Appendix 12-2:
1st Dissemination Seminar

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

DISSEMINATION SEMINAR
3 JUNE 2022, FRIDAY, 1:00PM-5:00PM
DISCOVERY SUITES HOTEL
CLERMONT FUNCTION HALL

Master of Ceremonies:
Ms. Andrei Mallare
JICA Expert Team

TOPIC	TIME	SPEAKER
Registration	1:00-1:15	-
OPENING CEREMONIES Invocation National Anthem Welcome Remarks Opening Remarks Introduction of the TCP and the Program of seminar	1:15-1:30	 JICA Expert Team JICA Expert Team **Engr. William P. Cuñado** OIC-Director, EMB, DENR **Mr. Yo Ebisawa** Senior Representative JICA Philippines Office **Ms. Juvinia Serafin** OIC-Chief,SWMD-EMB
SWM Planning for WTE	1:30-2:00	**Mr. Takahiro Kamishita** JICA Expert Team
Technical Features of Appropriately Controlled Combustion Technology	2:00-2:30	**Mr. Satoshi Higashinakagawa** JICA Expert Team
Institutional and Financial features of WTE	2:30-3:00	**Mr. Makoto Kosaka** JICA Expert Team
QA	3:00-3:15	
Tea break	3:15-3:30	
WTE related technical standards	3:30-4:00	**Mr. Makoto Kosaka** JICA Expert Team
Good practice of SWM other than WTE o Cost Recovery of SWM	4:00-4:30	**Ms. Kyoko Kimura** JICA Expert Team

o Collection and Transportation o Intermediate treatment/ 3R o Landfill o Information Education and Communication (IEC)		
QA	4:30-4:45	
CLOSING CEREMONIES Closing Remarks Picture-taking, egress	4:45-5:00	**Ms. Elvira Pausing** Assistant Project Manager EMB-SWMD/PMO

NIPPON KOEI

The Project for Capacity Development on Improving Solid Waste Management through Advanced/Innovative Technologies in the Republic of Philippines

- Project Outline -

May 2022
JICA Expert Team

Background of the Project

- Ecological Solid Waste Management Act (RA9003), 2001
  - Conversion of inappropriate final disposal site into sanitary landfill.
  - Reduction of amount of disposed waste by 3R.
  - LGUs' capacity on appropriate SWM is still limited because of technical and financial difficulties.
- Clean Air Act (RA8749), 1999
  - Waste incineration was recognized to be practically prohibited.
  - Decision by the Supreme Court of the Philippines in January 2002.
  - DENR notified that "only incineration emitting hazardous & toxic gas shall be prohibited".
- Guidelines Governing the Establishment and Operation of WTE Technologies for MSW (NSWMC Resolution 669), 2016
  - DENR has published DAO 2019-21 in accordance to this guideline.

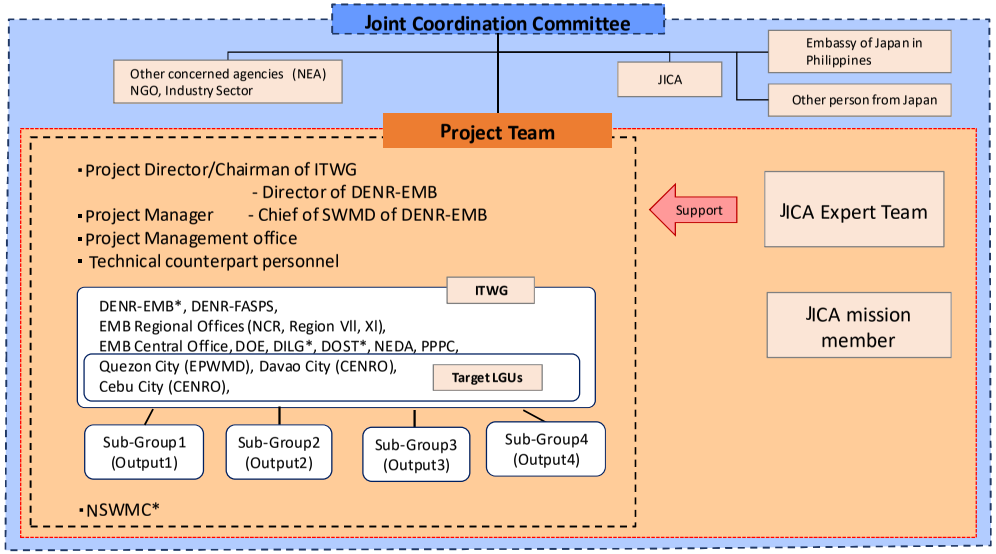
Background of the Project (cont.)

- Under these circumstances, DENR requested for the Japanese Government on a technical cooperation project for Capacity Development on Improving Solid Waste Management through Advanced/Innovative Technologies
- Upon the request, basic framework of the project was discussed and examined by the JICA missions, and
- Record of Discussion (R/D) for implementation of the Project was signed by both sides on 7th November 2017

Project outline

- Project objective:
  The Project intends to manifest the outputs and the project purpose by implementing activities based on the R/D and the Project Design Matrix (PDM).
- Duration:
  from March 2019 to December 2022 (3years 9months)
- Counterparts:
  - Implementing agency: DENR-EMB
  - Target LGUs: Quezon City, Davao City & Cebu City
  - Inter-agency Technical Working Group (ITWG)
  - Cooperation agency: NSWMC
- Target area:
  - Whole Philippines with special attention to Quezon, Davao, and Cebu cities.

Project implementation structure (based on SOs)

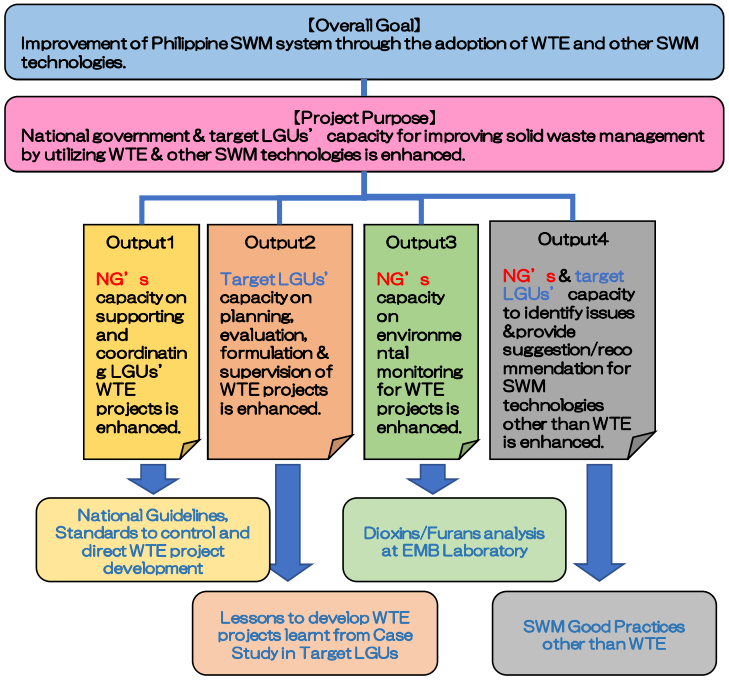


*NSWMC: DENR, DOH, DA, MMDA, DOST, DILG, DPWH, DTI, TESDA, PIA, LCP, LMP, LPP, LnB, NGO, Recycling Industry, Manufacturing and Packaging Industry

Related Official Orders

- EMB Special Order No. 2019-347:
  Creation of **ITWG** for the Full Implementation of the TCP, 19 Nov. 2019
- DENR Administrative Order No.2019-21:
  Guidelines governing Waste to Energy (WtE) Facilities, 26 Nov. 2019
- DENR Special Order (No.2019-963, No.2020-523):
  Creation of **JCC** for the TCP, 28 Nov. 2019
  Amendment, 10 Dec. 2020
- EMB Supplemental Special Order:
  Creation of the four (4) **Sub-groups**, 12 July 2020

Project Design



Project Design Matrix (PDM)

- Overall Goal:
  Improvement of Philippine SWM system through the adoption of WTE and other SWM technologies.
- Project Purpose:
  National government & target LGUs' capacity for improving solid waste management by utilizing WTE & other SWM technologies is enhanced.

Appendix 12

Project Design Matrix (PDM) (cont.)

- Output 1:
  National government's capacity on supporting and coordinating LGUs' WTE projects is enhanced.
- Output 2:
  Target LGUs' capacity on planning, evaluation, formulation & supervision of WTE projects is enhanced.
- Output 3:
  National government's capacity on environmental monitoring for WTE projects is enhanced.
- Output 4:
  National Government's & target LGUs' capacity to identify issues &provide suggestion/recommendation for SWM technologies other than WTE is enhanced.

Activities for Output 1

1-1:	Prepare Best Available Technique (BAT) / Best Environmental Practice (BEP) guideline	Completed
1-2:	Study policy & mechanism to promote WTE projects	Completed
1-3:	Hold seminar to disseminate WTE technology	Being prepared
1-4:	Prepare draft technical standards for WTE facility focused on waste incineration with power generation	Completed
1-5:	Prepare manual for management of bottom & fly ash discharged from WTE facility	Completed
1-6:	Prepare manual for planning, evaluation, formulation & supervision for WTE projects, and prepare evaluation criteria for EMB on 10-year SWM plans	On going
1-7:	Illustrate model procedure to introduce WTE facility	On going
1-8:	Review and update the existing regulations of sanitary landfill for municipal solid waste where incineration ash will be disposed of.	On going

Activities for Output 2

2-1:	Review current situation on introducing WTE facilities in the target LGUs	Completed
2-2:	Clarify current waste flow & amount, set target on waste reduction in the existing SWM 10-year plans	Completed
2-3:	Evaluate LGUs' land use plan for WTE projects	Completed
2-4:	Analyze & verify candidate WTE projects selected from the existing F/S, unsolicited/solicited proposals	Completed
2-5:	Define points & issues to be addressed for formulating WTE projects in the target LGUs	Completed
2-6:	Define proper responsibility of the target LGUs in promoting WTE projects under PPP scheme	On going
2-7:	Formulate technical specification of WTE facilities in each target LGU	Not started yet
2-8:	Define points & issues to be addressed for supervising WTE projects in the target LGUs	Not started yet

Activities for Output 3

3-1:	Review current capacity & activities on monitoring, analysis & QA/QC of Dioxins and Furans (DXNs) in the central & regional EMBs	Completed
3-2:	Analyze gap between present and required capacity of the central EMB Lab., and formulate training plan	Completed
3-3:	Prepare Standard Operation Procedures (SOP) for sampling, analysis & QA/QC of DXNs in ambient air & emission gas	On going
3-4:	Conduct training on sampling, analysis & QA/QC in ambient air & emission gas for the central EMB	On going
3-5:	Prepare sampling plan (design) for DXNs in ambient air	Not started yet
3-6:	Implement sampling, analysis & QA/QC of DXNs in ambient air & emission gas	Not started yet, to be onsite

Appendix 12

Activities for Output 4

4-1:	Grasp current situation by studying National SWM strategy & the 10-year SWM plans in the target LGUs	Completed
4-2:	Identify current issues for other SWM technologies in the target LGUs	Completed
4-3:	Collect information on “Good practice & Appropriate technology” of other SWM technologies in Japan & the third countries	Completed
4-4:	Summarize & provide suggestion & recommendation to improve utilization of other SWM technologies in the target LGUs	Completed
4-5:	Hold seminar to disseminate suggestion & recommendation	Not started yet

Dissemination Seminar

SWM Planning for WTE

3rd June 2022

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

Introduction,
SWM Planning for WTE

- The MSWM Plan (M/P) is the base for the implementation of the MSWM of LGUs.
- WTE facility can not be discussed without consideration of other components of MSWM.
- WTE facility is only one of the components/treatment options of entire MSWM, which could be selected to achieve the appropriate management of MSW of LGU.
- Prior to explanation of the technology of appropriately controlled combustion, the following information is shared:
  1. MSWM-M/P in the process of WTE development
  2. Waste flow diagram in MSWM plan
  3. Example of WTE facilities plan and improvement by implementation of the M/P of MSWM

Appropriately Controlled Combustion

- WTE Definition in DAO 2019-21
  "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"

- WTE options: Gasification/Pyrolysis, Refused Derived Fuel (RDF), and Biomethanation (aerobic digestion, biogas)

- Main target: Appropriately Controlled Combustion (ACC)
  - Dominant in the existing cases
  - Reliable technologies with a long history of application

1. MSWM-M/P in the process of WTE development

Overall Schedule of WTE Facility Development [example of Japan]

- Approx. 10 years to complete the facility construction from the start of planning, the overall schedule is planned backwards.
- Many plans and studies/surveys are conducted before construction.

		2021 (1)	2022 (2)	2023 (3)	2024 (4)	2025 (5)	2026 (6)	2027 (7)	2028 (8)	2029 (9)	2030 (10)	2031 (11)	Remarks
Existing Facility	Operation	26	27	28	29	30	31	32	33	34	35		Renewed in 30-40 yrs (e.g. 35 yrs)
New Facility	MSW Management Master Plan (MP)		2	3	4	5	6	7	8	9	10	1	Reviewed once every 5 yrs
	Facility Development Conceptual Plan												Decision on renewal & site
	Facility Basic Plan												Decision on processing method
	PFI/PPP Feasibility Study												Decision on business scheme
	Topographic Survey												Reflected in facility basic plan
	Geological Survey												Reflected in facility basic plan
	Environmental Impact Assessment												1.5-4 yrs
	Selection of Winning Bidder												standard 2 yrs
	Construction Work							Construction					standard 3-4 yrs
	Operation											Start	

In Japan, WTE-ACC facilities are to be upgraded based on the service life of the existing facilities. The service life is generally 30-40 years.

MSW Management Master Plan (M/P)

- A long-term plan for 10 to 15 years,
- Defined by the law as "the plan for municipalities responsible for the overall treatment of MSW to manage and ensure the proper treatment of it in their area"
- Required to be revised/updated approximately every five years
- Plan to discuss all components of MSWM, like 10-yr SWM in the Philippines

		2021 (1)	2022 (2)	2023 (3)	2024 (4)	2025 (5)	2026 (6)	2027 (7)	2028 (8)	2029 (9)	2030 (10)	2031 (11)	Remarks
Existing Facility	Operation	26	27	28	29	30	31	32	33	34	35		Renewed in 30-40 yrs (e.g. 35 yrs)
New Facility	MSW Management Master Plan (MP)		2	3	4	5	6	7	8	9	10	1	Reviewed once every 5 yrs
	Facility Development Conceptual Plan												Decision on renewal & site
	Facility Basic Plan												Decision on processing method
	PFI/PPP Feasibility Study												Decision on business scheme
	Topographic Survey												Reflected in facility basic plan
	Geological Survey												Reflected in facility basic plan
	Environmental Impact Assessment												1.5-4 yrs
	Selection of Winning Bidder												standard 2 yrs
	Construction Work							Construction					standard 3-4 yrs
	Operation											Start	

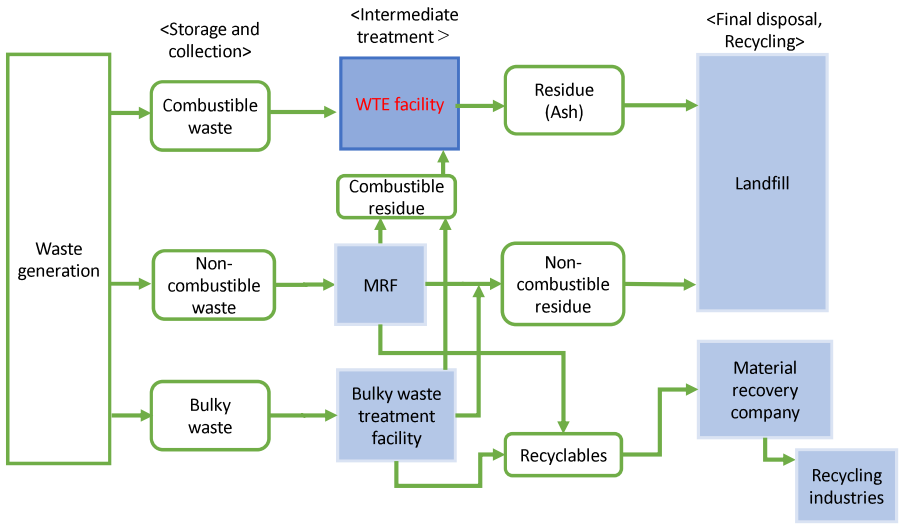
2. Waste flow diagram in MSWM plan

Waste Flow Diagram in the Target Year

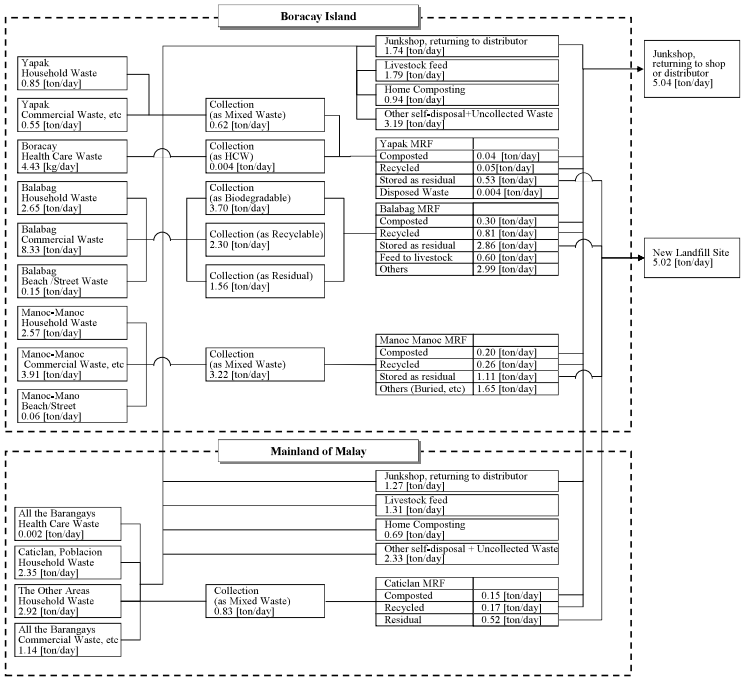
- To be prepared in the MSWM-M/P
  - For both the present condition and future plan
- Identify and illustrate:
  - the waste amount waste to be managed at all stages of MSWM from waste generation to final disposal
  - Capacity of waste facility and equipment such as waste storage, collection, transportation, treatment including MRF,
- The facility plan is prepared to treat/manage the identified waste amount
  - Capacity of equipment, machinery
  - Work force
  - Investment, operation and maintenance cost
  - Verification of feasibility before implementation

Appendix 12

Example of Waste Flow Diagram with WTE



Example of Waste Flow Diagram

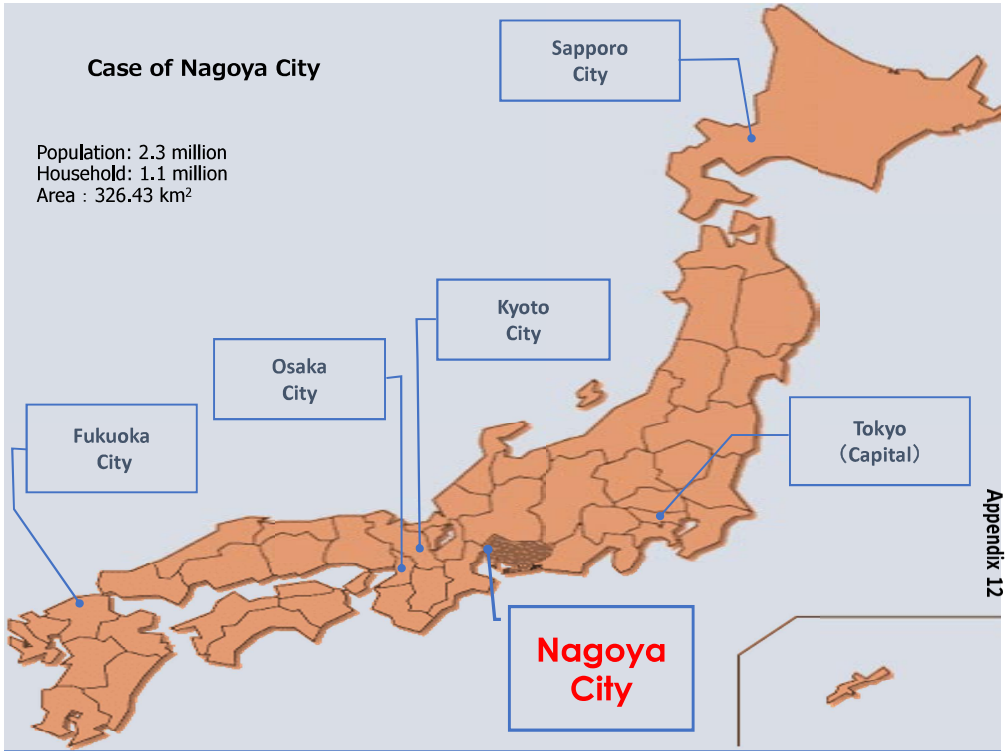


Nippon Koei Co., Ltd. (2008) "M/P on SWM for Boracay Island and Municipality of Malay: F/R"

3. Example of WTE facilities plan, and improvement by implementation of the M/P of MSWM

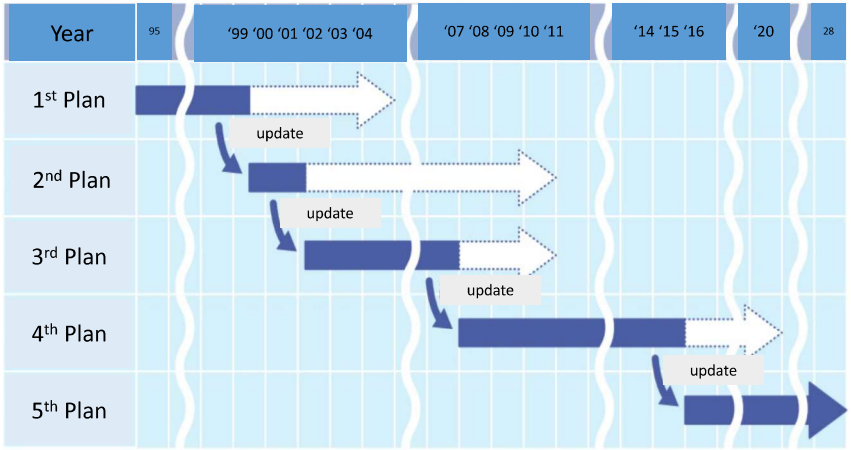
Case of Nagoya City

Population: 2.3 million
Household: 1.1 million
Area : 326.43 km²

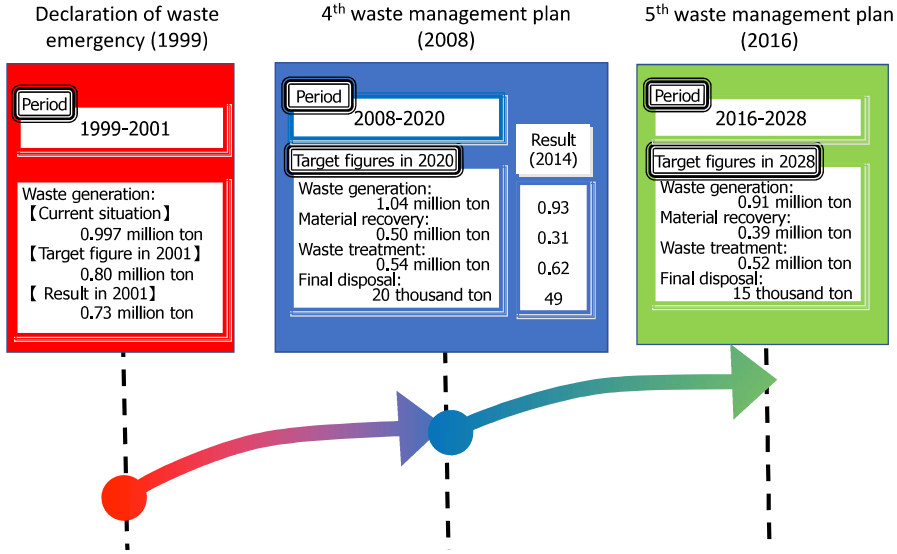


Appendix 12

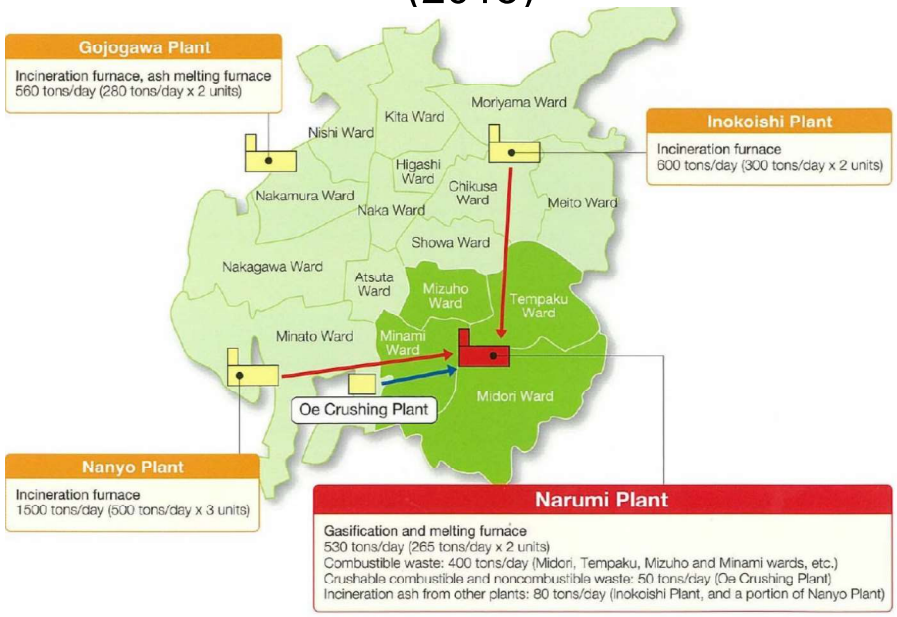
History of MSWM Master Plan of Nagoya



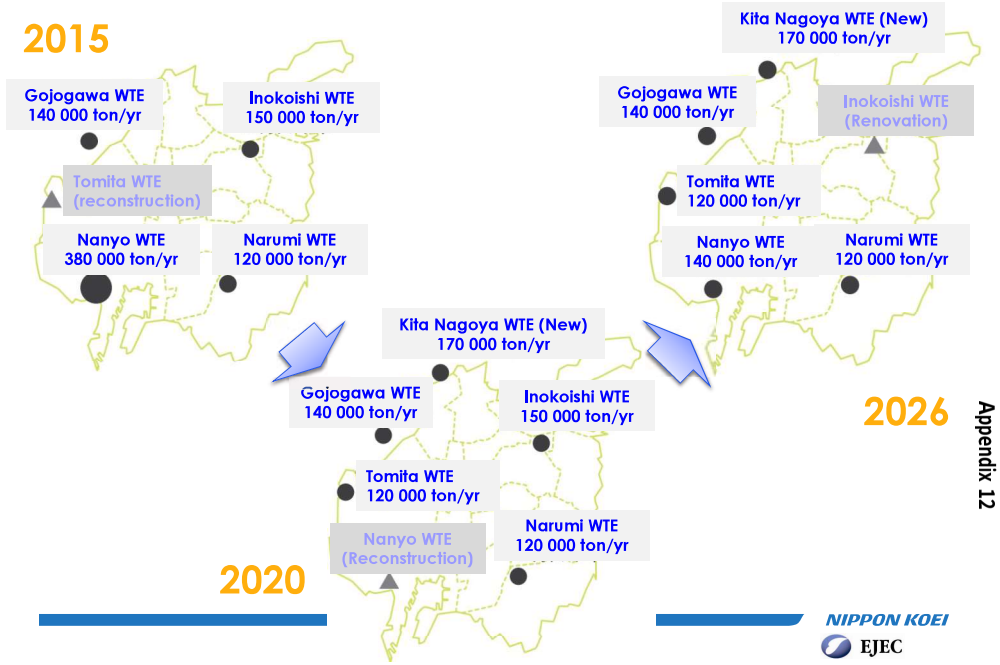
Achievements through Implementation of SWM M/P



Location of Treatment Facility in Nagoya (2015)



WTE Facilities Plan toward 2026 (5th M/P)



Appendix 12

PFI(PPP scheme) applied for WTEs

- Two WTEs (North Nagoya and Narumi) have been developed based on the Private Finance Initiative (PFI) Law.
- The City conducted the feasibility study to adopt BOT or BTO to the WTE development.
- Solicited approach to develop the facilities to be planned by the M/P

Planned Capacity of WTE Facilities

Year	2016	2020	2026
North Nagoya WTE (660ton/day)	Construction	170	170
Tomita WTE (450ton/day)	Re-construction	120	120
Nanyo WTE (1500ton/day-->560ton/day)	380	Re-size, re-construction	140
Inokoishi WTE (600ton/day)	150	150	Renovation
Gojogawa WTE (560ton/day)	140	140	140
Narumi WTE (450ton/day)	120	120	120
Total waste amont (thousand ton/year)	790	700	690

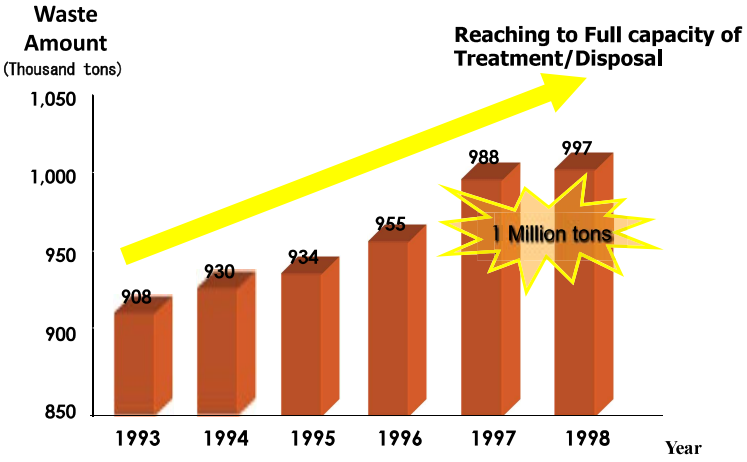
- Total capacity of waste treatment by WTE facilities is decreasing in accordance with the trend of waste amount prediction.
- However, in 1990s, the increasing waste amount was the big problem of the City.

"Declaration of waste emergency"

February 1999

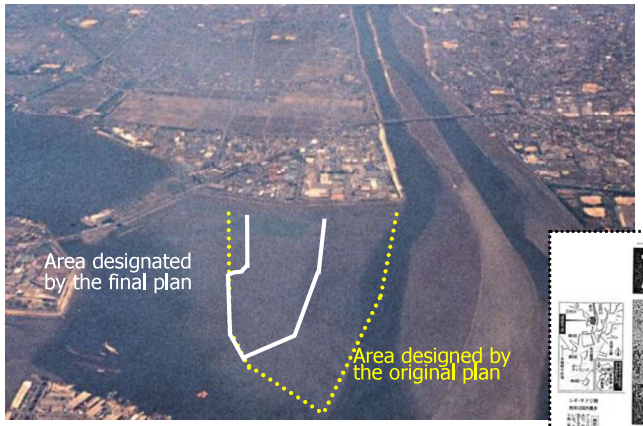
- Remaining capacity of final disposal: 2years only
- Reaching to full capacity of waste incineration
- Needs of waste reduction
- Needs of contribution of citizens, businesses and city

In 1990s, amount of waste kept increasing



Landfill Project at Fujimae Tidal Flat

- It was cancelled in 1999.
- Fujimae tidal flat was registered in Ramsar Convention on Wetlands in 2002.



News article announcing the cancellation


藤前埋め立て断念

名古屋市 代替地探し専念

渡り鳥飛来地 干潟の保全確定

Registration of the Fujimae Tidal Flat as a Wetland of International Importance under the Ramsar Convention

Oxbirds feeding

Certificate

Newly Taken Measures

Household waste

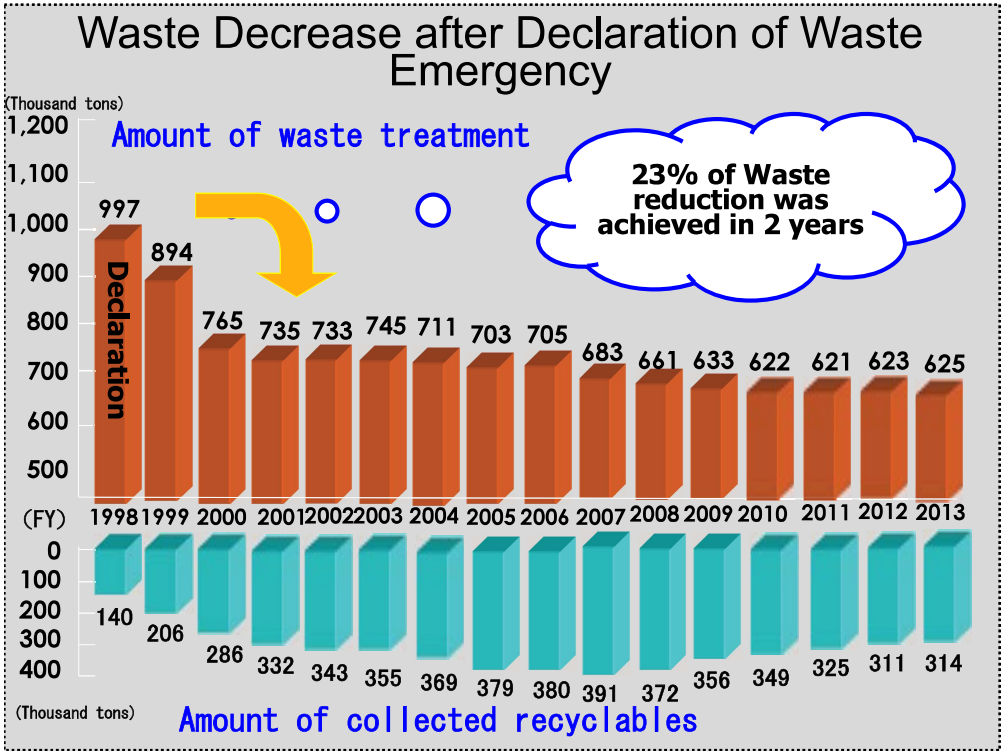
- Reinforcing recovery of glass bottles and cans
- Reinforcing segregation of plastic and paper containers and packaging
- Promotion of resources recovery by community
- Introduction of designated waste bag

Business waste

- Strict no acceptance of business waste
- Charging on all wastes
- Introduction of designated waste bag

Education and Public Relation

- Community meeting
  - 2,300 times meeting in 2months
  - Approx. 210 thousand people participated



Conclusions

- MSWM is the important responsibility of LGU to provide and keep safe environment to citizens
- The PDCA cycle shall be applied for MSWM-M/P, preparation, implementation, monitoring and updating
- Waste facilities plan including WTE shall accord with MSWM-M/P
- While the communities and people shall contribute their MSWM, the public sector shall be responsible for developing and managing the MSWM facilities

THANK YOU FOR YOUR ATTENTION

Dissemination Seminar

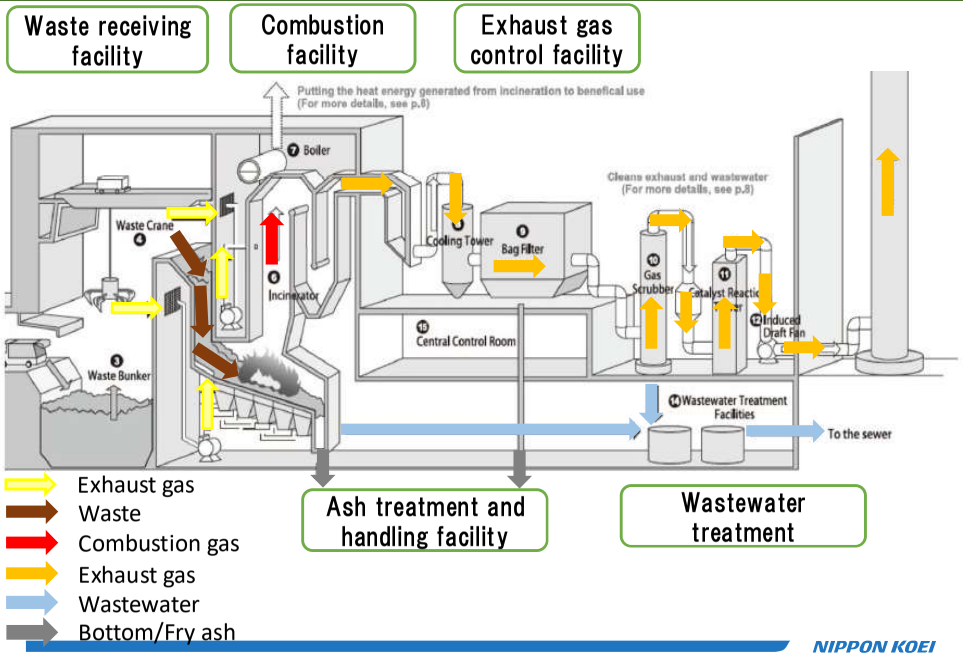
Technical Features of Appropriately Controlled Combustion Technology

3rd June 2022 (Friday)

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

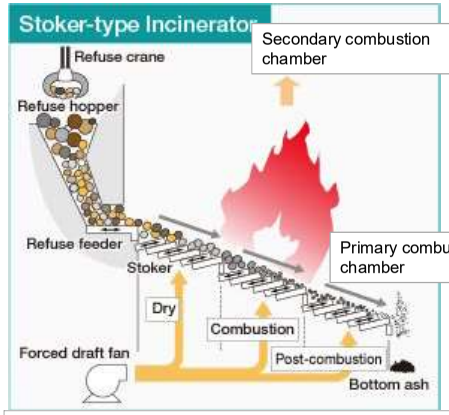
Table of Contents

Overall system of ACC-WtEy (Example of Metropolitan Tokyo)



Type of Combustion Technology for WtE-ACC

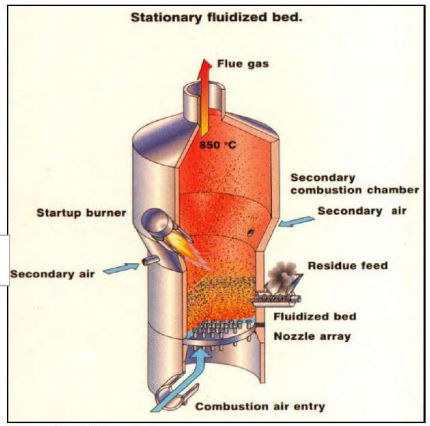
Stoker type (Moving Grate)



Source : Tokyo Environmental Public Service Corporation

83% of cases (48 out of 58 cases)

Fluidized Bed Combustion



Source: Hitachi Zosen Inova

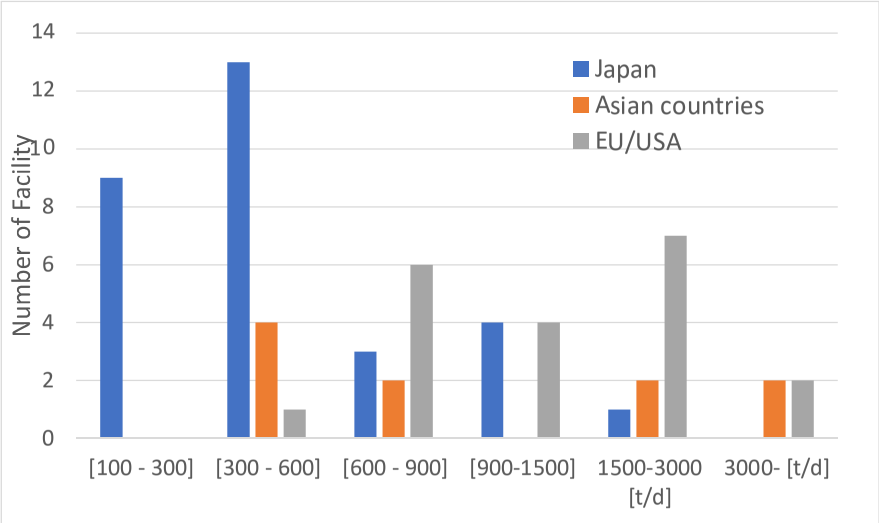
10% of cases (6 out of 58 cases)

Appendix 12

Type of Combustion Technology for WtE-ACC

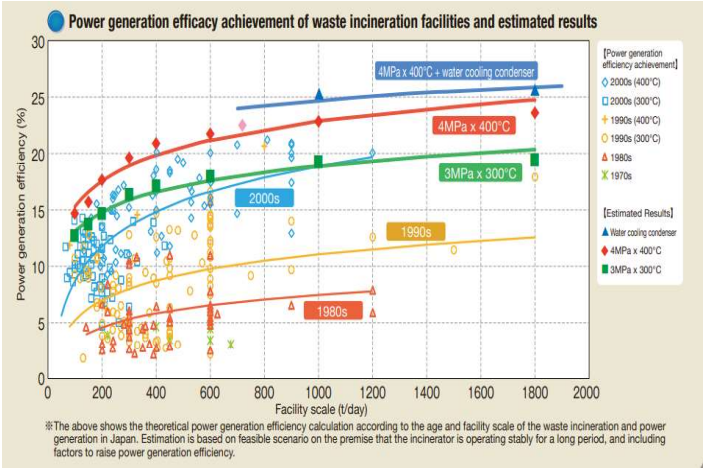
Items	Stoker Type	Fluidized Bed Combustion Type
Non acceptable waste	- Much larger bulky waste (more than 50 cm)	- Bulky waste - Liquid waste
Capacity of single furnace	- Up to 1,000 tons/day (24 hours)	- Up to 200 tons/day (24 hours)
Advantage	- High reliability - Less electricity utilization - Higher capacity of treatment - No need for shredding of bulky waste before combustion	- High combustion speed - Less oxidation of metal - Requires a smaller space of combustion furnace than stoker type incinerators
Disadvantage	- Much auxiliary fuel is necessary for starting the process of combustion - Bigger area required than Fluidized Bed Type	- Waste shredding required for bulky waste before feeding to combustion furnace - Lower capacity than stoker type - High ratio of fly ash - Relatively difficulty of Combustion control

Capacity of WtE-ACC Facility



According to 60 case studies in this project, the range of incineration is wide

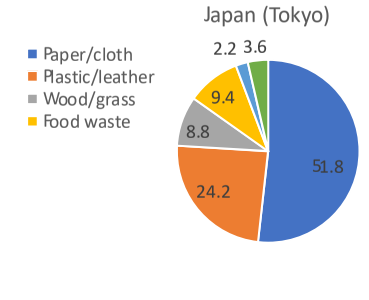
Capacity of WtE-ACC Facility



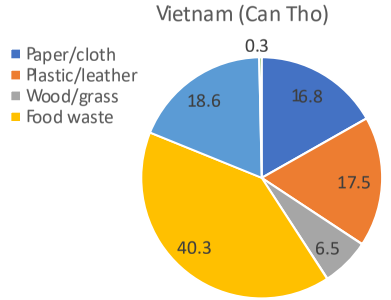
Source: Ministry of Environment, Japan

Most of WtE ACC facility is more than 100 [ton/day] considering power generation efficiency as above cases in Japan

Waste Characterization



Source: Ministry of Environment, Japan



Source: Can Tho City

Rate (%)

Physical composition (dry base)	Paper / cloth	Plastic/ Leather	Wood/ grass	Food waste	No-combustible	Others
Japan (average)	51.8	24.2	8.8	9.4	2.2	3.6
Japan (max)	63.5	32.0	19.3	19.6	5.9	13.6
Japan (min)	42.6	17.4	2.4	5.3	0.7	0.0

Source: Ministry of Environment, Japan

Acceptable Waste for WtE Facility

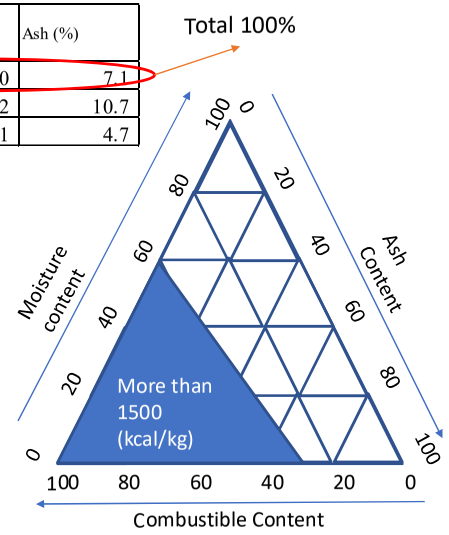
Bulk density, Moisture, Combustible, Ash Contents of the Case Studies in Japan

	Bulk density (kg/L)	Moisture contents (%)	Combustible (%)	Ash (%)
Japan (average)	145.8	40.9	52.0	7.1
Japan (max)	235.0	52.6	60.2	10.7
Japan (min)	104.2	33.3	41.1	4.7

Source: Ministry of Environment, Japan

- As one of examples, suitable moisture, combustible and ash contents are within the range of right figure.

- In the case study, moisture, combustible and ash contents are above table, which is within the range of right figure.



Source: National Institute for Environmental Study

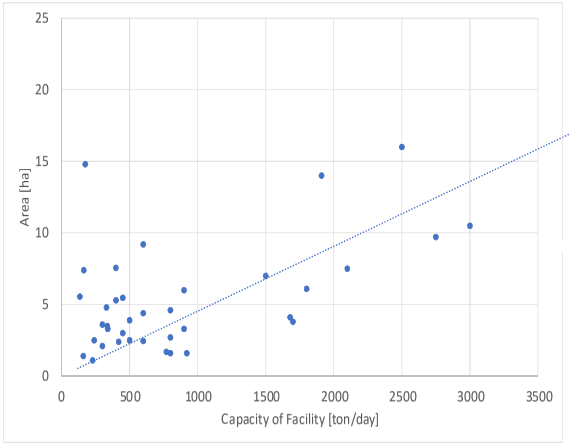
Acceptable Waste for WtE Facility



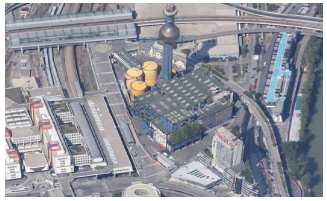

Source: Clean Authority of Tokyo

Non suitable waste for Appropriate Combustion
- Incombustible waste
- Bulky waste (ex. more than 50 cm)
- Waste including heavy metal such as mercury

Necessary area of WtE facility



Source: Clean Authority of Tokyo

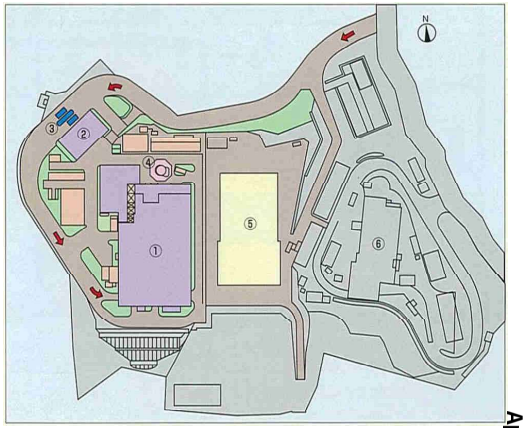


Source: Leaflet of Wien Energie GmbH

Layout of WtE facility

Outline of the facilities (Tobuki Incineration Plant)
Site area: 21,445 m²
Construction area: 7,118 m²
(including attached buildings)
Incineration capacity: 300 t/day (100 t/day/furnace × 3)

(1) Incineration plant
(2) Office
(3) Truck weighing station
(4) Stack
(5) Incombustibles Treatment Center
(6) Plastic Recycling Center
(7) Tobuki Yuttari Hall

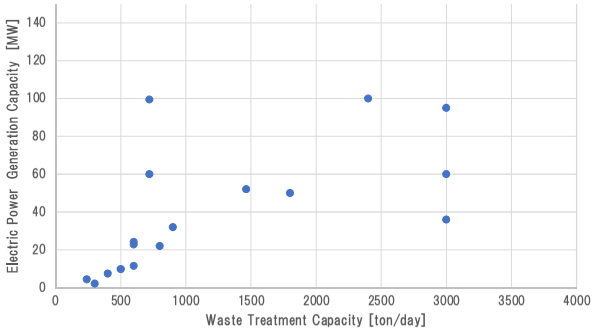


Source: Leaflet of Tobuki Incineration Plant

Appendix 12

Thermal Energy Recovery Process

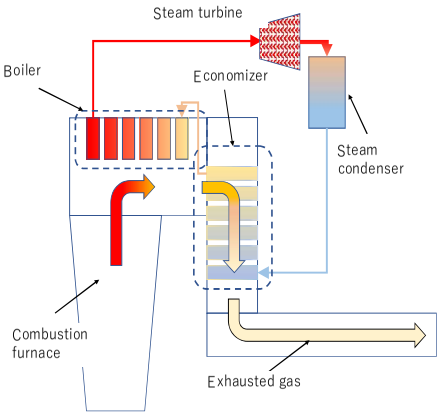
High electricity generation efficiency



- Electric power generation efficiency 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 efficiency

Thermal Energy Recovery Process

Item	Technology
- Increase of heat exchange capacity	- Reduction of exit temperature of economizer
	- Lower air ratio combustion or combustion gas recirculation by advanced combustion control
- Effective utilization of steam	- No utilization of steam for reheating of exhausted gas after cooling
	- No utilization of wastewater closed system
- Increase of the efficiency of steam turbine system	- Introduction of high temperature and pressure boiler
	- Introduction of steam condensing turbine or Water cooled steam condenser
- Increase of thermal energy	- Increase of waste quantity to be incinerated (capacity of WtE-ACC facility)



Source: Based on Guideline for Planning and Designing of Waste Treatment Facility Development in Japan (2017)

Thermal Energy Recovery Process

Utilization of surplus heat after electric power generation

Utilization of surplus heat after utilization of electric power generation

- District heating
- Hot bath for community
- Botanical garden
- Sky resort
- Pool, etc

Environmental Pollution Control (Standard)

Stricter standard for environmental pollution

Japan (Shinkoto)	Japanese Law	Facility standard	Actual
NOx [ppm]	250	60	36 - 41
HCl [ppm]	430	15	<2
SO2 [ppm]	Area basis	20	<1
HF [ppm]	-	-	-
Particulates [g/Nm3]	0.08	0.02	<0.001
Mercury [μg/Nm3]	50	-	<5
DXNs [ng/Nm3]	0.1	-	<0.00005

Exhausted Gas	EU (O_2-12%)	Japan (O_2-12%)
NOx [ppm]	87.7	250
HCl [ppm]	5.5	430
SO2 [ppm]	15.7	28
Particulates [mg/Nm3]	9	80
Mercury [μg/Nm3]	45	50
DXNs [ng/Nm3]	0.09	0.1

France (Isseane)	EU & French Law	Facility standard
NOx [mg/Nm3]	200	65
HCl [mg/Nm3]	10	5
SO2 [mg/Nm3]	50	17
HF [mg/Nm3]	1	0.8
Particulates [mg/Nm3]	10	3
Mercury [μg/Nm3]	50	30
DXNs [ng/Nm3]	0.1	0.07

- Stricter standard for facility in Japan and EU
- Facility standard or actual data in Japan satisfies the EU standard

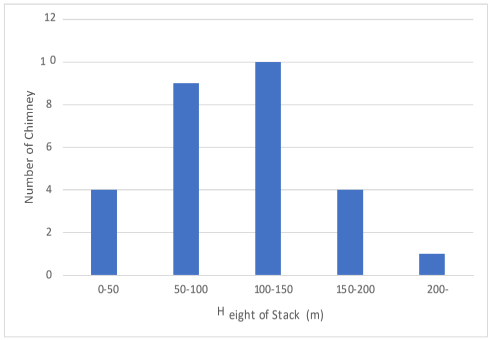
Appendix 12

Environmental Pollution Control (Exhausted Gas Treatment)

Typical Pollution Control Technologies	Explanation of Each Pollution Control Technology	Feature
Bag filter	Bag filters are composed of filter bags, which capture particles in exhaust gas.	- Pollutant particles or gaseous pollutant absorbed with particle are **removed effectively**
SNCR and SCR	To accelerate the reaction between the NOx and catalyst or ammonia.	- **Higher NOx removal** is possible,
Scrubber (Wet scrubber, dry scrubber)	In wet scrubber, exhaust gases are brought into contact with water and liquid reagents to absorb pollutant gases. Both the dry scrubber type neutralizes acid gases and produce a dry residue.	- Wet scrubber is **effective at removing acid gases**, but is less efficient in thermal energy terms and produces a liquid residue - **Dry scrubbers** are generally preferred as the **dry residue is easier to handle** but they are **less effective than wet scrubber**.
Flue gas recirculation	Flue gas recirculation lowers excess air rate,	**To reduce exhaust gas and NOx** **To increases thermal efficiency.**

Source: Based on Guideline for Planning and Designing of Waste Treatment Facility Development in Japan (2017)

Environmental Pollution Control (Hight of Stack)



Wastewater Treatment

Item	Wastewater comes from					
	Waste pit	Ash treatment	Wet scrubber	Domestic wastewater	Washing equipment or facility	Washing car
pH	5-7	7-12	5-8 (after treatment)	5-8	7-11	5-8
SS	○	●	●	○	◎	◎
BOD	●	◎	○	○	○	○
COD	○	◎	◎	○	○	○
Oil	◎	–	–	○	○	◎
Salt	–	◎	●	–	○	–
Fe	○	●	◎	–	○	◎
Zn	○	●	◎	–	○	–
Mn	–	●	◎	–	○	–
Cr	–	◎	◎	–	○	–
Cd	–	○	◎	–	–	–
Cu	–	○	◎	–	–	–
Pb	–	◎	◎	–	–	–
Hg	–	–	○	–	–	–

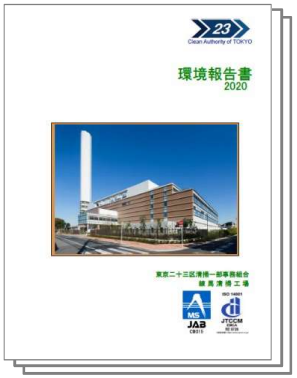
Note: ●: Especially high concentration, ◎: high concentration, ○: some concentration, –: Little concentration
Source: Based on Guideline for Planning and Designing of Waste Treatment Facility Development in Japan (2017)

Wastewater Treatment

Wastewater comes from	Characteristics	Treatment
Waste pit and car and platform washing	High organic contents (high BOD) from waste pit Fluctuation due to change of waste amount and characteristics. Oil in wastewater from car washing	- Organic wastewater can be treated by biological treatment method - Inorganic wastewater can be treated by coagulation/ chelate/ alkali/ sulfide filtration process, etc. - In principle, organic wastewater shall be separated from the inorganic content.
Wastewater from ash treatment	To be treated as inorganic wastewater (high heavy metal) in case of low ignition loss	
Wastewater from domestic facility	Wastewater from toilet and kitchen in the administrative office Quality is same as domestic wastewater	

Source: Based on Guideline for Planning and Designing of Waste Treatment Facility Development in Japan (2017)

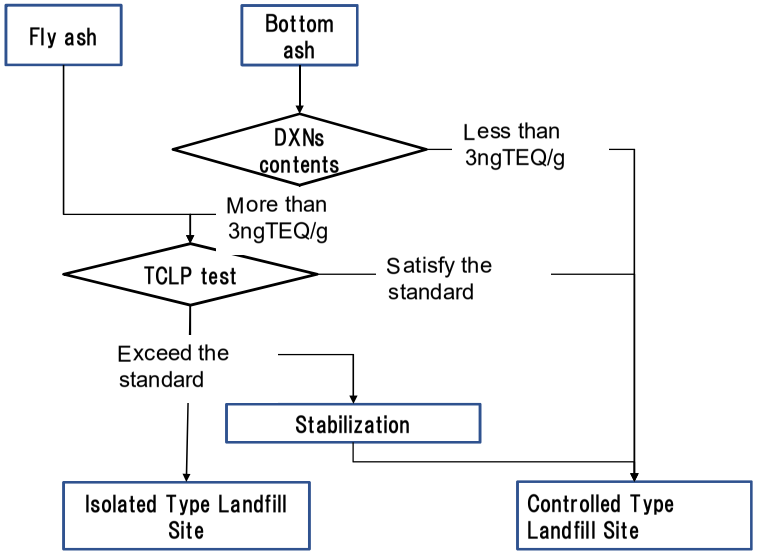
Environmental Monitoring and Dissemination to Public



Preparation of environment monitoring and management report in WtE facilities

Monitoring and dissemination to public of monitoring data

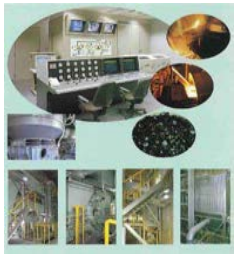
Ash Treatment



Ash Treatment (possible of recycling after separation and treatment)

Material recycle in bottom ash or slag	- Ferrous scrap metal in bottom ash is separated up by electro-magnetic separators to sell local steel mill factory.

Ash utilization	- Ash is utilized for road construction material after melting - Bottom ash is utilized for cement ingredient after removing chloride composition.



Maraming salamat po !

Appendix 12

*WTE-ACC: Waste-to-Energy with Appropriate Combustion Control

Institutional and Financial Features of WTE-ACC

Dissemination Seminar

At Discovery Suites Hotel Clermont Function Hall on 3rd June 2022

Makoto KOSAKA, SWM-PPP Expert

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

Objective and Contents of Session 3

*Session 2 "Technical Features of Appropriately Controlled Combustion Technology" explains **JET's case study analysis result from 58 WTE Projects in the world** in Technical Aspects,*

This Session 3 "Institutional and Financial features of WTE-ACC" intends to introduce following aspects;

1. ***Project Development and Implementation,***
   - *(1) Business Scheme / Project Implementation Framework*
   - *(2) Development Approach,*
   - *(3) Scope of Project,*
   - *(4) Implementation Schedule,*
2. ***Finance of WTE-ACC Projects,***
   - *(1) Capital Expenditure (Capex),*
   - *(2) Operation and Maintenance Expenditure (Opex),*
3. ***Public Involvement, Information, Education and Communication (IEC),***
4. ***Cost-Sharing Scheme for WtE in neighboring countries,***
   - *(1) Japan*
   - *(2) Indonesia*
   - *(3) Feed-in Tariff (FiT) for WtE*

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

Major Project Schemes applied in WTE-ACC Projects

Common in Developing Counties

PPP Modalities		Role: Construction Period: Design	Const.	Finance	Operation Period: Op.	Mt.	Owner of Facility: Const. Period	Op. Period	After Op. Period	Explanation
PFI	BOO	Private	Private	Private	Private	Private	Private	Private	Private	PFI over BOO/BOT/BTO, which Private sector raise funds, design, construct, and operate the facility thru project period. [BOO] Ownership will not be transferred to the public even after the operation period. [BOT] Ownership will be transferred to the public at the end of operation period. [BTO] Ownership will be transferred to the public after completion of the facility.
	BOT	Private	Private	Private	Private	Private	Private	Private	Public	
	BTO	Private	Private	Private	Private	Private	Private	Public	Public	
Non-PFIs	DBO	Public	Public	Public	Private	Private	Public	Public	Public	The public sector raises funds through bonds and grants, and comprehensively outsources the design, construction, operation of the facility to the private.
	DBM	Public	Public	Public	Public	Private	Public	Public	Public	The public sector raises funds through bonds and grants, and comprehensively outsources the design, construction, maintenance of the facility to the private.
	Public Build + long term O&M contract	Public	Public	Public	Private	Private	Public	Public	Public	The public sector designs and constructs the facility, and the private is entrusted with the operation for multiple years.

+ Conventional Public Build and Operate Scheme

Notes: In DBO, Public entity orders private contractor to construct the facility.
Source: ITWG Subgroup Output1

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

Table 2 Business Schemes applied to the Existing WtE-ACC Case Studies

Business Scheme	Number of cases	Ratio	In Japan	Outside of Japan	Remark
Public Build (DB) and Operate	21	35%	13	8	Japan, Singapore, Netherland, Italy, Denmark, Finland
DB+O (15yrs)	1		1	0	Japan
DB+O	2	2%	0	2	France, Singapore
DBO (15yrs)	4		4	0	Japan
DBO (20yrs)	10	23%	9	1	Japan, USA
BTO (20yrs)	2	1%	2	0	Japan
BOT (20yrs)	3	2%	0	3	Thailand, Taiwan, India
BOO (25yrs)	1		0	1	Singapore
BOO (22yrs)	1	1%	0	1	Vietnam
-	15				Data can't be obtained in this Case Study
Total	60		29	16	

- ✓ Public Build and Operate (35%) and DBO (23%) where public has ownership (Capex shouldered by public) of WtE is majority.
- ✓ BOT and BOO (3%) are applied in Thai, Taiwan, India, Singapore and Vietnam. Cases in Thai, India and Vietnam are first WTE installations in each country. *> Procurement of front-end finance is the issue for developing counties, in particular LGUs.*
  * Even in Taiwan and Singapore, BOT or BOO is not majority of their business scheme in WtE-ACC development.

Appendix 12

There are 2 development approaches, namely "Solicited" and "Unsolicited". According to PPP Center, these are explained as below;

Solicited vs Unsolicited Proposals;

In case of WTE-ACC, this usually be LGU

Solicited proposal;

A solicited proposal refers to projects identified by the **implementing agency (IA)** from the list of their priority projects.
In a solicited proposal, the IA formally solicits the submission of bids from the public. The solicitation is done through the publication of an invitation for interested bidders to submit bids, and selection of the private proponent is done through a public competitive process.

Unsolicited proposal;

In an unsolicited proposal, **the private sector project proponent** submits a project proposal to an IA without a formal solicitation from the government. An unsolicited proposal may be accepted for consideration and evaluation by the IA, provided it complies with the following conditions:

1. It involves a new concept or technology and/or it is not part of the list of priority projects in the Philippine Investment Program (PIP) [Medium Term Public Investment Program, Comprehensive and Integrated Infrastructure Program (CIIP)] and the Provincial/Local Investment Plans;
2. It does not include a Direct Government Guarantee, Equity or Subsidy;
3. It has to go to ICC for the determination of reasonable Financial Internal Rate of Return (FIRR) and approval to negotiate with the Original Proponent; and
4. After successful negotiation, proceed to publication and request for competitive proposals according to Swiss Challenge Rules.

Table 3 Development Approach of WtE-ACCs Case Study

Development option	Cases	%
Solicited	51	85
Solicited (1993), Unsolicited (2007)	1	2
No information	8	13
Total	60	100%

- ✓ Solicited approach was taken in 51cases (85%) out of 60 cases, only one case (Afval Energie Bedrijf Amsterdam, ID301, Netherlands) adopted the unsolicited approach in their latest development while first phase of this facility was developed by solicited approach,
- ✓ There are numerical numbers of submitted unsolicited proposals in Philippines and ASEAN countries, where LGUs don't have enough budget for front-end cost e.g. planning, FS, procurement, etc. **However, there are also a mountain of cases which private proposals** without enough deliberation of the concept or master plan of LGUs' MSW management **were cancelled or not materialized because of less due diligence, market change, loss of private interest, administration changes, etc.**
- ✓ **WtE-ACC is a waste treatment project** as well as power generation project. Since implementation of MSWM as planned is the obligation of LGUs, **LGU shall have right to handle the WtE-ACC project planning and implementation.** By reducing the scope of works for private partner, LGUs decision flexibility can be increased.
- ✓ For the purpose to increase the number of private interest, national government shall specify minimum technical requirements and specifications, and LGUs shall detail out the facility requirements based on local MSWM conditions and expectations.
- ✓ Therefore, it is suggested that LGUs to prepare its MSW facility plan by themselves first (not rely on private proposal at beginning). In which, main objectives and expectation of WtE-ACC facility, waste stream (mass balance), scope of private company shall be at least identified. By this, evaluation of unsolicited proposals can be easy drastically.

Table 4 Case studies on Scope of Works between Public/Private

	Business Scheme	Collection	Transp.	Processing WTE-ACC	Energy Sale	Bottom Ash	Fly ash
Suginami Incineration Plant (ID103)	Public Build and Operate	LG	LG	CAT23 (Public)	CAT23 (Public)	CAT23 (Public)	Tokyo Metropolitan Government
Kushiro Wide-Area Federation WtE Facility (ID109)	DB+O (15yrs)	LGs	LGs	Federation (Public)	Federation (Public)	Federation (Public)	Federation (Public)
Funabashi South Incineration Plant (ID110)	DBO (15yrs)	LG	LG	SPC	LG	LG	LG
Mito city incineration plant (ID111)	DBO (20yrs)	LG	LG	SPC	LG	SPC	SPC
Tuas South WtE Plant (ID202)	Public Build (DB) and Operate	NEA	NEA	NEA	NEA	NEA	NEA
Keppel Seghers Tuas WtE Plant	BOT (25yrs)	NEA	NEA	SPC	SPC	NEA	NEA
Nong Khaem WtE plant	BOT (20yrs)	BMA	BMA	SPC	SPC	BMA	BMA
Afval Energie Bedrijf Amsterdam (AEB) (ID301)	Public Build (DB) and Operate	AEB+LGs	AEB+LGs	AEB	JV with energy grid	AEB	AEB
Issy-les-Moulineaux WtE plant (Isseane) (ID303)	DB+O	SYCTOM	SYCTOM	Private	SYCTOM	Private	Private
Amager Bakke (ID307)	Public Build (DB) and Operate	LGs	LGs	ARC	ARC	ARC	ARC
Palm Beach Renewable Energy Facility 2 (ID318)	DBO (20yrs)	SWA	SWA	PBRRC	PBRRC	SWA	SWA

Notes) ■: responsibility of public entity, ■: responsibility of private partner,

- ✓ **Table 4** shows the task allocation throughout the waste management flow (from collection of MSW to final disposal of ash) in 11 selected cases.
- ✓ **There is no case which LGs contract out to WtE-ACC partner to do from MSW collection and transportation services.** This is because contract from collection up to final disposal (Called as **Removal** contract) is highly depending on private partner and there is risk in the contract price negotiation, bankruptcy of private partner, etc.

Table 5 Case Studies on the Duration of Original Plan to Bid and Construction

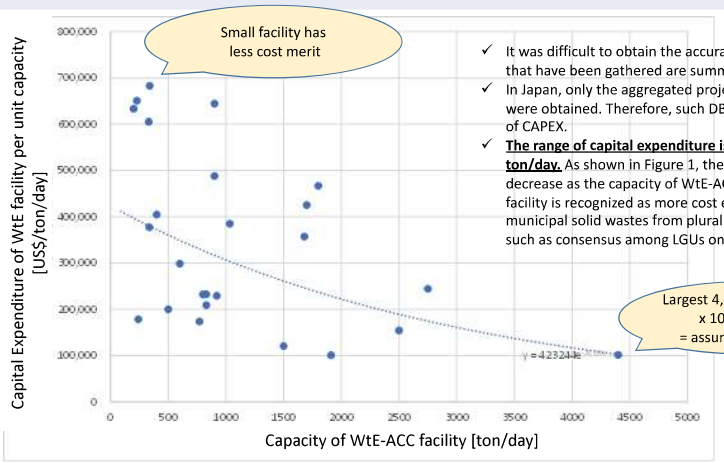
Duration (Years)	Effective number	Average	Maximum	Minimum*
From Facility Plan to Bid	15 cases	2.9 years	5.3 years	1.0 years
Construction (incl. design)	37 cases	4.0 years	6.6 years	2.0 years +

Note: Some cases don't have the month of bid or completion of construction so minimum years might be deliberated more.

- ✓ **Table 5** shows the required periods for the development of WtE-ACC by case study.
- ✓ Average project implementation timeline is **2.9 years for preparation of bid**, **4.0 years for construction (including design)** according to the outstanding cases in operation.
- ✓ 2.9 years from planning to bid announcement seems a bit longer. However, **considering the longest case takes 5.3 years, and there are a lot of projects which are not materialized, implementation Agencies must know that due deliberation of facility plan as well as bidding document must be taking time.**
- ✓ **With regard to the construction period, since most of facilities are ordered based on design-build basis, designing, construction and commissioning requires 4.0 years in average, at maximum 6.6 years**. In minimum a case shows 2.0 years but this case only has the information of year, so actual construction period might be longer than 2 years.

Appendix 12

2. Finances of WTE-ACC projects
(1) CAPEX



- ✓ It was difficult to obtain the accurate CAPEX of WtE-ACC facilities. The cases that have been gathered are summarized in Figure 1.
- ✓ In Japan, only the aggregated project cost of DBO projects including O&M cost were obtained. Therefore, such DBO projects are removed from the estimation of CAPEX.
- ✓ **The range of capital expenditure is from US$100,000 to US$700,000 per ton/day.** As shown in Figure 1, the capital expenditure per capacity tends to decrease as the capacity of WtE-ACC facility increase. Larger capacity WtE-ACC facility is recognized as more cost effective. In this sense, it is better to gather municipal solid wastes from plural LGUs if conditions to cluster can be satisfied such as consensus among LGUs on a reasonable cost of waste transportation

Figure 1 Relationship between CAPEX (USD/t/day) and WTE Capacity (t/day)

2. Finances of WTE-ACC projects
(2) OPEX

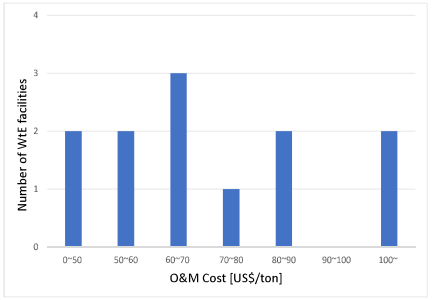


Figure 2 OPEX of each WtE facility

- ✓ O&M expenditure include fuel, electricity, chemical agent and personnel cost.
- ✓ **The O&M of WtE-ACC facilities, especially in EU and Asian countries other than Japan are not published and are difficult to access.**
- ✓ However, according to the data collected in Japan, the OPEX of incineration is approximately USD50 - 100/ton.
- ✓ Table 6 shows the breakdown of O&M expenditure of 3 WTE-ACCs in Clean Authority of Tokyo. Biggest cost items is maintenance in Shinkoto (44%) and Toshima (37%) which are operated by CAT directly while Ota WTE-ACC contract to private to operate the facility therefore Others is the biggest ratio (55%) and Personnel is lowest (5%).

Table 6 Examples of Operation and Maintenance Cost of WtE-ACC Facility (Japan)

Item	Unit	Shinkoto (ID102)		Toshima (ID123)		Ota (ID101)	
Personnel cost	million US$	7.0	22%	1.9	13%	0.7	5%
Utility cost	million US$	2.3	7%	0.8	5%	0.9	6%
Maintenance	million US$	**13.8**	**44%**	**5.2**	**37%**	**2.0**	**13%**
Ash handling	million US$	4.7	15%	1.3	9%	3.2	21%
Others	million US$	3.6	12%	**5.0**	**35%**	**8.3**	**55%**
Total O&M cost	million US$	31.4	100%	14.2	100%	15.0	100%
O&M unit cost	US$/ton	76.4	-	154.1	-	86.8	-
Waste amount	1,000 ton/yr	411.6		92.1		173.1	

3. Public Involvement, Information, Education and Communication (IEC)

- ✓ **Consensus with public, and public involvement is an essential part of the smooth implementation of WtE-ACC project.**
- ✓ EIA systems in each country, which facilitates the public involvement process of the project. **As part of EIA, public hearing and public consultation meetings are held during the planning and design stage.** In case of Japan, the procedure of public consultation meeting for WtE-ACC project is stipulated in the EIA Act as well as EIA ordinance in each prefecture.
- ✓ A public consultation meeting is open to anyone including residents near the site, NGO, academic experts. The meeting date or venue and the project profile are disseminated before a certain day and the project so that the participants have time to prepare the questions or explain their opinions.
- ✓ **WtE-ACC facilities basically accept facility tours by the public including residents**, NGOs and students so that the WtE-ACC operator can verify their environmental compliance and performance of MSW treatment.
- ✓ The tour is often utilized as an opportunity of environmental education to visitors as well. **The visitors of WtE-ACC are reminded and encouraged to think about MSW issues, their lifestyle and behavior in daily life.** Some pictures from a WtE-ACC facility tour exhibiting the environmental education area, air quality monitor in a WtE-ACC facility is shown in left figure.

4. Cost-Sharing Scheme for WtE in Neighboring Countries
(1) Funding support for SWM facilities by National Government in Japan

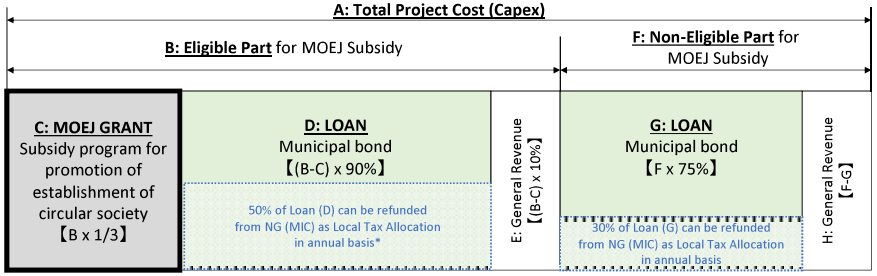
In 1950s, Japanese LGUs didn't have knowledge/technology and finance/budget to control the increased waste. NG amended the law to introduce NG's technical and financial support to LGUs to implement appropriate waste treatment. **The table below shows the Subsidy program for Waste Treatment Facilities (WTFs) provided by MOEJ from 1977. This subsidy program itself doesn't differ in priority depending on the situation of applied LGU such as tax revenue, urgency of waste treatment, geological situation, etc.**

Name	Subsidy program for promotion of establishment of circular society
Eligible entity	A LG or clustered LGs in Japan who has population above 50K or area 400km2 Some exceptions for island, peninsula, mountain, heavy snow, etc.
Conditions	**1/3 of total cost of target facility** (See Next Slide). LG(s) **shall prepare the facility plan (Feasibility Study)** as the application document, which shall be along with LG's MSW management master plan and have quantitative targets e.g. waste generation reduction, recycle ratio, energy recovery, final disposal amount.
Budget of MOEJ	FY2021 JPY 62,741M (USDe 627M) FY2020 JPY 118,665M (USDe 1,187M) FY2019 JPY 116,487M (USDe 1,165M)
Remarks	All LGs who meet with above condition can apply. No prioritization condition (e.g. low income LG, urgent necessity, etc.). To prepare application, renewing master plan, FS, TA, etc. shall be needed so it takes at least 3-4 years.

Next Slide **shows more detail about MOEJ subsidy and other supports on debt part.**

Appendix 12

4. Cost-Sharing Scheme for WtE in Neighboring Countries
(1) Funding support for SWM facilities by National Government in Japan



1. There are at least 3 NG Incentives for the WTF project in Japan, which targets Capex support only,
2. For the calculation of MOEJ Grant Amount, Capex shall be divided to Eligible part (above B) and Non-Eligible Part (above F),
3. NG/MOEJ provides grant (above C) to LG 1/3 of eligible part of Capex, *1
4. LG shall procure rest part by Municipal bond (above D) at low interest rate (0.5-0.8% *2) and general revenue source (above E),
5. LG shall also procure Non-Eligible part by Municipal bond (above G) and general revenue source (above H),
6. LG shall repay principle and pay interest for these Municipal bond part in annual basis,
7. However, a part (50% of D, and 30% of G) of principal repayment and Interest payment in previous year can be refunded by NG/MIC in the form of addition to the Local Tax Allocation in next year *3,

Note1) Since Blue-dot boxes will be "REFUNDED" by NG/MIC (Ministry of Interior and Communication) in the form of addition to the Local Tax Allocation in next year, payment of interest/repayment of principle in previous year is subject condition, therefore, while local tax allocation itself is NOT limited it's usage, it can be said that its usage is substantially appropriated (can be said as "limited") to the payment of interest/repayment of principle of debt part of WTF in next year.

Note2) Furthermore, it can be said that there are non-eligible municipalities for the "Local Tax Allocation" e.g, Tokyo Metropolitan Government, Narita city and Toyota city who have higher tax revenue by industrial concentration, etc.

4. Cost-Sharing Scheme for WtE in Neighboring Countries
(2) WtE-ACC project promotion by PPP scheme in Indonesia

- ✓ The Government of Indonesia declared promotion of WtE-ACC projects in the country and designated the 12 priority areas for development of WtE-ACC facilities by the Presidential Decree 2018-35. Although the WtE-ACC facility is not yet operational in Indonesia, some LGUs are currently preparing to develop WtE-ACC projects.
- ✓ The following policy instruments were installed in Indonesia to promote WtE-ACC projects by PPP scheme:

A) **Viability Gap Funding (VGF):** Government's subsidy for investment cost of PPP projects
A financial support funded by Ministry of Finance, to support establishment of PPP projects by providing part of Construction Cost for projects which have high social/economic benefits but low financial profitability.

- Form of payment: Cash
- Eligibility for payment: Part of construction cost.
- Timing of payments: To be stipulated in PPP project agreement. (Certain stages during construction period and commercial operation date.)
- PPP projects implemented by LGUs can be funded from LGUs' fund in addition to VGF.

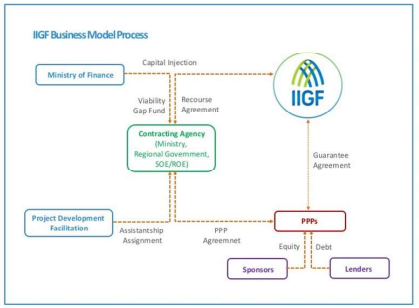
B) **Availability Payment (AP):** Government's subsidy for operational cost of PPP projects.
A system whereby Government Contracting Agency (GCA) promises a fixed payment to the private operator in return for the provision of infrastructure services at a specified quality under a PPP contract. Adequate return on investment for PPP projects involving O&M of infrastructure over a long term can be guaranteed from private operator's perspective.

C) **Feed-in-tariff (FiT):** set at US¢13.35/kWh

4. Cost-Sharing Scheme for WtE in Neighboring Countries
(2) WtE-ACC project promotion by PPP scheme in Indonesia

D) Indonesian Infrastructure Guarantee Fund (IIGF): Government's guarantee for PPP project
IIGF is a public guarantor established and 100% owned by Ministry of Finance. IIGF guarantees the performance of GCA in PPP projects and promises financial compensation on behalf of GCA in case GCA defaults on its obligations, thus making a significant contribution to reducing risk of private operators. In PPP projects where IIGF guarantee contracts are signed, three types of contracts (i) PPP project contract, (ii) guarantee agreement, and (iii) recourse agreement are basically signed by private sector, GCA, and IIGF. **Figure 9** illustrates the business model process of IIGF.

- PPP Project Contract:
  A PPP project contract is concluded between Private Operator and GCA, which stipulates rights and obligations related to a PPP project.
- Guarantee Agreement:
  IIGF and Private Operator will conclude a guarantee agreement for a PPP project. This agreement will guarantee performance of a PPP project contract by GCA.
- Recourse Agreement:
  In addition to the above, IIGF will enter into recourse agreement with GCA. If certain requirements are met, IIGF will make payments to Private Operator on behalf of GCA in response to payment requests by Private Operator. Then, IIGF will collect recourse payments from GCA under this Recourse Agreement.



Source: IIGF, Indonesia

Figure 9 IIGF's Business Model Process

4. Cost-Sharing Scheme for WtE in Neighboring Countries
(3) Feed-in-tariff (FIT) for WtE

- ✓ The FIT scheme applied for WtE projects in the Philippines as well as for other Southeast Asian countries is summarized in Table 8 below.
- ✓ In Philippines, FiT had applied for renewable energy such as wind, biomass (including WtE-ACC), solar and run-of river hydropower pursuant to ERC Resolution No. 10 Series of 2012. Application of the FIT for WtE-ACC project is already ended on 31Dec2019.

Table 8 FiT applied to WtE-ACC Project in the Southeast Asian Countries + Japan

Country	Enforcement	Tariff (US cent/kWh)	Condition, Remarks
Indonesia	2018	13.35	Capacity: < 20MW
		14.54 – (0.076 * [Capacity])	Capacity: > 20MW
Thailand	2015	20.9	Capacity: < 1MW
		19.2	Capacity: 1~3MW
		16.8	Capacity: > 3MW
Vietnam	2014	10.05	Applied for incineration
		7.28	Applied for landfill gas
Malaysia	2011	6.5 – 7.4	Applied for biomass/biogas
Philippines	**2013**	**13.3 (0.5% degression rate after 2years from effectivity of FIT)**	**Installation target – fully subscribed Period for qualification – ended on 31 December 2019**
Japan	2013	15.0 (as of 2021)	Only biomass fraction

Source: ITWG Subgroup Output1

Appendix 12

Thank you for your attention!

*WTE-ACC: Waste-to-Energy with Appropriate Combustion Control

WTE-ACC* Related Technical Standards

Dissemination Seminar

3rd June 2022 @ Discovery Suite Hotel

Makoto KOSAKA, SWM-PPP Expert

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

Contents

a. Recent Updates on WTE-ACC Related Technical Standards in Philippines

- Clean Air Act 1999 / Section 20. Incineration Ban
- DENR MC2002-05
  "Clarification on Incineration Ban"

Exhaust gas controlled incineration is not prohibited

- NSWMC Resolution 2016-699;
  "Guidelines governing the Establishment and Operation of Waste to Energy Technologies for MSW"
- DAO2019-21;
  "Guidelines governing Waste-to-Energy (WtE) Facilities for the Integrated Management of MSW"

Present situation;
- DAO2019-21 is not so specific on the technical issue,
- Main initiator of WTE development is LGU who is responsible of MSW in their jurisdiction, however LGU doesn't have capacity in particular the WTE technical aspect,
- National Government (e.g. DENR, DOST, etc.) shall regulate minimum requirement – **based on globally applicable standards**;
- Recommendation to the Philippines;

a. WTE Technical Standards set force in Japan/EU

*WTF includes WTE-ACC, Biogas, Compost, MRFs, RDF Production, etc.

- Japan has approx. 1,127 Waste Incineration Facilities in operation, which complies following standards,
- IRR of "Waste Treatment and Public Cleaning Law (1971~)" set following technical standards;
  (1) Structural Standards of Waste Treatment Facilities* (S/S),
  (2) Operation and Maintenance Standards of Waste Treatment Facilities* (OM/S),
  - ✓ S/S is mainly used when the facility basic plan is applied to provincial government for the building permit.
  - ✓ While S/S aims to be a checklist for both applicant/evaluation body whether each functional requirement of the facility meet with the standards or not at the WTFs building permission stage, OM/S is used in daily operation as well as periodical inspection.
  - ✓ Permission applicant shall prepare O&M plan and corresponding O&M report every year to disclose how the facility meet with this O&M/S in their website, etc.
  - ✓ This Japanese WTFs permitting system, thorough the evaluation of applied WTF plan by provincial government, enables to prevent frequently occurred MSW violations such as;
    (1) Pollution for the living environment caused by careless handling of waste, (2) Improper disposal of waste to avoid proper waste treatment cost,
- LGUs can construct WTE-ACC as long as it comply with S/S and OM/S, however, Ministry of Environment Japan set another technical standards namely "Guidelines for Performance Standards of WTFs for National Subsidy Program (P/S)", which request LGU to follow stringent standards in case if LGU wants to use subsidy program.
  - ✓ Caused by recent mass-production, mass disposal society at 2000s, social problems such as increase of environmental impact as well as running out of disposal space are occurred.
  - ✓ For the conservation of living environment in the future, together with waste prevention and reuse/ recycle activities, installation of waste treatment facilities (WTFs) subject to the improvement of stability and reliability on the waste treatment is absolutely necessary.
  - ✓ Therefore, in addition to the S/S and OM/S regulated in Waste Treatment and Public Cleaning Law, this performance requirements are set for the national subsidy projects.

Appendix 19

b. WTE Technical Standards set force in Japan/EU

- EU has approx. 499 WtE Plants in operation,

- **EU Directive 2010/75/EU "On Industrial Emissions (Integrated Pollution Prevention and Control)"** provides regulatory frameworks of waste incineration plants; which consolidated relevant waste management directives such as;
  - **Directive 2000/76/EC on the Incineration of Waste,**
  - Directive 2001/80/EC on the Limitation of emissions of certain pollutants into the air from large combustion plants,
  - Directive 2008/1/EC concerning integrated pollution prevention and control, etc.

- Annex I of Directive 2010/75 stipulates activities covered by this Directive, in which;
  (1) Energy industries, (2) Production of metals, (3) Mineral Industry, (4) Chemical Industry, **(5) Waste Management**, etc.

- Articles under "Chapter IV Special Provision for Waste Incineration Plants and Waste Co-Incineration Plants" and Annex VI "Technical Provisions relating to Waste Incineration Plants and Waste Co-Incineration Plants" introduces technical requirements for the Waste Incineration Plants such as but not limited to, permission condition, emission control, monitoring, operating conditions, waste acceptance, residues, etc.

This session aims to lay down these outstanding standards and figure out the necessary refinement of DAO2019-21

c. Components of Technical Standards ~ Recommendation to Philippines

1. General Conditions
2. Complete Combustion Control
3. Exhaust Gas Control
4. Wastewater Control
5. Ash Management
6. Other Environmental Pollution Control,
7. Other Requirement,

1.1 Requirement of Facility Structure

	Article 4 of IRR of "Waste Treatment and Public Cleaning Law" (1971-) (1) Structural Standards of WTFs (S/S) (2) O&M Standards of WTFs (OM/S) (3) Performance Standards of WTFs for National Subsidy 2008 (P/S)	DIRECTIVE 2010/75/EC DIRECTIVE 2000/76/EC	Proposed refinement to DAO2019-21, Guidelines governing WtE Facilities for the Integrated Management of MSW in Philippines
1.1 Facility Structure	1. To be safe in terms of structural strength against self-weight, loading capacity and other loads, seismic force and temperature stress.	No Specific Requirement	DAO2019-21 Sec. 5 requires WTE facility shall comply with EIS process. **=> Recommend to refer any structural/civil/building codes applicable in the Philippines**, e.g.; - Building Code of DPWH - Geographical and geological requirements in EIA, - Siting requirement for SLFs, etc.

1.2 Material, Anti-Corrosion for WTE

	Article 4 of IRR of "Waste Treatment and Public Cleaning Law" (1971-) (1) Structural Standards of WTFs (S/S) (2) O&M Standards of WTFs (OM/S) (3) Performance Standards of WTFs for National Subsidy 2008 (P/S)	DIRECTIVE 2010/75/EC DIRECTIVE 2000/76/EC	Proposed refinement to DAO2019-21, Guidelines governing WtE Facilities for the Integrated Management of MSW in Philippines
1.2 Material, Anti-corrosion	3. Necessary measures have been taken to prevent corrosion due to exhaust gas and wastewater, etc. generated from waste and as a result of waste treatment.	N/A	No Specific Condition for the material of WtE in DAO2019-21. **=> Recommend to include.**

High-temperature corrosion in Boiler tube must be prevented by use of anti-corrosion material (e.g. stainless steel).

Appendix 12

1.3 Firefighting Procedure and Equipment

	Article 4 of IRR of "Waste Treatment and Public Cleaning Law" (1971-) (1) Structural Standards of WTFs (S/S) (2) O&M Standards of WTFs (OM/S) (3) Performance Standards of WTFs for National Subsidy 2008 (P/S)	DIRECTIVE 2010/75/EC DIRECTIVE 2000/76/EC	Proposed refinement to DAO2019-21, Guidelines governing WtE Facilities for the Integrated Management of MSW in Philippines
1.3 Requirement for firefighting procedure and equipment.	To take necessary measures to prevent fires and provide fire extinguishers and other fire extinguishing equipment.	N/A	DAO2019-21, Sec. 5 f) WtE facility must be equipped with adequate fire-fighting devices certified by the Bureau of Fire Protection.

Because of contamination of explosive waste, mobile battery, etc., which shall not be mixed with MSW, fire accident of WTE sometimes happen. Due consideration for fire shall be necessary.
(If WTE operation will be stopped, there is no other place to accept waste and waste would be overflowed in the city)

1.4 Operation Stability

	Article 4 of IRR of "Waste Treatment and Public Cleaning Law" (1971-) (1) Structural Standards of WTFs (S/S) (2) O&M Standards of WTFs (OM/S) (3) Performance Standards of WTFs for National Subsidy 2008 (P/S)	DIRECTIVE 2010/75/EC DIRECTIVE 2000/76/EC	Proposed refinement to DAO2019-21, Guidelines governing WtE Facilities for the Integrated Management of MSW in Philippines
1.4 Requirement for operation stability	I. 1 (c) For the continuous running incinerator, it is required to be capable for continuous and **stable operation at least 90 days or more per line.** For the intermittent running incinerator, it is required to be capable for continuous and stable operation as planned at least 90days or more per line. * **To be checked by operational data of commercial facility.** (Detail is omitted)	N/A	**=> Recommend to include.**

While 90 days continuous operation shall be one of the performance requirements, it is tough to demonstrate it within the commissioning period. Therefore, as a compromised solution, this 90 days continuous operation test can be done after the Commercial Operation Date (COD) in Japan.

1.5 Effective Use of Residual Heat

Updated

	(3) Performance Standards of WTFs for National Subsidy 2008 (P/S)	DIRECTIVE 2000/76/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL "on the incineration of waste"	Proposed refinement to DAO2019-21, Guidelines governing WtE Facilities for the Integrated Management of MSW in Philippines
Requirement for effective use of residual heat	N/A in S/S and OM/S as they're standing on appropriate waste treatment aspect. Only P/S of WTFs for National Subsidy says; I. 1 (d) **For the continuous running incinerator, it is required to capable to effective use of residual heat such as power generation, external heat supply, etc.** * To be checked by operational data of experimental facility or commercial facility.	Article 4 Application and permit 2. Without prejudice to Directive 96/61/EC, the application for a permit for an incineration or co-incineration plant to the competent authority shall include a description of the measures which are envisaged to guarantee that: (b) **the heat generated during the incineration and co-incineration process is recovered as far as practicable e.g. through combined heat and power, the generating of process steam or district heating;**	**=> Recommend to include.**

To encourage innovation of technology, Japanese National Subsidy system provides higher subsidy rate to higher power generation efficiency, e.g. WTE-ACC facility with more than 23% of power gen. efficiency can avail 1/2 capex subsidy, etc.

c. Components of Technical Standards ~ Recommendation to Philippines ~

1. General Conditions
2. **Complete Combustion Control**
3. Exhaust Gas Control
4. Wastewater Control
5. Ash Management
6. Other Environmental Pollution Control,
7. Other Requirement,

Appendix 12

2.1 Processing Capacity

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

	Article 4 of IRR of "Waste Treatment and Public Cleaning Law" (1971-) (1) Structural Standards of WTFs (S/S) (2) O&M Standards of WTFs (OM/S) (3) Performance Standards of WTFs for National Subsidy 2008 (P/S)	DIRECTIVE 2010/75/EC DIRECTIVE 2000/76/EC	Proposed refinement to DAO2019-21, Guidelines governing WtE Facilities for the Integrated Management of MSW in Philippines
Processing Capacity Requirement for feeding quantity, to avoid overloading of the facility and incomplete combustion result. WtE operator is not allowed to accept waste more than permitted daily waste capacity.	(OM/S) 1. **To input garbage into facilities shall not to exceed the processing capacity of the said facilities.** (P/S) I. 1 (a) **Facilities must have the capacity to treat waste of the planned qualities and volume** into the planned incineration residue and/or melt-solidified substance. * **To be checked by operational data of commercial facility.** (Detail is omitted)	Article 4 Application and permit 4. **The permit granted by the competent authority for an incineration or co-incineration plant shall**, in addition to complying with any applicable requirement laid down in Directives: (a) list explicitly the categories of waste which may be treated. The list shall use at least the categories of waste set up in the European Waste Catalogue (EWC), **if possible, and contain information on the quantity of waste, where appropriate**; (b) **include the total waste incinerating or co-incinerating capacity of the plant**;	DAO2019-21 Section 6/ 6.1 Waste Delivery Control specifies category of MSW **but not specific condition for the processing capacity** of WTE. Para. 4 of 6.1 requires maintenance of operational record of accepted quantity in weight, source, type of waste, etc. **=> Highly recommend to include to state processing capacity in t/day in EIS, and to prohibit operator to accept waste over the processing capacity to avoid incomplete combustion and adherent environmental pollutions.**

2.2 Waste Feeding System

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

	Article 4 of IRR of "Waste Treatment and Public Cleaning Law" (1971-) (1) Structural Standards of WTFs (S/S) (2) O&M Standards of WTFs (OM/S) (3) Performance Standards of WTFs for National Subsidy 2008 (P/S)	DIRECTIVE 2010/75/EC DIRECTIVE 2000/76/EC	Proposed refinement to DAO2019-21, Guidelines governing WtE Facilities for the Integrated Management of MSW in Philippines
Feeding System Sealing, Mixing waste in the pit before feeding waste into the chamber, requires the feeder shall have function to isolate from outside air.	S/S 7-1. In the case of other incineration facilities, **a supply device capable of quantitatively and continuously introducing waste into the combustion chamber while being insulated from outside air shall be provided.** However, this shall not apply to the incineration facilities designated by the Minister of the Environment. OM/S 2-1. **When inputting waste into the combustion chamber by the pit crane method, to mix the waste uniformly at all times**. 2-2. Inputting waste into the combustion chamber shall be carried out continuously in a quantitative manner in a state of isolation from the outside air in the case of other incineration facilities.	N/A	N/A Highly recommend to include the followings; • Mixing waste in the pit before feeding waste into the chamber, • Feeder shall have function to isolate waste from outside air.

If mixing is not enough, complete combustion and stable operation will be difficult because waste quality is un-even enough (e.g. very wet food waste and very dry plastic waste), it should be averaged. Skilled crane operator can mix them well and recently automated (AI) crane operation and remote crane operation system are developed.

Source; EBARA Env. Plant Co., Ltd.

2.3 Waste Combustion Chamber / Temperature

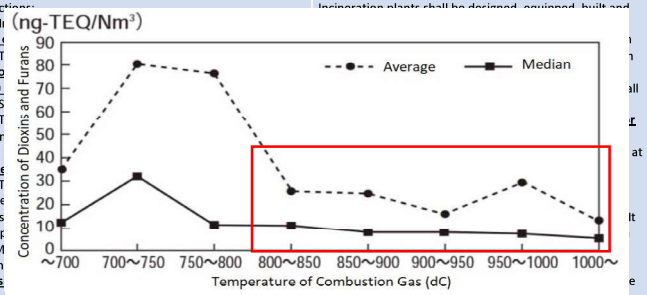
The Technical Cooperation Project (TCP) for Capacity Development on Improving Solid Waste Management (SWM) through Advanced/Innovative Technologies

Requirements for the waste combustion chamber; for the purpose to complete and stable combustion and to avoid generation of pollutants. Requirement of temperature of combustion gas.	(S/S)7-2. Combustion Chamber shall have following functions: (1) Incinerate waste in a state where **the temperature of the combustion gas is 800dC or more*.** (2) To be capable of retaining the combustion gas **for 2 seconds or more while maintaining the temperature of 800 dC or more*. *P/S requires 850dC or more** (3) Said system shall be isolated from the outside air. (4) To have the temperature of the combustion gas promptly raised to or above the temperature said in (1), and **to be equipped with an auxiliary combustion device necessary to maintain the temperature**. (5) The equipment has been installed to supply the necessary amount of the air for combustion (Limited to those having the function of adjusting the amount of supplied air.). (OM/S) 2-3. To maintain the temperature of the combustion gas in the combustion chamber at **800 degrees Celsius or more. *P/S requires 850dC or more.** 2-5. When starting operation, to quickly raise the furnace temperature by operating an auxiliary combustion device, etc. 2-6. When the operation of the said facilities is to be stopped, to keep the temperature of the said facilities high by operating an auxiliary combustion device, etc., and burn all waste.	Article 6 Operating conditions Incineration plants shall be designed, equipped, built and operated in such a way that the gas resulting from the process is raised, after the last injection of combustion air, in a controlled and homogeneous fashion and even under the most unfavorable conditions, **to a temperature of 850dC**, as measured near the inner wall or at another representative point of the combustion chamber as authorized by the competent authority, **for two seconds** (omit) Each line of the incineration plant shall be equipped with at least **one auxiliary burner. This burner must be switched on automatically** when the temperature of the combustion gases after the last injection of combustion air falls below 850dC as the case may be. It shall also be used during plant start-up and shut-down operations in order to ensure that the temperature of 850dC as the case may be is maintained at all times during these operations and as long as unburned waste is in the combustion chamber. During start-up and shut-down or when the temperature of the combustion gas falls below 850dC, the auxiliary burner shall not be fed with fuels which can cause higher emissions than those resulting from the burning of gasoil as defined in Article 1(1) of Council Directive 75/716/EEC, liquefied gas or natural gas.	No requirement for the temperature and retention time for the combustion gas. ⇒ for the complete combustion control, JET recommended to include the followings; (1) the requirement of combustion gas temperature as 850dC or more, (2) its retention time of 2 seconds or more, (3) Combustion chamber has to be isolated from outside air, (4) requirement for quick start-up, (5) requirement of equip the auxiliary fuel combustion devise,

2.3 Waste Combustion Chamber / (1) Temperature

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

Requirements for the waste combustion chamber; for the purpose to complete and stable combustion and to avoid generation of pollutants. Requirement of temperature of combustion gas.	(S/S)7-2. Combustion Chamber shall have following functions: (1) I the (2) T seco 800 (3) S (4) T pro and nec (5) T nece thos supp (OM com Cels 2-5. te d 2-6. high by operating an auxiliary combustion device, etc., and burn all waste.	Article 6 Operating conditions Incineration plants shall be designed, equipped, built and of gasoil as defined in Article 1(1) of Council Directive 75/716/EEC, liquefied gas or natural gas.	No requirement for the temperature and retention time for the combustion gas. ⇒ for the complete combustion control, JET recommended to include the followings; (1) the requirement of combustion gas temperature as 850dC or more, (2) its retention time of 2 seconds or more, (3) Combustion chamber has to be isolated from outside air, (4) requirement for quick start-up, (5) requirement of equip the auxiliary fuel combustion devise,



Above figure shows the Concentration of Dioxins and Furans generation per range of combustion gas temperature. Over 800 to 850, Dioxins and furans generation can be avoided drastically.

Appendix 12

2.3 Waste Combustion Chamber / (2) Ignition Loss

Requirements for the waste combustion chamber; Requirement for characteristics of incinerated bottom ash as "ignition loss" (unburned combustible matter remaining in incinerated bottom ash in weight %). Ignition loss indicates complete combustion level and stable combustion of the furnace. In Japan, Ignition loss shall be regulated to monitor once in every month in KANSEI 95 (Circular No. 95 in 1977).	(OM/S) 2-4. **Incinerate so that ignition loss of the bottom ash to be 10% or less.** However, this shall not apply to the case where the bottom ash is used so as not to cause hindrance to the preservation of the living environment. (P/S) I. 1 (b) **Ignition loss of continuous running incineration residue (excluding fly- ash) shall be 5% or less,** and same of intermittent running incineration residue shall be 7% or less. These are not applied for waste carbonization facility. * To be checked by operational data of experimental facility or commercial facility. (Detail is omitted)	Article 6 Operating conditions 1. Incineration plants shall be operated in order to achieve a level of incineration such that **the slag and bottom ashes Total Organic Carbon (TOC) content is less than 3 % or their loss on ignition is less than 5 % of the dry weight of the material.** If necessary appropriate techniques of waste pretreatment shall be used.	No requirement neither for Ignition Loss or TOC in bottom ash. ⇒for the complete combustion control, together with combustion chamber temperature, JET recommended to include the ignition loss requirement as 5% or less.

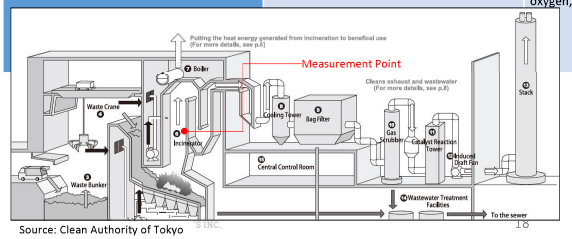
Ignition Loss (or Loss of Ignition) can be calculated by;

I/L (%) = 100 x (W1 – W2)/W1,

Where;
W1: Weight of bottom ash (dry up at 105dC to be constant weight),
W2: Weight of bottom ash after burning at 600dC x 3hrs

2.4 Continuous Measurement System in Combustion Chamber

Requirements for measurement system inside of combustion chamber Basically, it composes thermocouple, transmitter, and DCS. Requirement for continuous monitoring/recording of temperature of combustion chamber.	(S/S) 7-3. Equipment is provided for **continuously measuring and recording the temperature of the combustion gas in the combustion chamber.** (OM/S) 2-7. **To continuously measure and record the temperature of the combustion gas in the combustion chamber.**	Article 11 Measurement requirements 2. The following measurements of air pollutants shall be carried out in accordance with Annex III at the incineration and co-incineration plant: (b) **continuous measurements of the following process operation parameters: temperature near the inner wall or at another representative point of the combustion chamber** as authorized by the competent authority, concentration of oxygen, pressure, temperature and water	DAO2019-21 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 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 => DAO2019-21 already contains CEMS requirement, so recommend to add the monitoring of operational parameters as well.



Source: Clean Authority of Tokyo

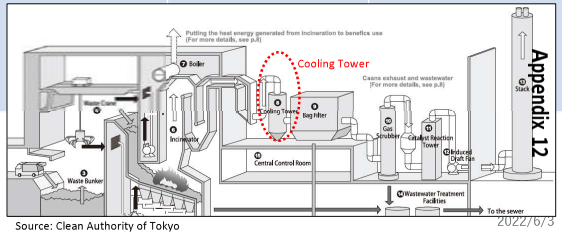
c. Components of Technical Standards ~ Recommendation to Philippines ~

1. General Conditions
2. Complete Combustion Control
3. **Exhaust Gas Control**
4. Wastewater Control
5. Ash Management
6. Other Environmental Pollution Control,
7. Other Requirement,

3.1 Cooling System for DXN regeneration avoidance

Requirements for the capacity of cooling system of combusted gas for the purpose to avoid regeneration of DXNs and burnout of bag filter. Requirement for cooling management of combusted gas. Usually, this is managed by Distributed Control System (DCS).	(S/S) 7-4. **A cooling facility capable of cooling the temperature of the combustion gas flowing into the dust collector to approximately 200 degrees Celsius or less shall be equipped.** However, this shall not apply to the case where the temperature of the combustion gas can be quickly cooled to approximately 200 degrees Celsius or less in the dust collector. (OM/S) 2-8. **To cool the temperature of the combustion gas flowing into the dust collector to approximately 200 degrees Celsius or less.** However, this shall not apply to the case where the temperature of the combustion gas can be quickly cooled to approximately 200 degrees Celsius or less in the dust collector.	N/A	No requirement about cooling tower. => Highly recommend to include.

When reducing the flue gas temperature, there is opportunity for Dioxins and furans to be re-generated at 300-500dC range. So, quick quenching system to be 200dC or less is required.



Source: Clean Authority of Tokyo