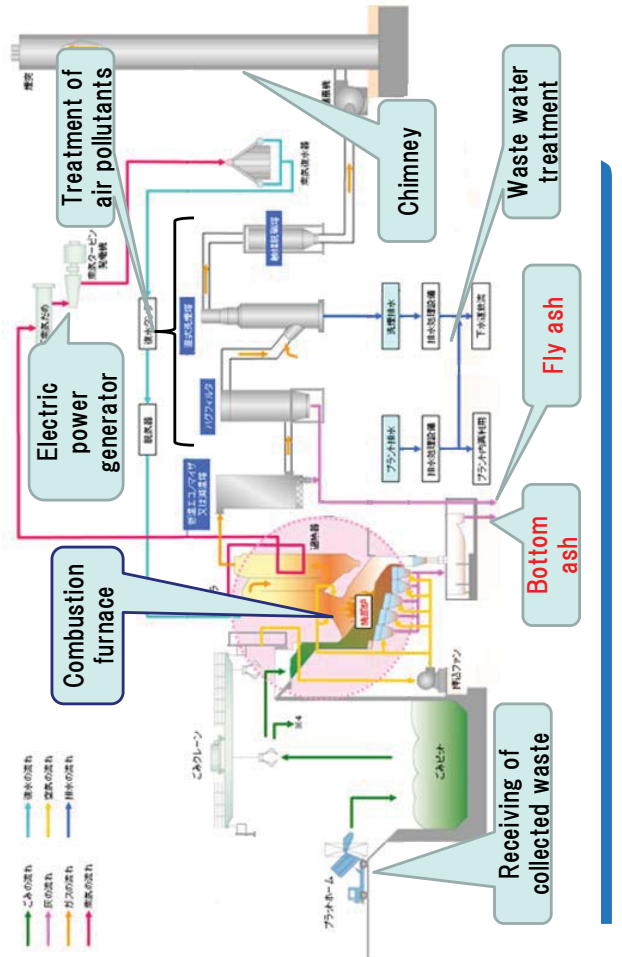
In case of Kawasaki City



In case of Shibushi City



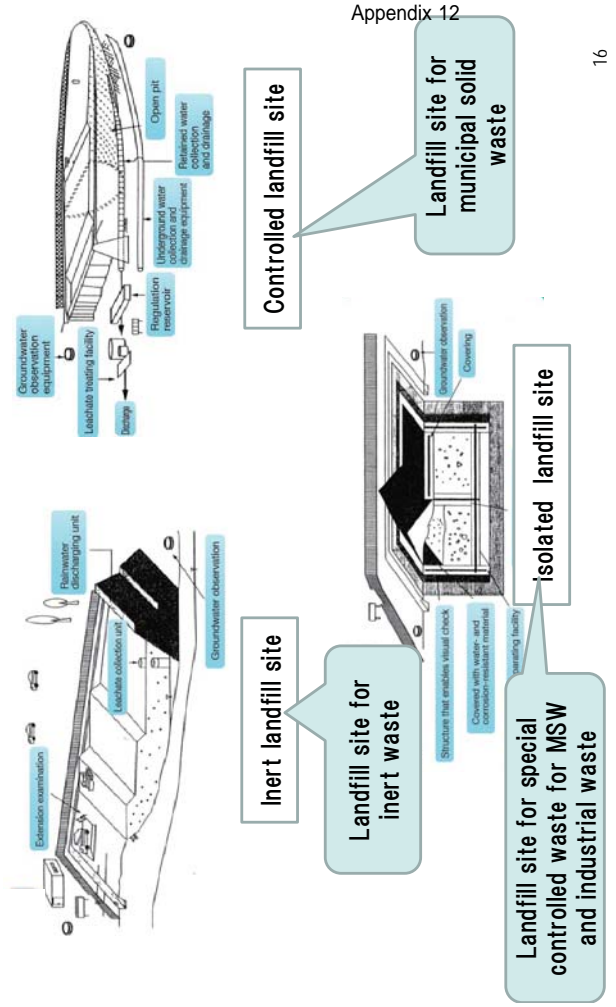
Disposal method of residual from WTE plants



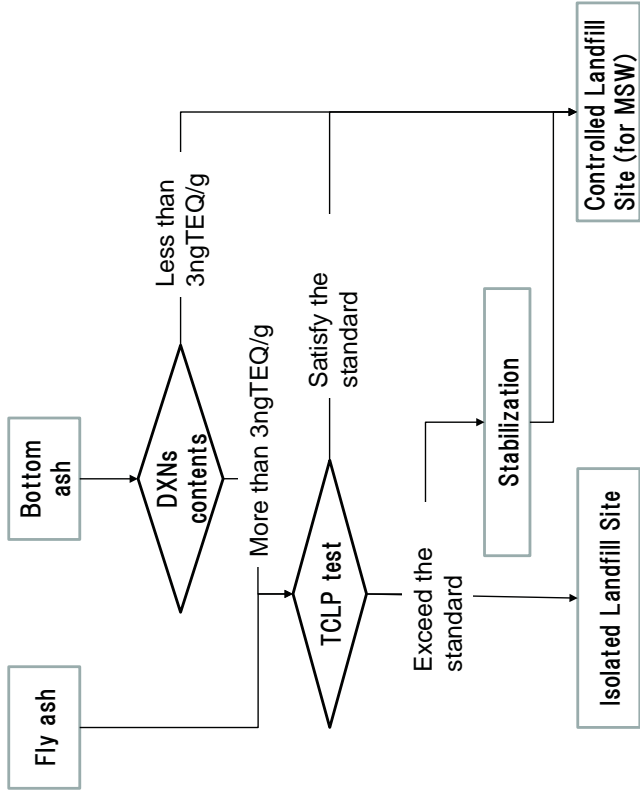
Situation of collected waste in the Philippines



Type of landfill site in Japan



Handling procedure of incineration residue in Japan



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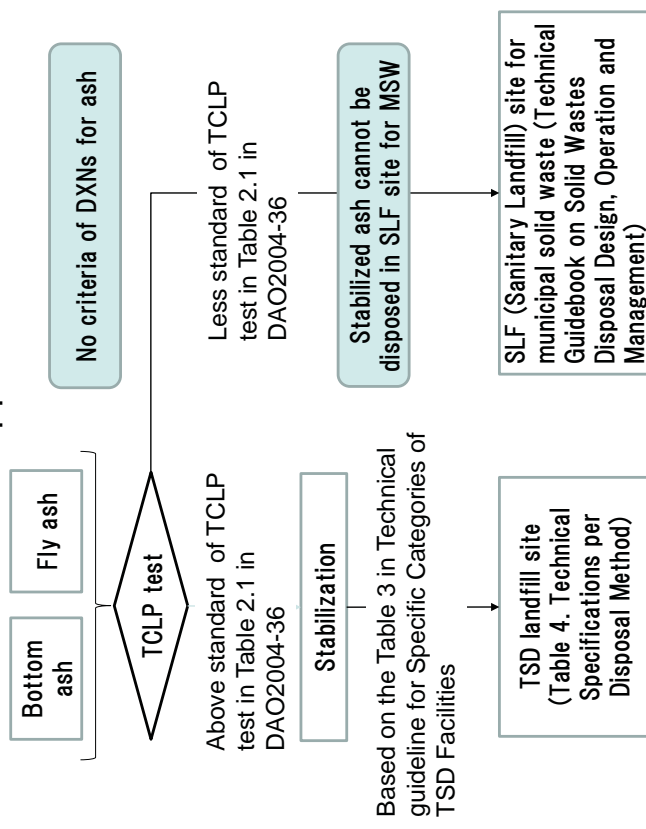
Summary of Incineration Residue (Bottom ash and fly ash) for WTE

- Firstly separation of bottom ash and fly ash is important due to the difference of constituent
- Normally fly ash contains heavy metal or dioxin more than bottom ash
- TCLP test should be implemented for representative samples normally
- It would be necessary to consider disposal manner in MSW landfill after treatment to stabilization.
- It would be better to consider to reuse ash which satisfy with standard or after the treatment in the future

Let's Consider it in the preparation process of the manual for management of bottom ash and fly ash from WTE facility

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Handling procedure of incineration residue in the Philippines



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Thank you.

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Last November 26, 2019, DENR issued DAO 2019-21, entitled Guidelines Governing Waste-to-Energy (WTE) Plants. The said guidelines are intended to guide the implementation of WTE projects and to protect the environment through with their activities.

Most significant in the Guidelines was the emission standard for dioxin and furan. DAO 2019-21 specifically states in Section 6 (Operational Guidelines for WTE Facility), Subsection 6.3.c that:

All average values of dioxin and furan measured over the sampling period of a minimum of six (6) consecutive days shall not exceed the limit value of 100 picogram per cubic meter (pg/m³)

However, the greatest opposition to the establishment of WTE facilities come from civil society groups (CSG) because of their concern to emissions of dioxin. Among their concerns are as follows:

1. Dioxin and furan are toxic chemicals that can cause cancer
2. The Philippines has a very limited capability in monitoring dioxin and furan emissions in order to prove that WTE is a viable (economic, technical and environmental) option to managing waste, we hope that we together undertake these:
 1. **Emphasize the adherence to the waste management hierarchy**, where the order of preference to manage waste is through source reduction, recycling, treatment and disposal.
 2. **Validate permitably tolerable limit.** The World Health Organization proposes a provisional tolerable limit of 100 picogram per cubic meter (pg/m³) for dioxin and furan. With the help of medical professionals, the capacity of the Filipino human physiology to absorb dioxin with significant health impact must be determined.
 3. **Identify the sources of dioxin and furan** from various sources and dioxin levels in air, water, land and food. In a report submitted by the Philippines as compliance to the Stockholm Convention on Persistent Organic Pollutants, a baseline value (for year 2010) of over 775 gram of dioxin potentially abound in the country. Open burning accounts for over 29 per cent of this amount. The report also states that the Philippines is not able to reduce dioxin emissions significantly as in the case in Japan where they were able to reduce dioxin emissions from 5,000 gram/year to 30 gram/year with the proper WTE technologies and air pollution control.
 4. **Build local capability to monitor dioxin and furan.** At the moment, all sampling for dioxin and furan are being done by DENR-accredited samplers but almost all samples are still sent abroad for analysis. Through the technical assistance of JICA, we hope to overcome this difficulty.

We are not dismissing the concerns of other sectors but surely, working with everyone can help us create a better future of generations to come.