

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

### LESSONS LEARNED and WAYS FORWARD



DAVAO CITY, PHILIPPINES

### Technical Cooperation Project for capacity development on improving Solid Waste Management through Advanced/Innovative Technologies :

Participation of Davao City:

OUTPUT 2: Enhancement of Target LGUs' capacity for Planning, Evaluation, Formulation and Supervision of WTE project.

OUTPUT 4: Enhancement of National Government's and target LGUs' capacity to identify issues and provide suggestions/ recommendations for other SWM technologies other than WTE.



DAVAO CITY, PHILIPPINES

### Technical Cooperation Project for capacity development on improving Solid Waste Management through Advanced/Innovative Technologies :

Activities undertaken with Davao City:

1. Consultation meetings and data gathering (10-year SWM Plan, SW volumes and etc.)
2. Site Visits to Davao City Sanitary Landfill including proposed SLF expansion Site and Proposed Waste-to-Energy Site
3. Attendance to seminars and Online Trainings conducted by JET.



DAVAO CITY, PHILIPPINES

### Technical Cooperation Project for capacity development on improving Solid Waste Management through Advanced/Innovative Technologies :

General Outcomes/Realizations:

#### OUTPUT 2

- Better understanding of Waste-to-Energy Technology addresses the wrong notions and eliminate failures and incorrect decisions through careful planning and evaluation of solid waste situations and the technology.
- Segregation and recycling should complement the WTE process to divert more waste from the landfill thereby ensuring the efficient operation of both facilities (SLF and WTE).



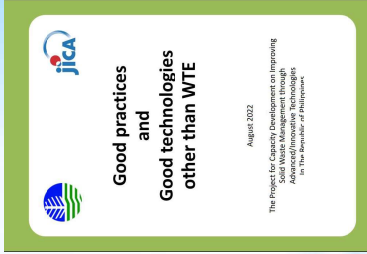
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## Technical Cooperation Project for capacity development on improving Solid Waste Management through Advanced/Innovative Technologies :

General Outcomes/Realizations:

### OUTPUT 4

- Best practices in SWM are already being done in many parts of the country and other countries which can be replicated. Hence, the need to learn from their experiences and adopt the best doable practices to help improve solid waste management in the city.
- Private sector's participation in providing solutions to SWM is indispensable.

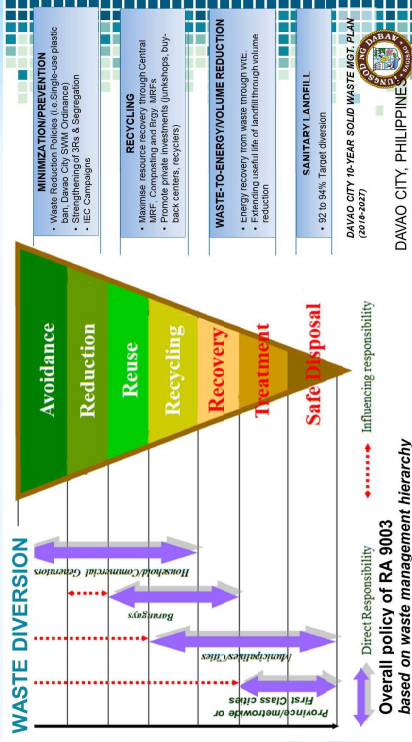


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## Technical Cooperation Project for capacity development on improving Solid Waste Management through Advanced/Innovative Technologies :

Ways Forward:

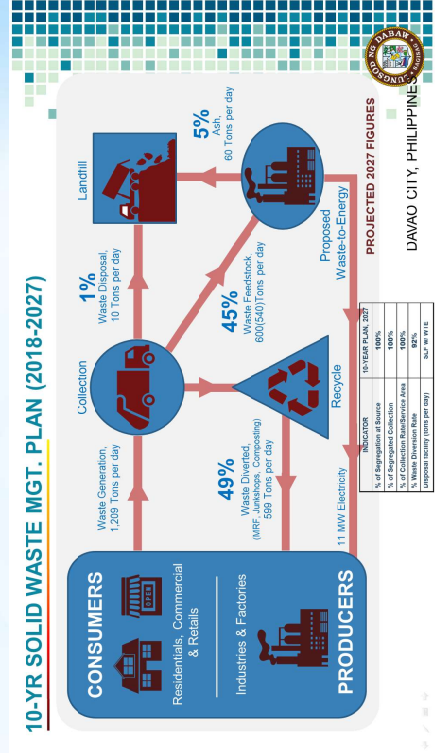
- Pursue with the plans, programs and activities outlined in the City's 10-year SWM Plan taking into consideration the learnings/ outcomes of the TCP project especially on increasing SW avoidance and 3Rs.



## Technical Cooperation Project for capacity development on improving Solid Waste Management through Advanced/Innovative Technologies :

Ways Forward:

- Seek guidance from Outputs produced in the TCP in furthering the WTE project of the City.



DAVAO CITY, PHILIPPINES

THANK YOU!

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

# Manual for Planning, Formulation, Evaluation and Contract Management of WTE-ACC project (PFEC Manual Ver. 6.1) Under Activity 1-6

JCC December 14, 2022 @ Joy Nostalg, Pasig City

Makoto KOSAKA, SWM-PPP Expert



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



## Today's contents

1. Background and Objective of PFEC Manual
2. TOC of PFEC Manual v.6.1
3. Contents of each chapter,

## 1. Background and Objective



❖ **LGUs in the Philippines don't have the experience to plan, formulate, procure, contract and monitor a WTE-ACC facility.**



❖ **Objective: To provide a practical guide to LGUs who don't have the experience, and enable them to address such challenges.**



❖ **It discusses how to evaluate unsolicited proposals for WTEs,**

## 2. Table of Contents of PFEC Manual v.6.1

<b>Ver.6.1</b>	<b>Rationale</b>	<b>NEW</b>
<b>Chapter 1</b>	1.1 Background 1.2 Objective of the Manual (for the development of WTEs) 1.3 Consignment of Professional Engineer 1.4 Access to the Project Development Finances 1.5 Definitions 1.6 Abbreviations	<b>APPENDIX A</b>
<b>Chapter 2</b>	<b>Planning Phase</b> 2.1 Components of the Planning Phase 2.2 Legal requirement to LGUs in MSWM 2.3 Positioning of 10-year Solid Waste Management Plans 2.4 Facility Conceptual Plan 2.5 The selection of candidate construction sites	<b>UPGRADED</b> <b>DOWNWARD</b>
<b>Chapter 3</b>	<b>Formulation Phase</b> 3.1 Formulation of Feasibility Study (F/S) 3.2 Technology selection 3.3 Target Waste Amount 3.4 Target waste quality 3.5 Pollution prevention standards 3.6 Waste heat utilization 3.7 Financial model (Case of BOT/BOO) 3.8 Business scheme 3.9 Role demarcation 3.10 Value Chain Analysis 3.11 Other Aspects	<b>APPENDIX B</b> <b>APPENDIX C</b> <b>APPENDIX D</b> <b>APPENDIX E</b> <b>APPENDIX F</b>
<b>Chapter 4</b>	<b>Evaluation Phase</b>	<b>NEW</b>
<b>Chapter 5</b>	<b>Contract Management Phase</b>	<b>NEW</b>
<b>Chapter 6</b>	<b>Dismantling of WTE-ACC</b> 6.1 Dismantling of WTE-ACC 6.2 Dismantling manual 6.3 Estimation of dismantling costs and financial resources	
<b>Chapter 7</b>	<b>Appendix</b> A: Consignment of Professional Engineer B: Applications/Notifications to the Governments (Example in Japan) C: General Structure of WTE/WTF D: WTE-ACC as a Stable Power Source Cases in Japan E: Safety Measures F: Responsiveness to Disaster Waste	

- Rationale:** provides background and objective of formulation of this manual,
- Planning phase:** whose main message is planning tagged with budgeting plan, is the most important factor to implement WTE/WTF project, so this chapter covers long-term MSW management master plan (10-year SWM plan), and specific project conceptual plan. One of the important elements of conceptual plan, selection of candidate site for WTE/WTF, is also discussed,
- Formulation phase:** covers a lot of factors associated with the project formulation. Technology selection, target waste quantity/quality identification as the technical aspects, financial model and business scheme formulation as financial aspects, appropriate public-private role demarcation and value chain analysis are also important in the legal aspect. All of these aspect shall be sorted in the Feasibility Study before entering into the bidding process. Success of bidding process really depends on the quality of FS.
- Evaluation phase:** is a break chapter where there is discussion on how to evaluate one or more unsolicited proposals raised from private entities.
- Contract Management Phase:** covers how LGUs shall supervise the design and construction works to be done in the construction sub-phase as well as monitor the operational performance in the operation sub-phase. Considering most of WTE projects will be done by BOT/BOO scheme, it is also important to know how much intervention can be appropriate for the investor's specification documents to the EPC/O&M contractors.
- Dismantling of WTE-ACC:** shows the explanation of dismantlement of WTE facility in Japanese case. It is 15 to 20 years from now so just show the example in Japan.
- Appendix:** contains a lot of examples and suggestable issues associated in the development of this guide.

## Draft Manual for the Planning, Formulation, Evaluation and Contract Management of WTE Projects

### 1. Rationale

#### Chapter 1 Rationale

- 1.1 Background
  - 1.2 Objective of the Manual (for the development of WTEs)
  - 1.3 Consignment of Professional Engineer
  - 1.4 Access to the Project Development Finances
  - 1.5 Definitions
  - 1.6 Abbreviations

### 2. Planning Phase

### 3. Formulation Phase

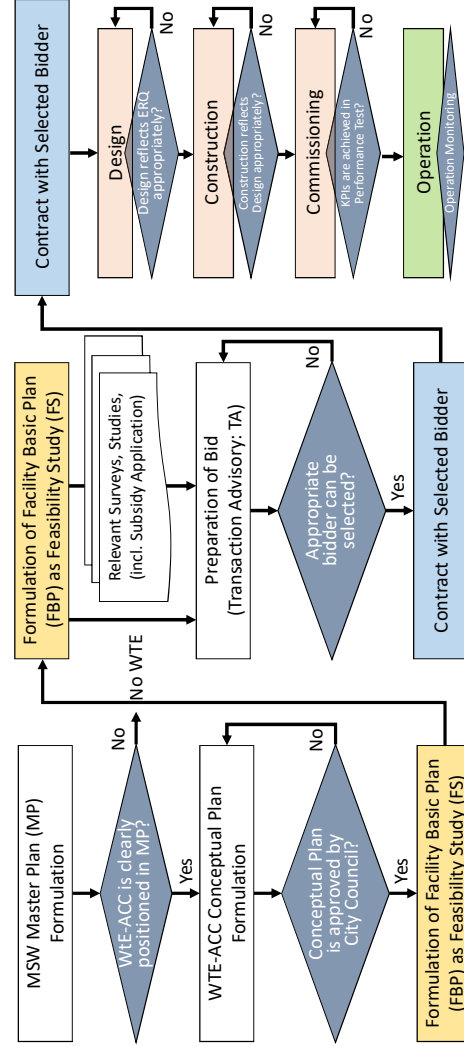
### 4. Evaluation Phase

### 5. Contract Management Phase

### 6. Dismantling of WTE-ACC

### Appendix

## Chapter 1. WTE Standard Project Procedure – as Activity 1-7



## Chapter 1. Rationale: Overall Timeline (in the case of Japan)

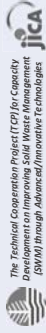
- The table shows the typical timeline for the introduction of WTE facility in the case of Japan.
- Construction of WTE usually takes 3-4 years including the design, construction and commissioning stages. Afterwards, commercial operation can start.
- The total process from Master Plan to commercial operation usually takes 10 years. However, if necessary surveys, studies, and decisions can be done in parallel and appropriately, some portion of the time can be shortened.

Year	1	2	3	4	5	6	7	8	9	10	11	Remarks
MSW Treatment Master Plan (MP) (10 year SWM Plan - Chapter 2)												Reviewed once every 5 yrs
Facility Conceptual Plan												Decision on renewal & site
F/S Facility Basic Plan - Chapter 3)												Decision on proceeding method
Business Scheme Study (PI/PPP)												Decision on business scheme
Applicability Study - Chapter 3)												Reflected in facility basic plan
New Facility												Reflected in facility basic plan
Topographic Survey												1.5-4 yrs
Geological Survey												standard 2 yrs
Environmental Impact Assessment												standard 3-4 yrs
Bid/ Selection of Winning Bidder												
Construction Work (Chapter 5)												
Operation (Chapter 5)												

3. Contract Management Phase

+ Unsolicited Proposal

## Chapter 1. Consignment of Professional Engineer for WTE



- ❖ WTE/WTF take place once every 20-30 years for each LGU, it is not realistic to place engineering experts in the LGU for these projects,
- ❖ Therefore, most of LGs in Japan employ waste treatment specialists who are well-versed in procedures to develop a facility as well as being familiar with laws and technologies in the field,
- ❖ Consignment items for Waste Treatment Consultants (below) and selection criteria (experience for similar projects, licenses) are introduced.
- ❖ So far, there is no project in Philippines, for short term, international experienced consultant is recommended.

a. Drafting a Waste Treatment Master Plan;	m. Environmental Assessment (Status Survey);
b. Drafting a Waste Treatment Master Plan for clustered LGs;	n. Environmental Assessment (Impact assessment);
c. Drafting a Waste Collection/Transportation method;	o. Support for the integration of the facility into urban land-use plan;
d. Selection of candidate construction sites;	p. Cost-benefit analysis;
e. Drafting a plan for application for subsidy on WTF from the central government;	q. Design the WTF;
f. Surveys (e.g., topographical surveys, geological surveys, soil surveys, groundwater surveys);	r. Transaction advisory for PFI/PPP project procurement;
g. Analysis (e.g., waste compositions, exhaust gas, wastewater);	s. Supervising the construction process;
h. Drafting a conceptual plan for WTF;	t. Provide support for long term operating contracts;
i. Comparative consideration of different treatment/processing systems;	u. Operations and Maintenance (O&M) Management monitoring (maintenance costs evaluation);
j. Drafting a basic plan for the WTF;	v. Drafting disaster waste treatment plan;
k. Consideration of the business method	w. Conduct performance inspection of facility equipment;
l. Survey for the possibility of Private Finance Initiative (PFI)/Public-Private Partnership (PPP) introduction;	x. Drafting plan to prolong life cycle of the WTF;
	y. Deposition of the property of the WTF; and
	z. Designing and supervising the dismantling process of WTF.

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## Draft Manual for the Planning, Formulation, Evaluation and Contract Management of WTE Projects



### 1. Rationale

### 2. Planning Phase

### 3. Formulation Phase

### 4. Evaluation Phase

### 5. Contract Management Phase

### 6. Dismantling of WTE-ACC

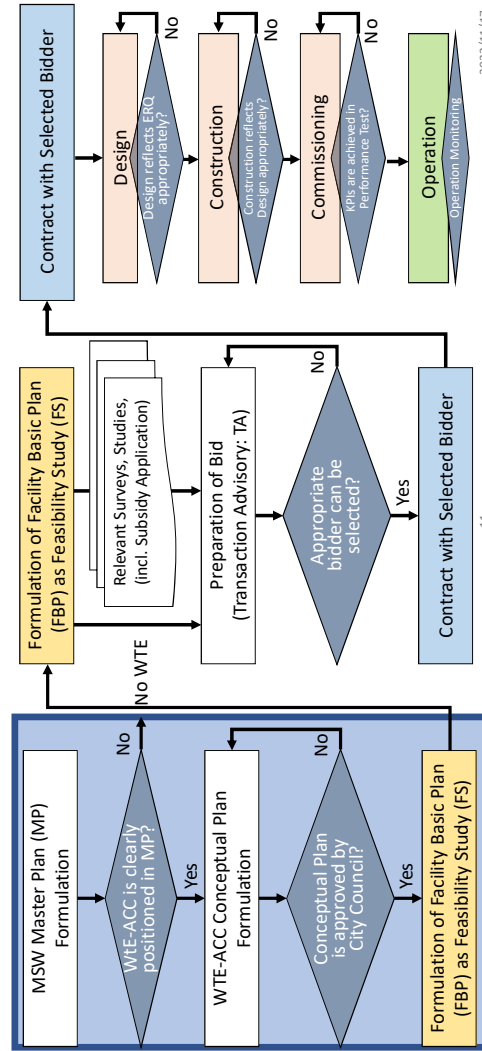
### Appendix

#### Chapter 2 Planning Phase

- 2.1 Components of the Planning Phase
- 2.2 Legal requirement to LGUs in MSWM
- 2.3 Positioning of 10-year Solid Waste Management Plans
- 2.4 Facility Conceptual Plan
- 2.5 The selection of candidate construction sites

## 1. Planning Phase

### WtE Project Procedure



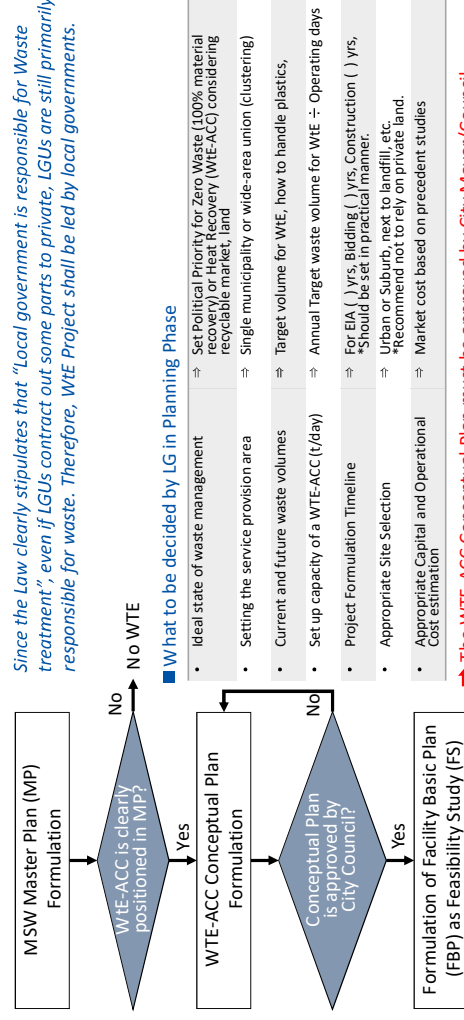
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## 1. Planning Phase

### (1) Procedure of WtE Project Planning



Since the Law clearly stipulates that "Local government is responsible for Waste treatment", even if LGUs contract out some parts to private, LGUs are still primarily responsible for waste. Therefore, WTE Project shall be led by local governments.

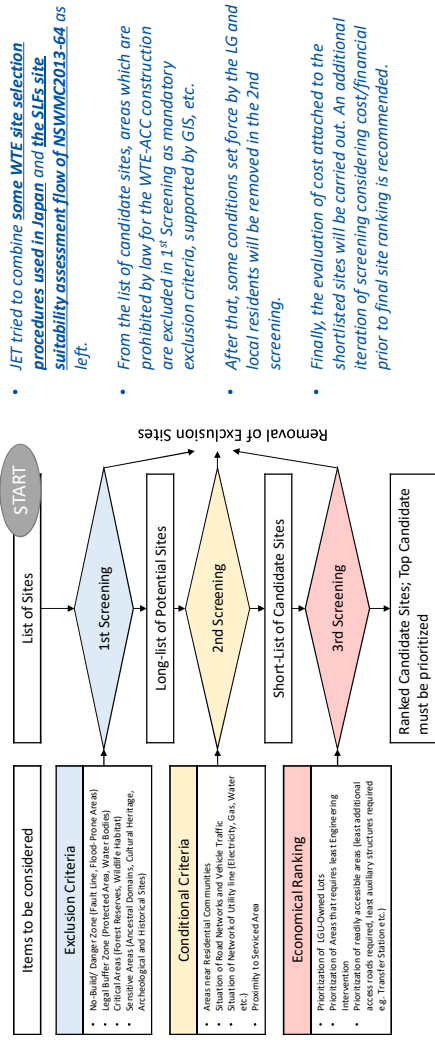
➔ The WTE-ACC Conceptual Plan must be approved by City Mayor/Council.

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# 1. Planning Phase

## (2) Recommended Site Selection Procedure for WtE (Tentative)



- JET tried to combine some WtE site selection procedures used in Japan and the SJFs site suitability assessment flow of NS-WMC2013-64 as left.
- From the list of candidate sites, areas which are prohibited by law for the WtE-ACC construction are excluded in 1<sup>st</sup> Screening as mandatory exclusion criteria, supported by GIS, etc.
- After that, some conditions set force by the LG and local residents will be removed in the 2nd screening.
- Finally, the evaluation of cost attached to the shortlisted sites will be carried out. An additional iteration of screening considering cost/financial prior to final site ranking is recommended.

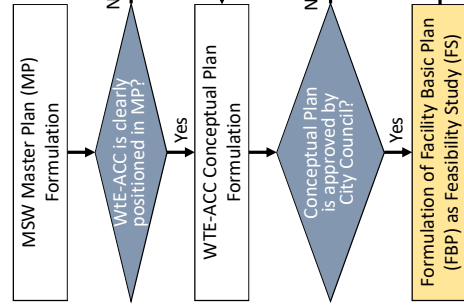
➔ Transparent and Public Involved Process shall be required bcs WtE is NIMBY

# Draft Manual for the Planning, Formulation, Evaluation and Contract Management of WTE Projects

1. Rationale
  2. Planning Phase
  3. Formulation Phase
  4. Evaluation Phase
  5. Contract Management Phase
  6. Dismantling of WTE-ACC
  7. Appendix
- Chapter 3 Formulation Phase**
- 3.1 Formulation of Feasibility Study (F/S)
  - 3.2 Technology selection
  - 3.3 Target Waste Amount
  - 3.4 Target waste quality
  - 3.5 Pollution prevention standards
  - 3.6 Waste heat utilization
  - 3.7 Financial model (Case of BOT/BOO)
  - 3.8 Business scheme
  - 3.9 Role demarcation
  - 3.10 Value Chain Analysis
  - 3.11 Other Aspects

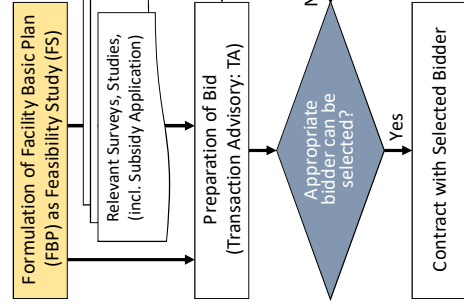
# 3. Formulation Phase

## (1) WtE Project Procedure



# 3. Formulation Phase

## (2) Facility Basic Plan as LGU oriented Feasibility Study

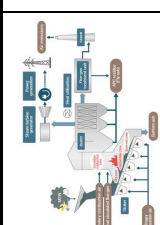



- What to be decided by LG in the FS Phase**
  - Treatment Technology Selection
    - Thermal (Stoker, fluidized bed or gasification, etc.) or Non-thermal (Biomethanation, etc.)
  - Quantity / Quality of WTE Feedstock
    - How much MSW can be "continuously" supplied to WTE? How much LCV can be guaranteed? (This is out of control of private proposer)
  - Pollution Control Standards (Exhaust gases, Wastewater, Residues, etc.)
    - Under Clean Air Act (National Standards), International Standards, and/or Stricter Voluntary Standards?
    - Monitoring frequency shall also be identified.
  - Business Scheme
    - Study on applicability of PPP modality (BOT, BOO or DBO, Concession, JV, etc.)
  - Project cost estimation (Capex/Opex), Financing Plan (Financial Model), Financing Plan
    - Total cost, amount of funds to be procured ...
  - Role demarcation (Scope of Work)
    - Basic concept of task demarcation shall be identified at this phase so that **gov. budget can be forecasted.**
  - Value Chain Analysis (Treatment Process flow for upstream/ downstream)
    - Upstream arrangement (Segregation classification, pretreatment, how to deliver segregated waste, etc.), downstream arrangement (Handling of bottom ash and fly ash, disposed at TSD? Monofill?)

➔ Since there are NO "Zero T/F" WtE projects in the World, LGU shall concept out what LGU can provide and what LGU expects to Private Operator, in such aspect, security of annual expenditure for T/F through project period must be the most important point.

### 3. Formulation Phase

#### (3) Technical : Technology Selection

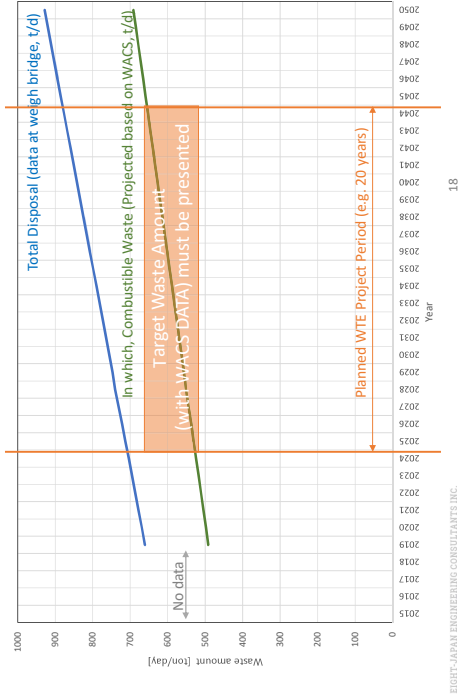
Thermal / Stoker Incinerator	Thermal / BFB Incinerator
 <ul style="list-style-type: none"> <li>Widely applied in the world;</li> <li>Mechanically driven stoker grates sequentially dry, combust and post-combust the waste for 1 to 2 hrs.</li> <li>Bottom ash falls into the ash water-sealed conveyor from the tail end of the stoker together with the incombustibles, and after cooling, it is discharged by a conveyor.</li> <li>Dust (fly ash) which captured in the exhaust gas treatment system contains poisonous components shall be collected, and treated before disposal.</li> </ul>	 <ul style="list-style-type: none"> <li>Widely applied in the world;</li> <li>Crushed waste is fed into the fluidized bed of hot sand and dried, burned, and post-combusted almost at the same time (up to a dozen seconds).</li> <li>The ash is discharged from the upper part of the furnace together with the combustion gas and exhaust gas treatment system collected as fly ash in the gas cooling chamber and dust collecting equipment.</li> </ul>

Other MSW Treatment System	Explanations
 <p><b>Bio-Methanation</b></p>	<ul style="list-style-type: none"> <li>A technology which the biodegradable waste is anaerobically fermented and obtain combustible biogas.</li> <li>Segregated food waste will be crushed and separated to biodegradable fraction and non-bio fraction. Biodegradable fraction will be fed to digester after pulping, fermented in the digester for 3 weeks then collect digested gas (biogas).</li> <li>Captured biogas can be used for fuel and digested sludge can be utilized after drying. Quantity of sludge might be the problem.</li> </ul>
 <p><b>RDF Production</b></p>	<ul style="list-style-type: none"> <li>There are several RDFs, following explains about RDF fluff:</li> <li>A technology which the combustible waste is shredded and wrapped to be the alternative fuel.</li> <li>Segregated paper and plastic waste will be further separated manually in the conveyor and air separator. Light combustible fluff will be shredded and wrapped as a cube-shaped fuel (RDF fluff), RDF fluff can be used as fuel at cement kiln, or WTE facility.</li> </ul>
 <p><b>Compost</b></p>	<ul style="list-style-type: none"> <li>A technology which the biodegradable waste is aerobically fermented and converted to compost.</li> <li>Segregated food waste will be manually separated, mechanically crushed (&lt; 5cm) and piled up around 2.5m, add micro-organism for fermentation.</li> <li>Pile will be mixed by wheel loader once in a couple of days and aged for 60 days.</li> <li>Matured compost will be sieved by trommel to be the products,</li> </ul>

- Which kind of system is the most appropriate to address LGU's needs?
- It is necessary to avoid to choose "un-proven" technology/provider.

### 3. Formulation Phase

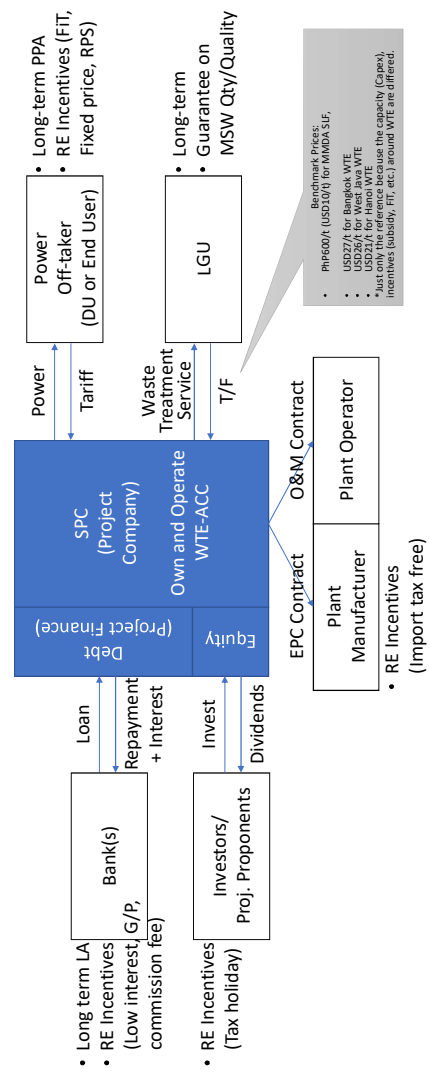
#### (4) Technical : Quantity and Quality of Target Waste (to be fed to WTE-ACC)



- The planned waste amount is the basis for setting the scale/size of the facility, and is important for the prediction of future amount, and must have high accuracy.
- This Planned waste amount (t/d) x Tipping Fee (PHP/t) must be budgeted in annual basis.
- Considering the recent plastic ban and plastic recycling tech innovation, several scenarios shall be developed and reflected to the WTE project FS.
- In the PPP Contract for WTE, waste quantity as well as quality (LCV) usually guaranteed by LGUs.

### 3. Formulation Phase

#### (5) Financial : Business Model (Case of BOT/BOO)



- Long term LA
- RE Incentives (Low interest, G/P, commission fee)
- RE Incentives (Tax holiday)
- Long-term PPA
- RE Incentives (FIT, Fixed price, RPS)
- Long-term Guarantee on MSW Qty/Quality
- RE Incentives (import tax free)

Benchmark Prices:

- PHF60/t (US\$34/t) for WINDAS-IF,
- US\$27/t for Bangkok WTE
- US\$23/t for Hanoi WTE
- \*Just only the reference because the capacity (Graw) in Indonesia (Labohaty, Piy, etc.) around WTE are differed.

To ensure "Bankability" of the Project which is composed of "Financial Viability", "Risk Optimization" and "Contractual Robustness"

### 3. Formulation Phase

### 3. Formulation Phase

#### (6) Financial : Business Scheme / PPP Modality

PPP Modalities	Role			Owner of Facility		Explanation
	Design	Const.	Finance	Op. Period	After Op. Period	
PFI	BOO	Private	Private	Private	Private	PFI covers 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	Public	The public sector raises funds through bonds and grants, and comprehensively outsources the design, construction, operation of the facility to the private.
	BTO	Private	Private	Private	Public	The public sector raises funds through bonds and grants, and comprehensively outsources the design, construction, maintenance of the facility to the private.
Non-PPIs	DBO	Public	Public	Private	Public	The public sector raises funds through bonds and grants, and comprehensively outsources the design, construction, maintenance of the facility to the private.
	DBM	Public	Public	Private	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	Private	Public	The public sector designs and constructs the facility, and the private is entrusted with the operation for multiple years.

### 3. Formulation Phase

#### (7) Project Boundary : Role Demarcation / Scope of Work in ASEAN BOT

Category	No	Role	Gov.	SPC	
Land Acquisition	1	Project site and water supply facility		✓	
	2	MSW Acceptance Facility (Weighbridge and Registration Office, etc.)		✓	
	3	Sample sorting facility (Dumping box, etc.)		✓	
	4	Processing system and visitor center		✓	
	Design and Construction (including commissioning & testing)	5	Water supply piping		✓
		6	Adherent Landfill and Leachate Treatment Facility		✓
	Operation and Maintenance	7	Supporting infrastructure (Road, rainwater drainage, etc.) in MSWM complex but outside of Waste Treatment Facility Plot		✓
		8	Supporting infrastructure (Road, rainwater drainage, etc.) in Waste Treatment Facility Plot		✓
		9	MSW supply to site and Unsuitable Waste removal prior to site delivery		✓
		10	Processing system (from MSW weighbridge until residue loading station), visitor center		✓
	Financing	11	Water supply		✓
		12	Landfill and Leachate Treatment site operation including residue transfer to landfill		✓
		13	Supporting infrastructure (Road, rainwater drainage, etc.) in MSWM complex but outside of Waste Treatment Facility Plot		✓
		14	Supporting infrastructure (Road, rainwater drainage, etc.) in Waste Treatment Facility Plot		✓
15		Land for Project Site		✓	
16		Weighbridge, Registration Office, Sample Sorting, Processing System, visitor center		✓	
Financing	19	Water supply facility		✓	
	20	Supporting infrastructure (Road, rainwater drainage, etc.) in TPAAS complex but outside of Waste Treatment Facility Plot		✓	
	21	Supporting infrastructure (Road, rainwater drainage, etc.) in Waste Treatment Facility Plot		✓	
	22	Supporting infrastructure (Road, rainwater drainage, etc.) in Waste Treatment Facility Plot		✓	
	23	Supporting infrastructure (Road, rainwater drainage, etc.) in Waste Treatment Facility Plot		✓	

➡ Not fully relying on to the Private, roles where LG has specialty should be responsible for LG to secure bankability. 2022/11/17

### 3. Formulation Phase

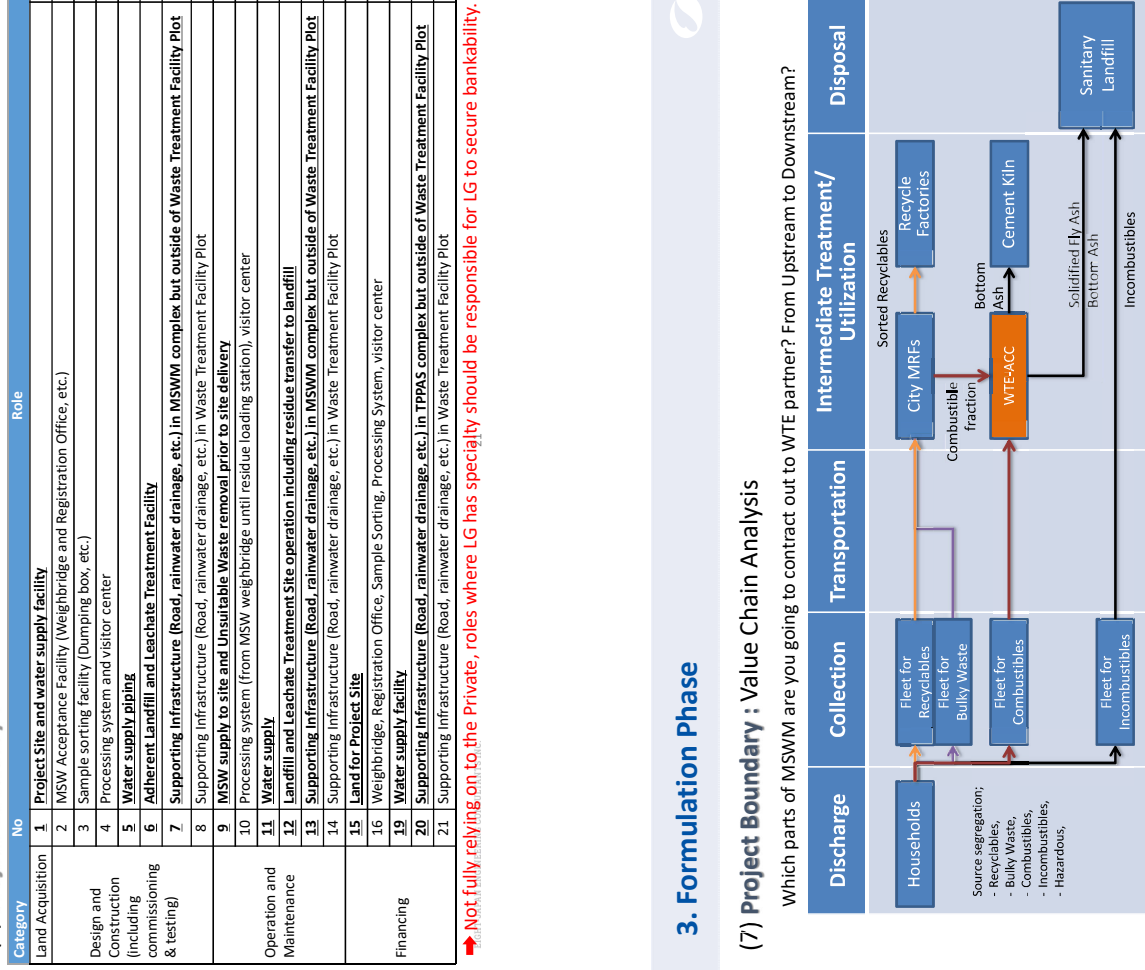
#### (7) Project Boundary : Role Demarcation / Scope of Work in Japanese DBO

Phase	Responsibility of LG	Responsibility of Private Partner
Design and Construction Phase	✓ Security of Land	✓ Support LG on Topo/Geo Survey
	✓ Topographic Survey	✓ Support LG on the documentation for applications to gov. agencies,
	✓ Geological Survey	✓ Design and Construction of WTE,
	✓ Obtain project approval from government agencies,	✓ Process and disposal of construction waste,
	✓ EIA *	✓ Preparation of manuals for operation*,
	✓ Application of the permission*,	✓ Provision of spare parts, etc.
Operation and Maintenance Phase	✓ Supervision of Design/Construction*, etc.	✓ Reception, weighing, collection of fee,
	✓ Delivery of Waste Feedstock,	✓ Operation management (prepare plan, implement, etc.)
	✓ Sales of Recovered Material,	✓ Consumables management (prepare plan, procurement, etc.),
	✓ Monitoring of the operation, etc.	✓ Maintenance management (prepare plan, regular inspection, repair, back up, etc.),

Note: In DBO facility will be owned by LG so permissions including EIA usually be secured by LG.

### 3. Formulation Phase

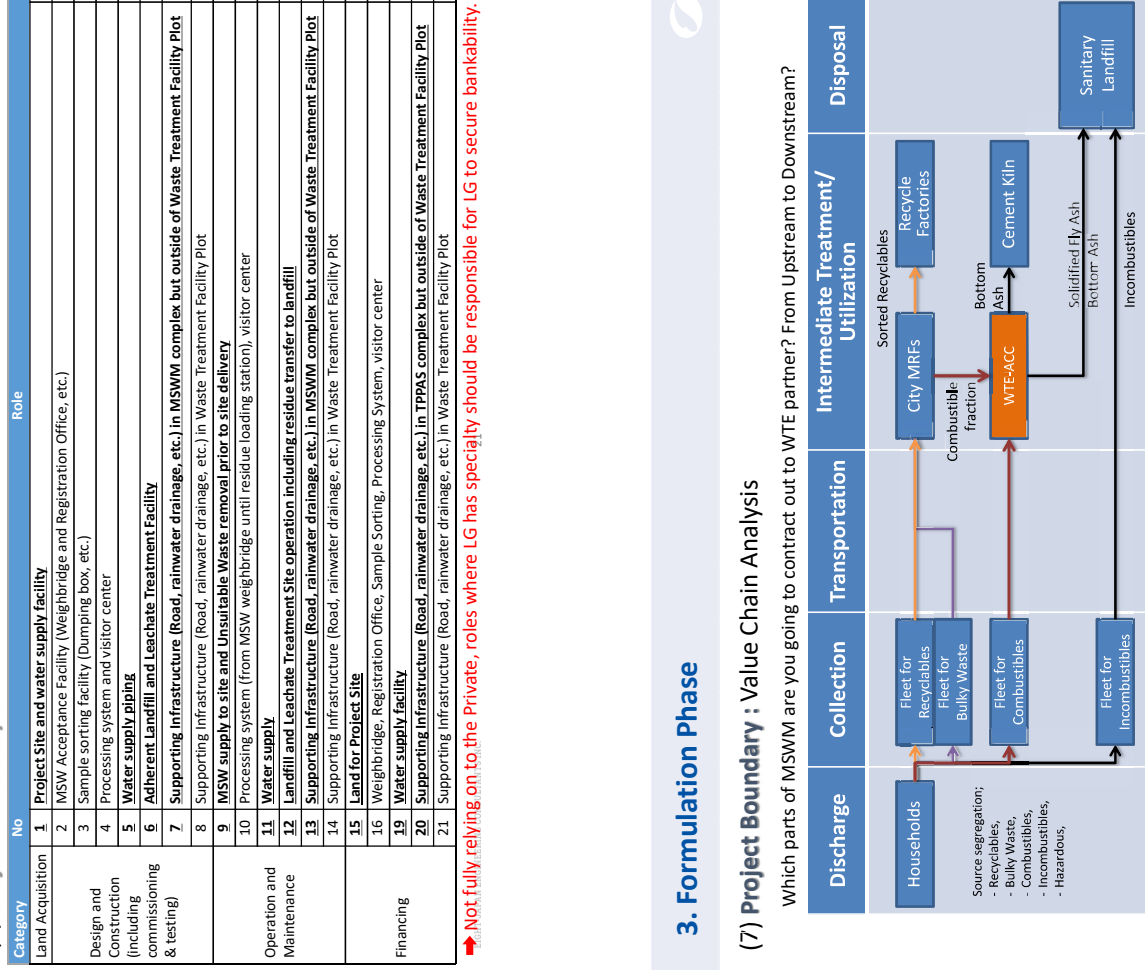
#### (7) Project Boundary : Value Chain Analysis



➡ Upstream arrangement (Segregation classification, segregated waste transport) is usually the role of LGU,  
 ➡ Downstream arrangement (bottom/fly ash disposal) can be tasked to private but T/F must be increased. 2022/11/17

### 3. Formulation Phase

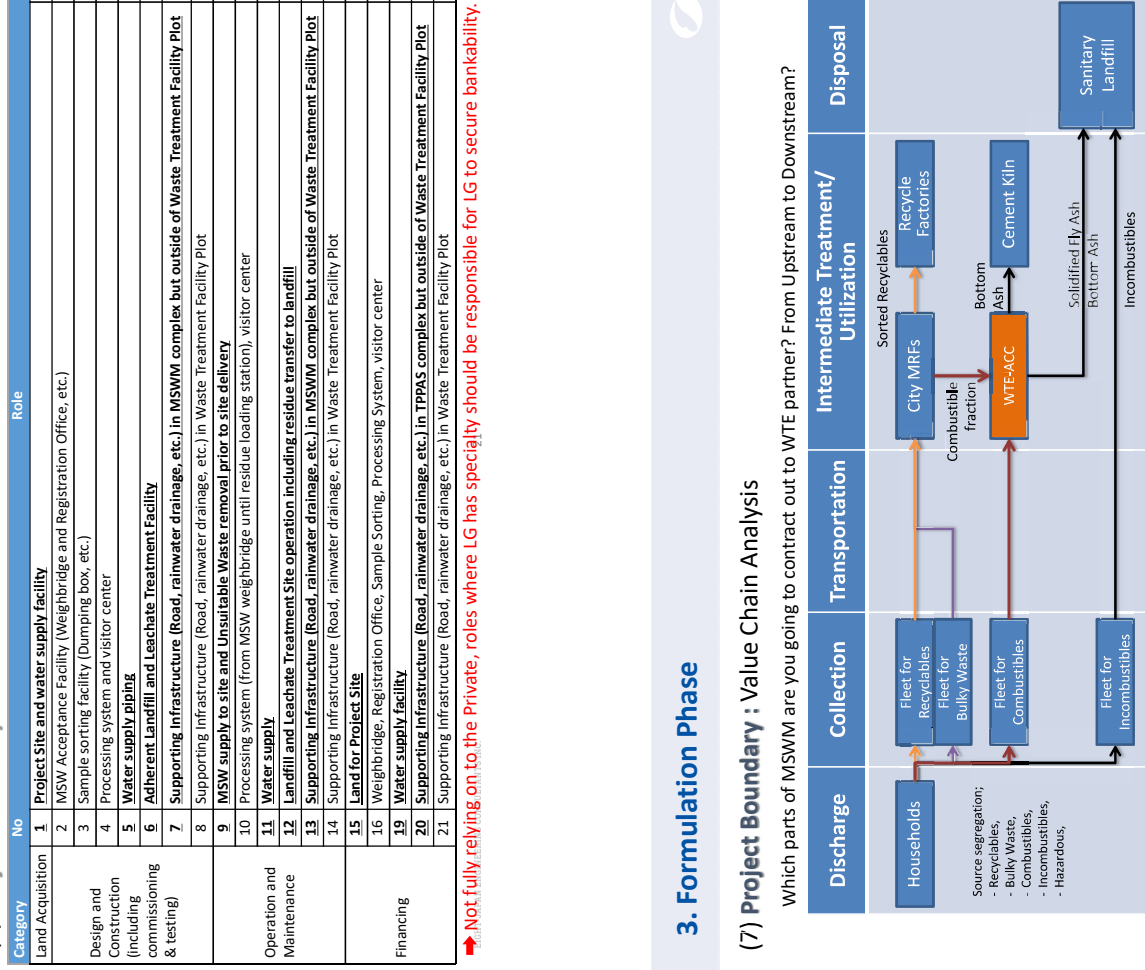
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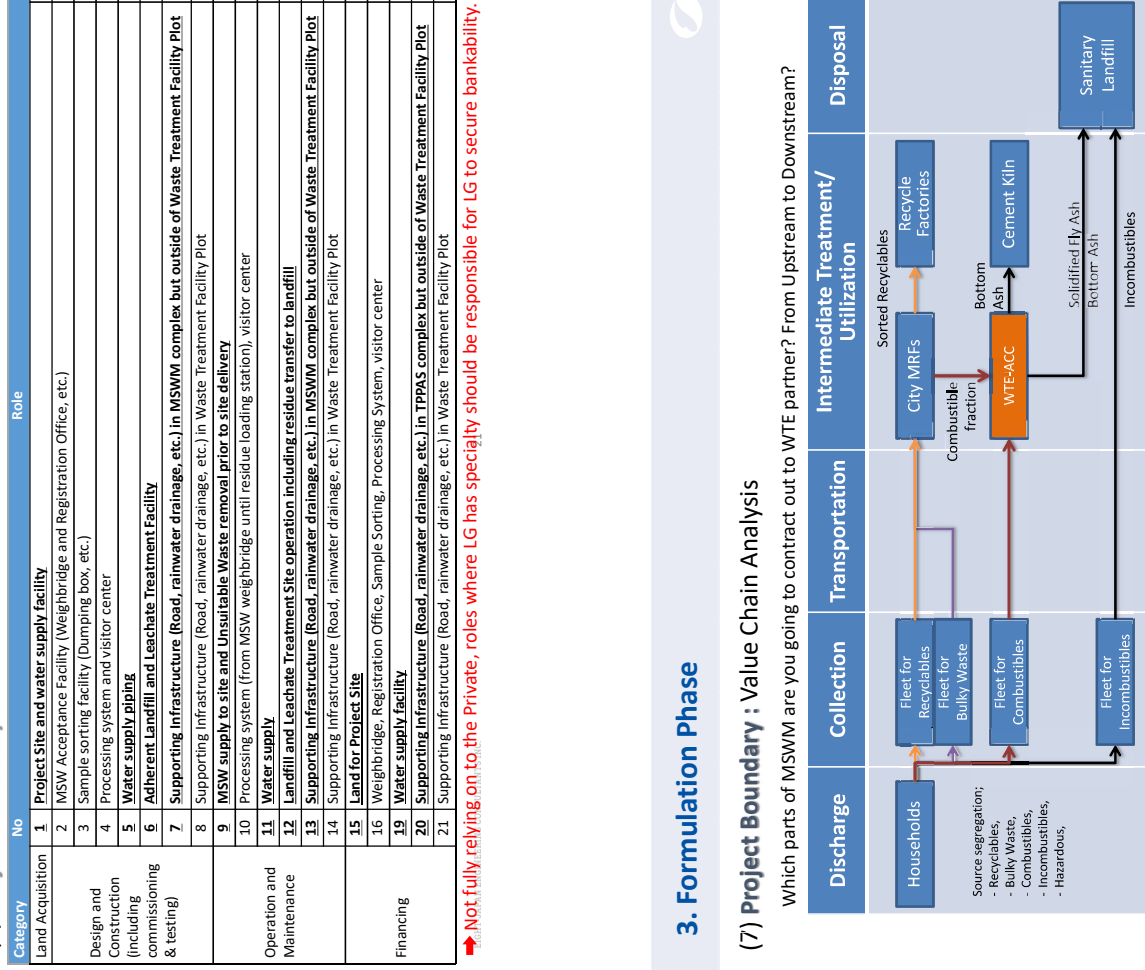
#### (7) Project Boundary : Value Chain Analysis



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 ➡ Downstream arrangement (bottom/fly ash disposal) can be tasked to private but T/F must be increased. 2022/11/17

### 3. Formulation Phase

#### (7) Project Boundary : Value Chain Analysis



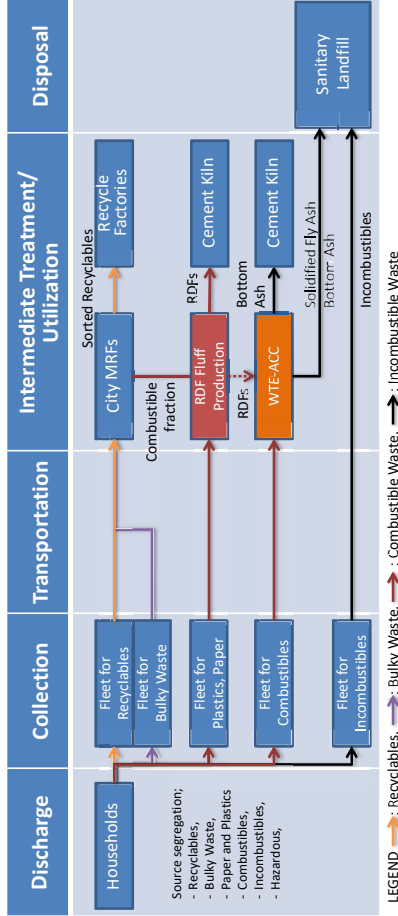
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 ➡ Downstream arrangement (bottom/fly ash disposal) can be tasked to private but T/F must be increased. 2022/11/17



### 3. Formulation Phase

#### (7) Project Boundary : Value Chain Analysis

Which parts of MSWM are you going to contract out to WTE partner? From Upstream to Downstream?

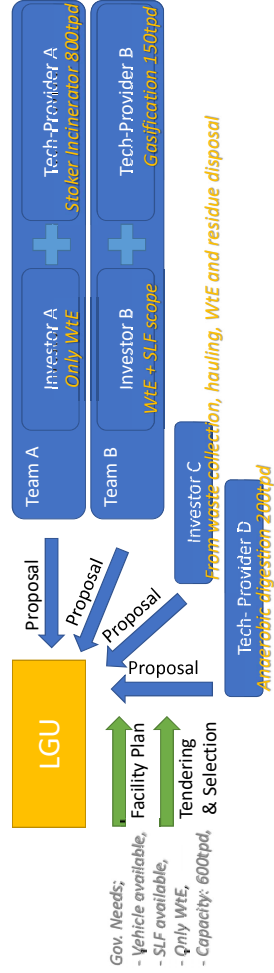


### Draft Manual for the Planning, Formulation, Evaluation and Contract Management of WTE Projects

1. Rationale
2. Planning Phase
3. Formulation Phase
4. Evaluation Phase
5. Contract Management Phase
6. Dismantling of WTE-ACC
7. Appendix

### 4. Evaluation of Unsolicited Proposal

- ✓ How to evaluate "Unsolicited WTE-PPP Proposal"? is one of frequently asked questions,
- ✓ Unsolicited Proposal is usually the project based on the private investor's interest in terms on scope, capital size, applied technology, while existing status and effort/achievement of LGUs in MSW management is different in LGUs, so, simply it's quite difficult to evaluate,
- ✓ Simple comparison of different schemes / types / technologies of private proposals is not make sense,
- ✓ **LGU shall have own MSW MP-based FS or even WTE-ACC conceptual plan as "NEEDS"** to ease the evaluation and/or selection of the **better** private proposal,



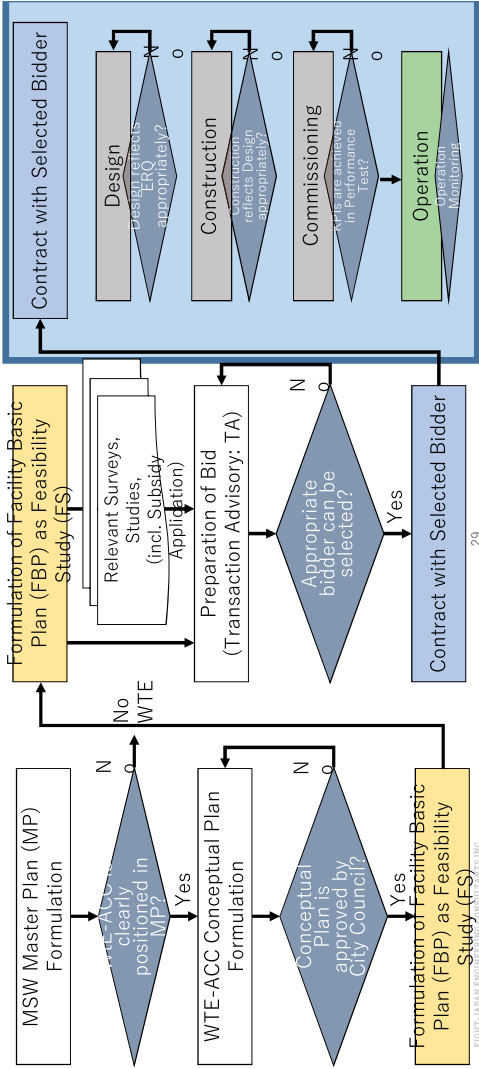
→ Solicited approach is widely applied for the WTE-PPP project development in the world. If unsolicited approach will be adopted, at least WTE-ACC conceptual plan should be formulated beforehand.

### Draft Manual for the Planning, Formulation, Evaluation and Contract Management of WTE Projects

1. Rationale
2. Planning Phase
3. Formulation Phase
4. Evaluation Phase
5. Contract Management Phase  
Chapter 5  
5.1 Background  
5.2 Purpose of Contract Management  
5.3 Differences in Business Schemes and Contract Management between Japan and Philippines  
5.4 Design and Construction Stage  
5.5 Detailed Procedure in DBO Case and implication to BOT/BOO;  
5.6 Operation Phase
6. Dismantling of WTE-ACC
7. Appendix

## 5. Contract Management Phase

### (1) WtE Project Procedure

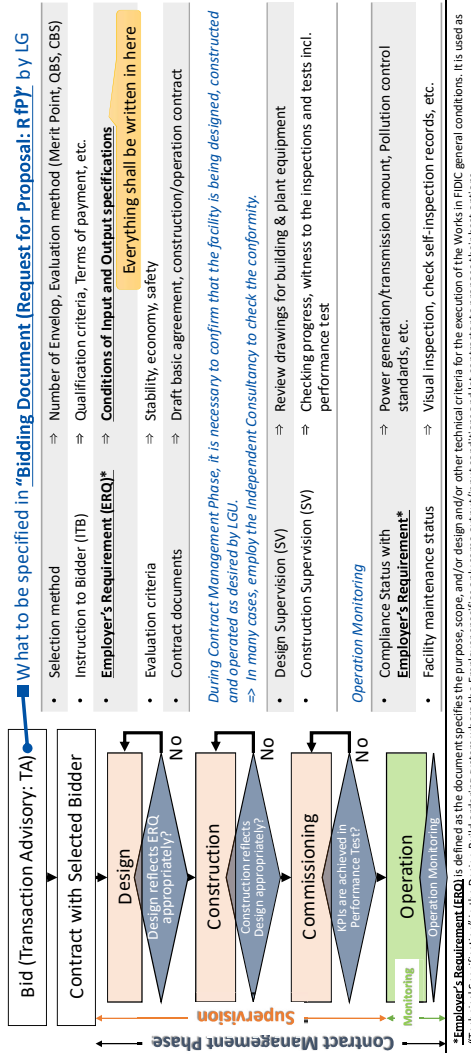


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## 5. Contract Management Phase

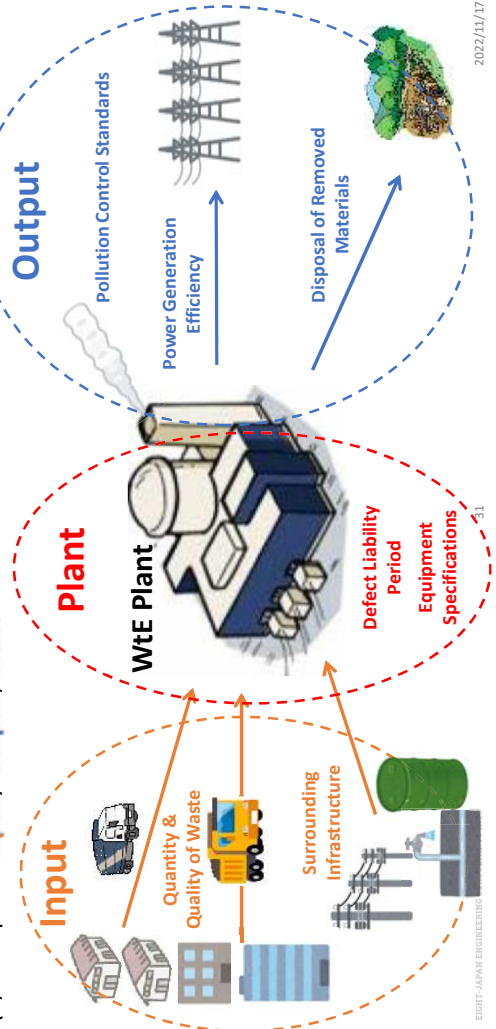
### (1) Procedure of Contract Management (in the aspect of LGU)



\*Employer's Requirement (ERQ) is defined as the documents specifies the purpose, scope, and/or design and/or other technical criteria for the execution of the Works in FIDIC general conditions. It is used as "technical Specification" in the Design-Build ordering system where the Employer specifies only some output/input conditions and let contractor to propose their best options.

## 5. Contract Management Phase

### (2) Example of Input / Output / Plant Conditions



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## 5. Contract Management Phase

### (2) Example of Input / Output / Plant Conditions

Main contents of "Employer's Requirement (ERQ)" in Bidding Document

(A) COMMON	(B) CONSTRUCTION	(C) OPERATION
1. Capacity of the Facility, Project scheme	1. Quantity and quality of waste	1. Project implementation structure
2. Construction Site, Area	2. Performance Guarantee Matters; (1) Power generation efficiency (2) Pollution control standards, etc.	2. Development of manuals and plans
3. Project period, time schedule	3. Performance guarantee method	3. Operation and maintenance contents; (1) Operation management
4. Topography and geology conditions	4. Defect Liability Period	(2) Inspection, testing, repair and renewal
5. Surrounding infrastructure, city planning related matters	5. Equipment specifications (1) Mechanical equipment specifications (2) Electrical instrumentation equipment specifications (3) Civil engineering and building works specifications	(3) Disposal of removed materials (4) Information management
		4. Handling after the Project Period

Source: Outline of WtE Technology and Requirements for WtE Project (JICA-TCP Online Training, 10Dec2021)

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## 5. Contract Management Phase

### (3) Relationship among LGU, Operator (SPC) and EPC contractor

#### Design/Construction Supervision:

- In the design/construction phase, LGU, the client of the Project, directly or indirectly through (SPC) monitor the design and construction of EPC contractor's drawings, as well as the work plan for commissioning and performance test.
- The purpose of monitoring is to confirm, through approval and confirmation of drawings and implementation of inspections and tests, whether the construction work is planned and executed in accordance with the agreement, RFP, and the project proposal.

#### Operation Monitoring:

- In the operation phase, the purpose of monitoring is to provide citizens with high-quality public services based on an appropriate division of roles between the LGU and the Operator (SPC) by monitoring and confirming the implementation status of various tasks related to the operation and reflecting the results in the payment of fees.

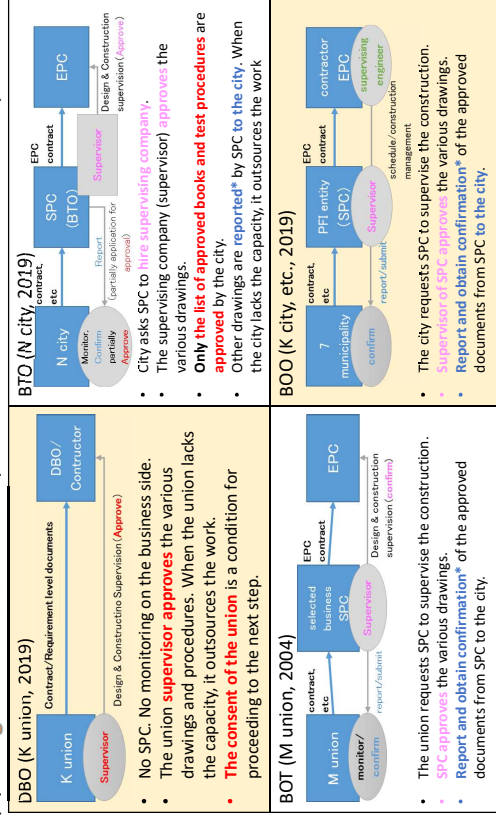
➔ Even though BOT/BOO, LGU can design the level of intervention to the Private Partner's role bcs this is Public Project.

## 5. Contract Management Phase

Phase	Work	Contents
Construction	Design supervision	Checking whether there are any discrepancies between the requirements document/contract and the basic design/detailed design documents
	Construction supervision	Confirmation that construction work is being carried out in accordance with the requirements, contract, and design documents
Operation	Operation supervision	Confirmation that operation and maintenance are being carried out in accordance with the requirements and contract documents

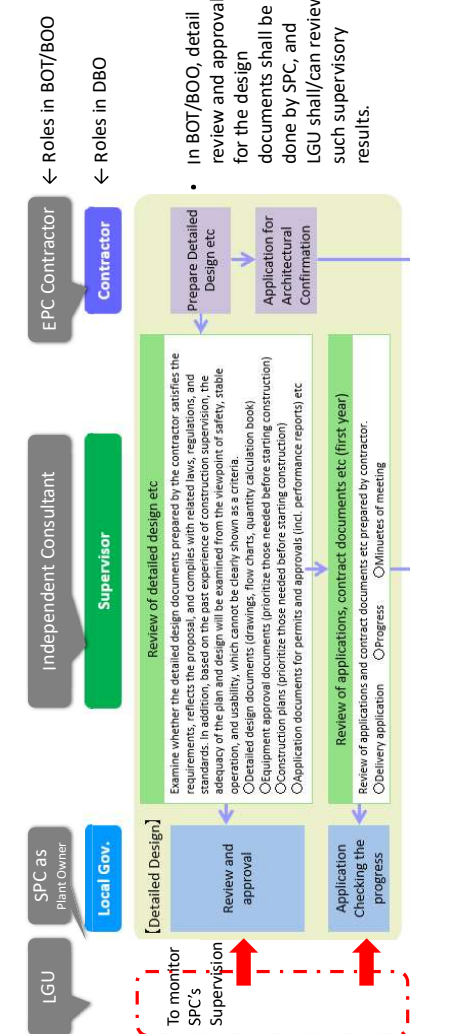
## 5. Contract Management Phase

### (3) Design and Construction Supervision / 4 PPP case studies in Japan



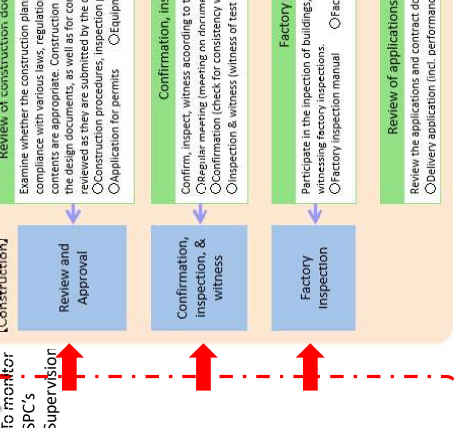
### 3. Contract Management Phase

(5) **Design and Construction Supervision /** Detail Procedure in DBO Case / and implication of BOT/BOO;



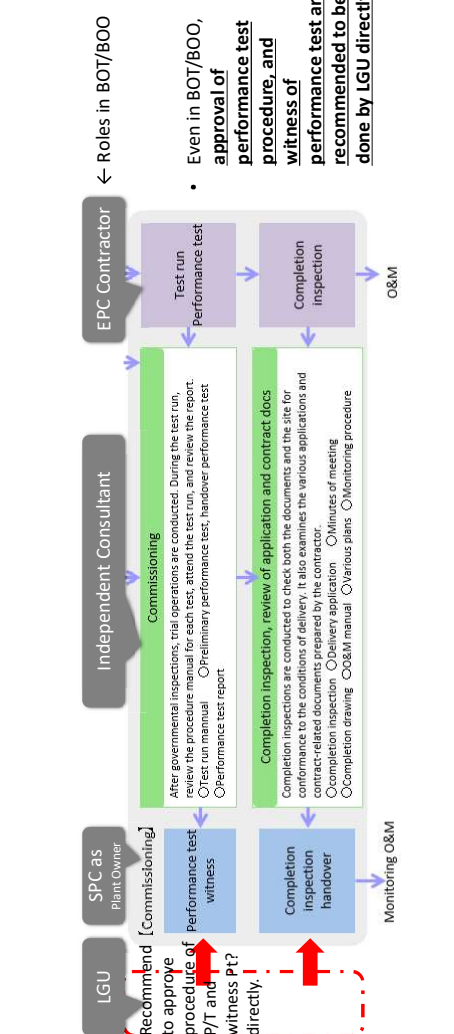
### 3. Contract Management Phase

(-) **Design and Construction Supervision /** Detail Procedure in DBO Case / and implication of BOT/BOO;



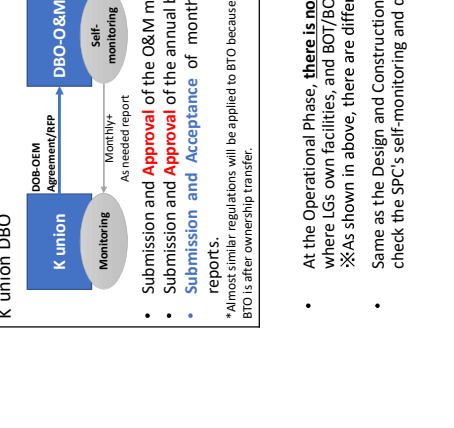
### 3. Contract Management Phase

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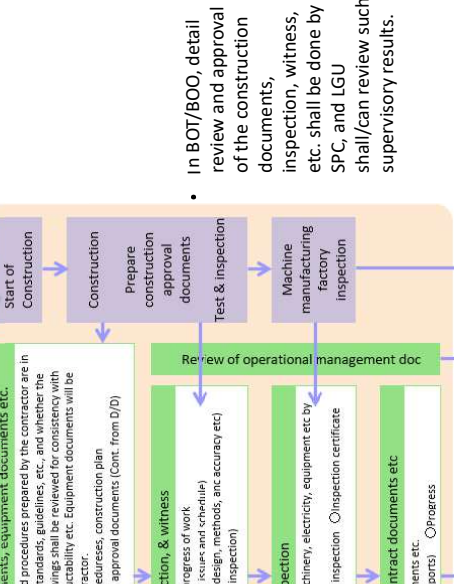
### 5. Contract Management Phase

(6) **Operation Monitoring /** 3 PPP case studies in Japan



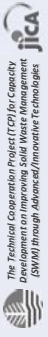
### 3. Contract Management Phase

(-) **Design and Construction Supervision /** Detail Procedure in DBO Case / and implication of BOT/BOO;





## 7. Appendix



The Technical Cooperation Project (TCP) for Capacity Development in the Water and Sanitation Sector (SDW) through Advanced/Innovative Technologies

The following sections consist of the Appendix, which highlight the examples and suggestable issues associated in the development of this guide

- ❖ **A: Consignment of Professional Engineer**
- ❖ **B: Applications/Notifications to the Governments (Example in Japan)**
- ❖ **C: General Structure of WTE/WTF**
- ❖ **D: WTE-ACC as a Stable Power Source Cases in Japan**
- ❖ **E: Safety Measures**
- ❖ **F: Responsiveness to Disaster Waste**

# **GUIDANCE DOCUMENT ON THE OPERATION OF WASTE-TO-ENERGY (WtE) FACILITY ON APPROPRIATELY CONTROLLED COMBUSTION**

DENR-DOST-DOE JOINT ADMINISTRATIVE ORDER NO. \_\_\_\_  
Series of 2021



In line with the mandate of the Department of Environment and Natural Resources (DENR) through the Environmental Management Bureau (EMB) to recommend policies in the elimination of barriers to waste reduction programs and to effectively strengthen the implementation of the Republic Act (RA) No. 9003 otherwise known as the “Ecological Solid Waste Management Act of 2000” and its Implementing Rules and Regulations, and to complement the DENR Administrative Order 2019-21 otherwise known as the “Guidelines Governing Waste-to-Energy (WtE) Facilities for the Integrated Management of Municipal Solid Wastes”, this Joint Administrative Order (JAO) on the Guidance Document for the Operation of Waste-to-Energy Facilities on Appropriately Controlled Combustion (WtE-ACC Facilities) is hereby provided as follows:



## **Section 1. Purpose and Objective**

This JAO is issued to provide guidance for the evaluation, establishment, and control of Waste-to-Energy Facilities on Appropriately Controlled Combustion (WtE-ACC) for the proper management of municipal solid wastes in the country.

## **Section 2. Scope**

This JAO shall apply to all WtE-ACC Facilities that will be operated nationwide. It shall provide comprehensive set of guidelines in the form of technical checklist for the structure, operation and maintenance of WtE-ACC Facilities and the guidelines for the management of bottom and fly ash that will be generated from the said facility.

## **Section 3. Definition of Terms**

This JAO hereby adopts the following terms which shall have the following meanings:

- a) Appropriately Controlled Combustion (ACC)
  - b) Auxiliary Combustion Device
  - c) EMB
  - d) Continuous Emission Monitoring System (CEMS)
  - e) DENR
  - f) DOE
- a) DOST
  - b) Residual Waste
  - c) Residual Waste Containment Area
  - d) WtE Feedstock
  - e) WtE-ACC Operator
  - f) WtE-ACC Facility

## Section 4. Technical Standards and Guidelines

All persons, natural or juridical, who are engaged in structural, operational and maintenance standards for WtE-ACC Facilities must adhere to the minimum standards and guidelines set out in this Section. These shall be used as the guidance on baseline in determining the minimum performance standards and specifications in WtE-ACC projects. Thus, all persons and entities engaged in relation to WtE projects and facilities shall coordinate with the respective Regional Offices of the DENR, DOE and DOST which have the jurisdiction area of operation to ensure compliance to the following standards and guidelines, to wit:

### Section 4.1 General

#### 1. Compliance with other Applicable Laws and Regulation

All WtE-ACC facilities shall comply with existing structural requirements set forth in National Building Code (PD 1096), Occupational Safety and Health Standards (RA 11058) and other applicable regulations in terms of structural strength against self-weight, loading capacity and other loads, seismic force and temperature stress.

#### 2. Prevention of Corrosion

All WtE-ACC facilities shall take necessary measures to prevent corrosion caused by molten chlorides and sulphates released during combustion or high temperature chlorine attack, exhaust gas, and wastewater, generated from waste and a result of waste treatment.

### Section 4.1 General

#### 3. Fire Prevention and Control

All WtE-ACC facilities shall meet the design conditions and requirements in accordance with RA 9514, or the Fire Code of the Philippines and Rules 9, 10 and 11 of its Revised Implementing Rules and Regulations in particular and take necessary measures to prevent fires and provide the necessary fire extinguishers and other fire extinguishing equipment.

#### 4. Operation Stability

All WtE-ACC facilities, whether intended to be run continuously or intermittently, shall be designed for continuous and stable operation for at least ninety (90) days or more per line

#### 5. Effective Use of Excess Energy Generated

All WtE-ACC facilities shall be capable to effectively use the excess heat for several purposes such as power generation, and external heat supply.

### Section 4.2 Complete Combustion Control

#### 1. Processing Capacity

All WtE-ACC facilities shall sustain the processing capacity (in tons per day) indicated in the EIS application document. All WtE-ACC operators shall not accept waste, more than the indicated capacity in the approved ECC

The WtE-ACC facility shall secure a new ECC, prior to expansion, should it be necessary to increase the processing capacity of the WtE-ACC facility

#### 2. Waste Feeding

All WtE-ACC facilities shall have a device capable of quantitatively and continuously introducing waste into the combustion chamber while being insulated from outside air

All WtE operators shall input waste into the combustion chamber continuously in a quantitative manner in a state of isolation from the outside air

When inputting waste into the combustion chamber by the pit crane method, ensure that waste is mixed uniformly at all times



## Section 4.2 Complete Combustion Control

### 3. Structural Requirement for Combustion Chamber

- All WtE-ACC facilities shall have a combustion chamber and ensure the compliance of the following requirements:
- The system shall be designed such that it is possible to incinerate waste in a state where the temperature of the combustion gas is eight hundred fifty (850) degrees Celsius or more;
  - The system should be capable of retaining the combustion gas for two (2) seconds or more while maintaining the temperature of eight hundred fifty (850) degrees Celsius or more;
  - The system shall be isolated from outside air;
  - The system shall keep the temperature of the combustion gas promptly raised to or above the temperature as stipulated in letter (i), and to be equipped with an auxiliary combustion device necessary to maintain the temperature; and
  - The equipment shall be installed to supply the necessary amount of the air for combustion (*i.e. Limited to those having the function of adjusting the amount of supplied air*).

## Section 4.2 Complete Combustion Control

### 4. Operational Requirements for Combustion Chamber

The WtE Facility Operators shall:

- Maintain the temperature of the combustion gas in the combustion chamber at eight hundred fifty (850) degrees Celsius or more
- Incinerate so that loss of ignition of the incinerated bottom ash is five (5) percent or less. However, this shall not apply to the case where the incinerated bottom ash is used so as not to cause hindrance to the preservation of the surrounding environment
- Quickly raise the furnace temperature to or above as indicated in letter (i) by operating an auxiliary combustion device when starting operation
- Keep the temperature of the said furnace to or as indicated in letter (i) by operating an auxiliary combustion device and burn all waste when the operation of the said facilities is to be stopped

### 5. Continuous Measurement and Record of Temperature of Combustion Gas

All WtE-ACC facilities shall have appropriate equipment to continuously measure and record the temperature of the combustion gas near the wall of the combustion chamber. All WtE Facility Operators shall continuously measure, record and maintain a record of the temperature of the combustion gas in the combustion chamber

## Section 4.3 Exhaust Gas Control

### 1. Cooling System of Combusted Gas

All WtE-ACC facilities shall have a cooling facility capable of lowering the temperature of the combustion gas flowing into the dust collector to approximately two hundred (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 two hundred (200) degrees Celsius or less in the dust collector

All WtE Facility Operators shall ensure the cooling of the temperature of the combustion gas flowing into the dust collector to approximately two hundred (200) degrees Celsius or less. However, this shall not apply to the case where the temperature of the combustion gas can be cooled to approximately two hundred (200) degrees Celsius or less in the dust collector

### 2. Continuous Measurement and Record of Temperature of Combusted Gas Flowing into the Dust Collector

All WtE-ACC facilities shall have appropriate devices to continuously measure and record the temperature of the combustion gas flowing into the dust collector. All WtE Facility Operators shall continuously measure, record and maintain a record of the temperature of the combustion gas flowing into the dust collector.

## Section 4.3 Exhaust Gas Control

### 3. Exhaust Gas Treatment System

All WtE-ACC facilities shall have exhaust gas treatment systems (limited to those with an advanced function to remove dust) capable of preventing the hindrance in the preservation of the living environment caused by the exhaust gas discharged from the chimneys of the facility shall be provided.

All WtE Facility Operators shall, in its operation, comply with exhaust gas emission standard specified in Section 19 of RA 8749 to prevent the hindrance in the preservation of the environment caused by exhaust gas, and remove soot and dust accumulated in cooling equipment and exhaust gas treatment equipment

### 4. Continuous Measurement of CO in Exhaust Gas

All WtE-ACC facilities shall have appropriate equipment for continuously measuring and recording the concentration of carbon monoxide (CO) in the exhaust gas discharged from the chimney of the facility:

- All WtE operators shall incinerate waste so that the concentration of carbon monoxide (CO) in exhaust gas discharged from chimneys is one hundred (100) ppm or less (as one (1) hour average at twelve (12) percent O<sub>2</sub> basis)
- Provided, however, that this shall not apply to WtE-ACC facilities which it is inappropriate to use the concentration of carbon monoxide (CO) as an index for the maintenance of combustion in order to suppress the generation of dioxins in exhaust gas discharged from chimneys, and which measures and records the concentration of dioxins in the said exhaust gas at least once every three (3) months
- All WtE Facility Operators shall continuously measure and record the concentration of carbon monoxide (CO) in the exhaust gas discharged from a chimney. This continuous measurement shall be kept from the time which WtE facility starts its operation until carbon monoxide (CO) concentration could be lowered enough after the stop of operation

## Section 4.3 Exhaust Gas Control

### 5. Emission Limit Value of Dioxins and Furans

All WTE-ACC facilities shall incinerate waste so that the concentration of dioxins in exhaust gas discharged from chimneys is less than the concentration specified in 6.3, c) of DENR Administrative Order No. 2019-21

### 6. Monitoring Frequency of Exhaust Gas

Aside from the requirements of CEMS installation for the monitoring of operation performance, all WTE-ACC facilities shall measure and record the concentration of dioxins in the exhaust gas emitted from chimneys at least once a year, and the concentration of exhaust gas (i.e. Limited to the substances related to sulfur oxides (SOx), dust, hydrogen chloride (HCl) and nitrogen oxides (NOx)) at least once in six (6) months in compliance to NESSAP under the DAO 2000-81

### 7. Wastewater Control

Wastewater generated from WTE-ACC facilities including wet scrubber/s should be contained and treated in accordance with the effluent standards under the DAO 2016-08 and DAO 2021-19 Updated Water Quality Guidelines, and General Effluent Standards for Selected Parameters, respectively

## Section 4.5 Management of Fly and Bottom Ash

### 1. Ash Management

WTE-ACC residues such as fly and bottom ash shall be managed appropriately through the use of appropriate technologies to ensure that handling, transport, and disposal is executed without exposing harm to public health and the surrounding environment of the facility.

Ash management generated from WTE-ACC shall be primarily under the responsibility of the respective LGU, aligned to their responsibility of managing MSWM in accordance with RA 9003. LGUs can, in its waste processing contract, delegate the responsibility to the WTE Facility Operator.

### 2. Ash Discharge

All WTE-ACC facilities shall have an ash discharging facility and its storage facility capable of discharging and storing fly ash separately from bottom ash. The structure of ash discharging facility shall ensure that fly ash and bottom ash do not scatter or fly out.

All WTE Facility operators shall discharge and store fly ash from bottom ash separately.

## Section 4.5 Management of Fly and Bottom Ash

### 3. Toxicity Characteristics Leaching Procedure Test / Determination of Toxicity Characteristics

The management of the generated fly and bottom ash will depend on its classification. The ash shall be subjected to a laboratory analysis specifically Toxicity Characteristics Leaching Procedure (TCLP) and pH test to determine if it is hazardous or not.

#### a) Ash Classified as Hazardous Waste

The generated fly and bottom ash classified as hazardous wastes shall be managed in accordance with the provisions of DAO 2013-22: Revised Procedures and Standards for the Management of Hazardous Wastes (Revising DAO 2004-36)

#### b) Ash Classified as Non-Hazardous Waste

The generated fly and bottom classified as non-hazardous wastes shall be managed in accordance with the provisions of DAO 2001-34: Implementing Rules and Regulations of the Philippine Ecological Solid Waste Management Act of 2000.

## Section 4.5 Management of Fly and Bottom Ash

### 4. Cement Solidification or Chemical treatment of Ash

In the case of stabilization of fly ash or bottom ash by cement solidification or chemical treatment, a kneading device capable of uniformly mixing fly ash or bottom ash, cement or chemicals and water shall be provided. In this case, fly ash or bottom ash, cement or chemicals and water shall be uniformly mixed

## Section 4.6 Other Environmental Pollution Control Requirements

### 1. Prevention of Noise and Vibration

All WtE-ACC facilities shall have a structure not to generate extreme noise and vibration, nor damage the surrounding environment. All WtE-ACC Facility Operators shall, in its operation, comply with Noise Control Standard specified in NPCC MC 1980-002 and take necessary measures so that the surrounding environment will not be damaged by significant noise and vibration. Approaches in structural and site layout must be compiled particularly on the waste handling operations that must be totally enclosed to contain noise.

### 2. Prevention of Scattering and Offensive Odor

All WtE-ACC facilities shall have a structure or equipment necessary for odor management. WtE-ACC Facility Operators shall take necessary measures to ensure the prevention of waste scattering and emission of offensive odor. Provision of appropriate technologies and practices to minimize odor and litter concerns should be implemented and strictly observed.

### 3. Housekeeping of the facility

All WtE-ACC facilities shall endeavor to prevent the occurrence of mosquitoes, flies, and maintain the cleanliness of the premises and surrounding areas of the facility. Provision of pest control programs to control specific vector populations and practices that reduce attracting vectors shall be implemented and strictly observed.

## Section 4.7 Other Requirements

### 1. Periodical Inspection

In addition to the preceding items, all WtE-ACC facilities shall undertake the necessary measures to maintain the functions of the facility, and periodically conduct functional inspections of the exhaust gas and water quality.

### 2. Record Management

Records of check, inspections and other measures concerning the maintenance of facilities (including emergency measures) shall be prepared and retained for five (5) years in soft and hard copies.

## Section 5. Duties and Responsibilities of the DENR, DOE and DOST

The DENR, DOST, and DOE shall have the following duties and responsibilities:

### A. The DENR through its Environmental Management Bureau shall:

1. Review, assess, and evaluate all related applications prior to the construction of WtE-ACC Facilities in compliance to the existing rules and regulations;
2. Permitting requirements under DAO 2019-21 and policies of Department of Human Settlements and Urban Settlements.
3. Design of exhaust gas treatment system of the WtE-ACC facility under RA 8749.
4. Installation of CEMS for the monitoring of operation of performance, measure and record of the concentration of dioxins and furans emission, and exhaust gas in compliance to NESSAP of DAO 2000-81.
5. Monitoring and evaluation of the ash management and discharge in compliance with DAO 2013-22 and DAO 2001-34.
6. Monitoring and evaluation of the management of wastewater in compliance with DAO 2016-08 and DAO 2021-19.
7. Provide technical support to DOST and DOE relative to the assessment, review, and evaluation of compliance to structural and operational requirements, as deemed necessary, and
8. Perform other duties and responsibilities geared towards achieving the objective of this Order.

## Section 5. Duties and Responsibilities of the DENR, DOE and DOST

The DENR, DOST, and DOE shall have the following duties and responsibilities:

### B. The DOE shall:

1. Review, assess, and evaluate all WtE-ACC Facility design/plan in compliance to all the structural and operational requirements;
  2. Adapt the necessary provisions and requirements under Section 7 of House Bill No. 3423 and Section 30 of the Renewable Energy (RE) Act;
  3. Provide technical support to DENR and DOST in prescribing policies and programs to enhance the electric power industry participants in the development of WtE Facilities, as deemed necessary;
  4. Promote WtE facilities as base load renewable energy which can contribute to solid waste management, benefit to the local economy, and create green jobs, among others; and
- Perform other duties and responsibilities geared towards achieving the objective of this Order

## Section 5. Duties and Responsibilities of the DENR, DOE and DOST

The DENR, DOST, and DOE shall have the following duties and responsibilities:

- c. The DOST shall:**
1. Review, assess, and evaluate all WtE-ACC Facility design/plan in compliance to all the structural and operational requirements;
  2. Adapt the necessary provisions and requirements under Section 4 of DAO 2006-01;
  3. Provide technical support to DENR and DOE as deemed necessary; and
  4. Perform other duties and responsibilities geared towards achieving the objective of this order

## Section 6. Separability Clause

If any provision of this JAO, or the application of any such provision to any person or circumstance, shall be held to be unconstitutional, invalid, illegal or unenforceable, the remainder of the provisions hereof that are not affected, or the application of such provision to persons or circumstances other than those as to whom or which it is invalid, illegal or unenforceable, shall not in any way be affected or impaired thereby.

## Section 7. Repealing Clause

All other Orders inconsistent with any provisions hereof are hereby repealed and amended accordingly.

## Section 8. Effectivity

This Circular shall take effect fifteen (15) days after the publication in a newspaper of general circulation and upon acknowledgment of receipt of a copy thereof by the Office of the National Administrative Register (ONAR).

## SIGNATORIES

ROY A. CIMATU	ALFONSO G. CUSI	FORTUNATO T. DE LA PEÑA
DENR Secretary	DOE Secretary	DOST Secretary



# Contents of Presentation

1. History of meetings
2. BAT/BEP Guidelines in the TCP
3. The Case Study Analysis
  1. Structure and Scope
  2. Results of Case Studies
  3. Findings

## “The Case Study Analysis for BAT/BEP Guideline”

### JICA Expert Team

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

1

## 1. History of the meetings for BAT/BEP Guideline

Meeting	Date	Main Presentation/Discussion
1 <sup>st</sup> SG	18 Feb. 2020	<ul style="list-style-type: none"> <li>- Discussion of the target <b>countries</b> and <b>type of WtE</b> facility</li> <li>- Presentation of survey format for each member</li> </ul>
2 <sup>nd</sup> SG	5 March	<ul style="list-style-type: none"> <li>- It was agreed that case studies mainly focus on <b>combustion</b>.</li> <li>- JET requested members to investigate what they are interested.</li> </ul>
3 <sup>rd</sup> SG	4 June	<ul style="list-style-type: none"> <li>- Confirmation of <b>selection criteria and survey format</b></li> <li>- Presentation of <b>4 collected cases</b> studies base on the survey format (Japan, Singapore, Netherland and France)</li> </ul>
4 <sup>th</sup> SG	7 July	<ul style="list-style-type: none"> <li>- Presentation of summary of <b>15 cases</b></li> </ul>
5 <sup>th</sup> SG	20 Aug.	<ul style="list-style-type: none"> <li>- Presentation of summary of <b>36 cases</b></li> </ul>
6 <sup>th</sup> SG	14 Oct.	<ul style="list-style-type: none"> <li>- Presentation of summary of <b>46 cases</b></li> </ul>
2 <sup>nd</sup> ITWG	3 Dec	<ul style="list-style-type: none"> <li>- Explanation of Survey Procedure of Case Studies of BAT/BEP GLs</li> <li>- Presentation of summary of <b>60 BAT/BEP cases</b> (Japan:30, Asia except Japan: 10, EU and USA:20)</li> </ul>
4 <sup>th</sup> SG- (OP4)	25 March, 2021	<ul style="list-style-type: none"> <li>- Submission and Explanation of the <b>1<sup>st</sup> draft BAT/BEP GL</b> (17 Mar)</li> <li>- Deadline for <b>SG members' comments</b> was set for the beg. of April</li> </ul>

Meeting	Date in 2021	Main Presentation/Discussion
7 <sup>th</sup> SG	23, April	<ul style="list-style-type: none"> <li>- Presentation of the answer for the comments</li> <li>- Explanation of additional information for the comments</li> </ul>
3 <sup>rd</sup> ITWG	26, April	<ul style="list-style-type: none"> <li>- Explanation of <b>1<sup>st</sup> draft of BAT/BEP GL</b></li> <li>- Sharing the comments from SG members and JET answers</li> </ul>
8 <sup>th</sup> SG	14, June	<ul style="list-style-type: none"> <li>- Submission of the <b>2<sup>nd</sup> draft BAT/BEP GL</b></li> <li>- Deadline for <b>SG members' comments</b> was set for June 24 (→Only DOE provided a comment to supplement information of FIT)</li> </ul>
	July	<ul style="list-style-type: none"> <li>• QC submitted the letter with comments to EMB after deadline (July) →PMO/EMB responded to QC within July</li> <li>• PMO suggested change of the title of the document</li> </ul>
4 <sup>th</sup> ITWG	2, Aug.	<ul style="list-style-type: none"> <li>• Submission and explanation of the <b>2<sup>nd</sup> draft as Case Study Analysis</b> (updated with input by DOE, the different title suggested by PMO)</li> <li>• Deadline for <b>ITWG members' comments</b> was set by August 13</li> </ul>
	Aug-Sep	<ul style="list-style-type: none"> <li>• QC submitted a letter with the follow up comments to the communication in July(5 August) → Meeting with QC-OP4 (10 Sep)</li> <li>• NEDA submitted comments to EMB (18 August)</li> </ul>
9 <sup>th</sup> SG	4 Nov.	<ul style="list-style-type: none"> <li>• Responses to NEDA and QC comments</li> </ul>
	Nov.	<ul style="list-style-type: none"> <li>• Endorsement by NEDA and QC for JCC</li> </ul>

## 2. BAT/BEP Guidelines in the TCP (Backgrounds and understanding)

### 1. NSWMC Resolution669-2016:

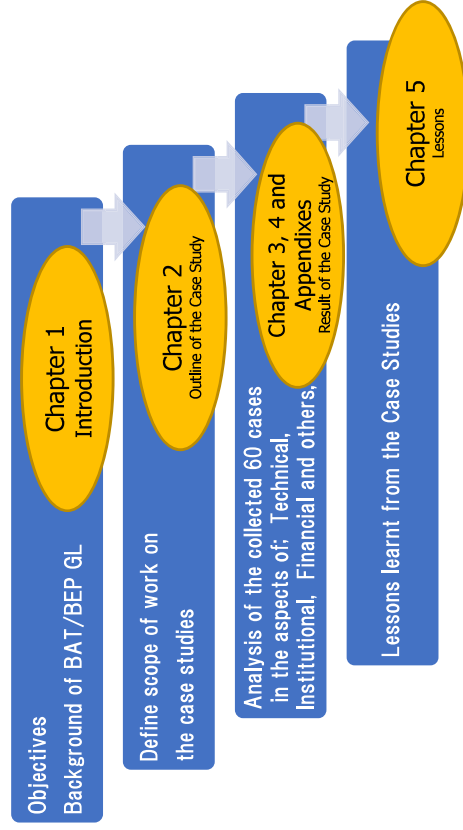
The National Ecology Center (NEC) is in charge of finalizing and publishing the BAT/BEP guidelines

### 2. Understanding in the TCP:

1. BAT/BEP Guidelines to be drafted in the TCP with cooperation with DOST, while finalization of the guidelines and preparation of budget shall be arranged by the NEC
2. “BAT/BEP Guidelines for WTE technologies” will not be “Obligation” but “Recommended Technologies” for WTE.

The document can be a guidance for the BAP/BEP Guideline

## 3.1 Structure of Document



## 3. The Case Study Analysis

### 3.1 Scope of Case Study

1. WTE Technology
  - WtE facilities utilizing combustion technology, as the Appropriately Controlled Combustion (WtE-ACC)
2. Countries and Region
  - East Asia (Japan, China, Taiwan and Korea)
    - a high percentage of cases processed by WtE-ACC and a large number of cases.
  - Southeast Asia/ South Asia
    - Same region where the Philippines are located
  - EU, North America (Other Developed Region)
    - Other Developed Region
3. Treatment Capacity
  - Minimum 100 tons/day, which may avoid low efficiency and unfeasibility of facilities

## The Collected WtE Cases

Region/ Country	Number of Cases	Region/ Country	Number of Cases
East Asia	32	EU	17
China	1	Austria	2
Japan	30	Belgium	1
Taiwan	1	Denmark	2
Southeast/ South Asia	8	Finland	2
India	1	France	1
Singapore	4	Germany	1
Thailand	2	Italy	1
Vietnam	1	Netherlands	1
North America	3	Norway	1
USA	3	Spain	1
		Sweden	3
		United Kingdom	1
		<b>Total</b>	<b>60</b>

## 3.2. Results of Case Studies

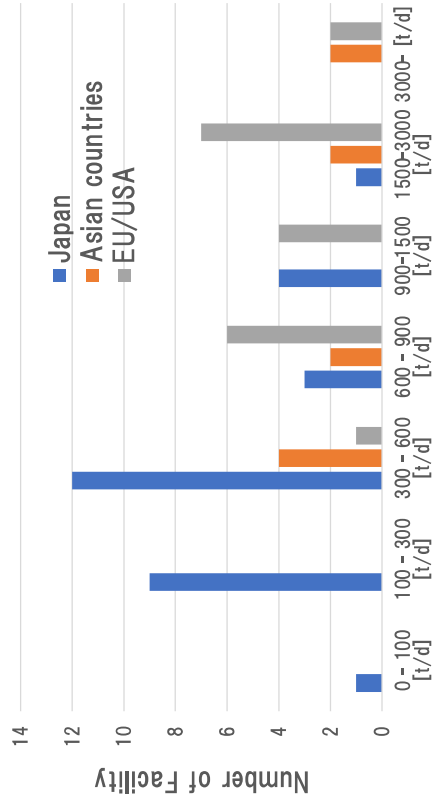
### Example of Collected Case Study (Suginami Incineration Plant)

Name	Suginami Incineration Plant	Location	Suginami ward, Tokyo, Japan			
Impl. Body	Clean Authority of TOKYO	Footprint	3.6 ha			
Capacity	600t/d (300 x 2lines)	Heat Usage	Power 24.2MW			
Target Waste	Combustible municipal solid waste	Waste Quality	8,854 kJ/kg			
History	Dev. Plan	Demolish	Bid	Const. St/Fin	Op. Start/Fin	Demolish
	Original	-	-	-	-	-
	Actual	-	-	2012	2017	2017
Capex	-	Fund Source	NG Subsidy + LG			
Opex	1.01 B-JPY/yr (2019)	Fund Source	LG + TF + Energy			
Fin. Scheme	Public Build (DB) and Own	Dev. Approach	Solicited			
Coverage (SOW)	Collection	Transp.	Incineration	Power sale	Bottom ash	Fly ash
	LG (ward)	LG (ward)	LG	LG	LG	LG
Process Type	Stoker type	EPC / Tech	Hitz (JPN)			
Pollution Control	Exhaust Gas	Wastewater	Bottom ash	Fly ash	Other	
	Stricter Standard (Scrubber + SCR + Bag Filter)	Discharge to Sewage	Eco-cement or SLF	SLF after chemical treatment		

### Example of Collected Case Study (Nong Khaem WTE plant)

Name	Nong Khaem WTE plant	Location	Nong Khaem, Thailand			
Impl. Body	C&G Environmental Protection Holdings Limited (C&G)	Footprint	? ha			
Capacity	500 t/day	Heat Usage	Power 9.8MW			
Target Waste	Municipal solid waste	Waste Quality	? KJ/kg			
History	Plan	Bid	Const. St/Fin	Op. Start/Fin	Demolish	
	Original	-	-	-	-	
	Actual	-	-	2014	2014	
Capex	THB 900 million	Fund Source	Bangkok Metropolitan Authority (BMA)			
Opex	1000 Bahts/ton	Fund Source	Tipping fee from BMA + energy sale ?			
Fin. Scheme	BOT	Dev. approach	?			
Coverage (SOW)	Collection	Transp.	Processing	Energy sale	Bottom ash	Fly ash
	C&G	C&G	C&G	C&G ?	BMA ?	BMA ?
Process Type	Stoker type	EPC / Tech	New Sky Hitz ?	(Remarks if any)		
Pollution Control	Exhaust Gas	Wastewater	Bottom ash	Fly ash	Other	
	?	?	?	?	?	

## Treatment Capacity of the WtE-ACC Facilities

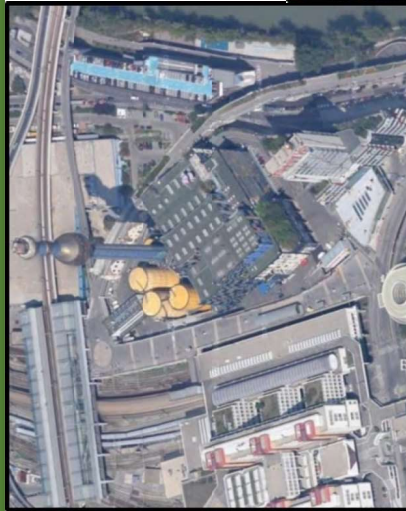


Treatment Capacity of Facility

## Type of Combustion Furnace

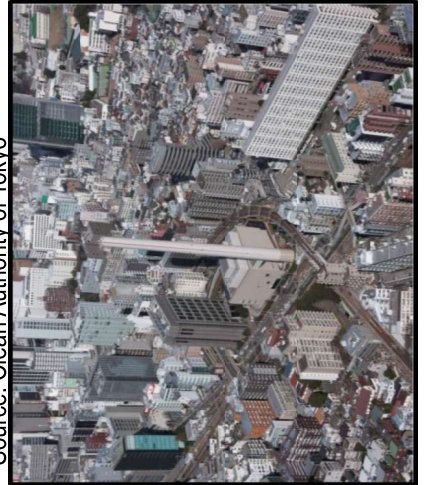
	Fluidized bed (FB)	Stoker	Gasification and Melting (GM)	FB, GM	Total
1. East Asia	3	25	3	1	32
2. Southeast/South Asia	0	8	0	0	8
3. EU	3	13	0	0	17
4. North America	0	2	0	0	3
Total	6	48	3	1	58
Ratio (%)	10	83	5	2	100

## WtE Facilities located in the Center of the Urban Area

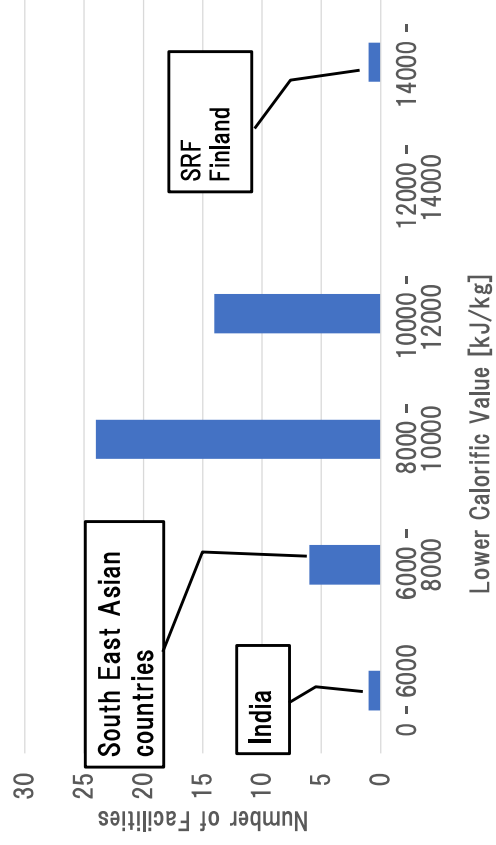


Wien-Spittelau, Vienna, Austria  
Source: Wien Energie GmbH

Shibuya Incineration Plant, Tokyo, Japan  
Source: Clean Authority of Tokyo

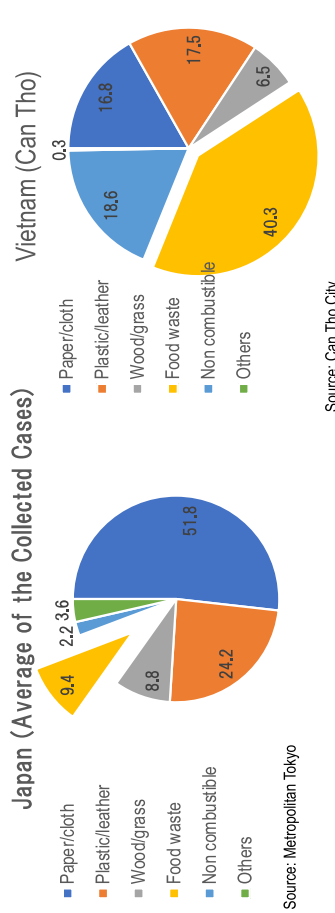


## Lower Calorific Value of the Waste





## Physical Composition of Target Waste



## Physical Composition of Waste for WtE-ACC in Japan (%)

Physical composition (dry base)	Paper/cloth	Plastic/Leather	Wood/grass	Food waste	Non-combustible	Others
Maximum	63.5	32.0	19.3	19.6	5.9	13.6
Average	51.8	24.2	8.8	9.4	2.2	3.6
Minimum	42.6	17.4	2.4	5.3	0.7	0.0

## Environmental Monitoring

### Examples of EU and Japan

Item	O&M/S in Japan (Section 17 above)	MOE Circular (Kansei 95), Japan	EU directive 2000/76 (EU Directive 2010-75)	WTE Technical Standards (under endorsement) in the Philippines
Capacity of WtE	Mandatory	Recommended	Mandatory	
	All	For >200t/d		
DXNs	1/year	-	2/year	1/year
SOx	2/year	6/year	Continuous	2/year
Dust	2/year	6/year	Continuous	2/year
HCl	2/year	6/year	Continuous	2/year
NOx	2/year	6/year	Continuous	2/year

## Emission Standards of Exhaust Gas

Parameter	Japanese Law	Facility standard (Shinkoto)	Actual
NOx [ppm]	250	60	36 - 41
HCl [ppm]	430	15	<2
SO <sub>2</sub> [ppm]	Area basis	20	<1
Particulates [mg/Nm <sup>3</sup> ]	80	0.02	<0.001
Mercury [ $\mu$ g/Nm <sup>3</sup> ]	50	-	<5
DXNs [ng/Nm <sup>3</sup> ]	0.1	-	<0.00005

Parameter	EU Directive	Facility standard (Isseane, France)
NOx [ppm]	87.7	28.5
HCl [ppm]	5.5	2.2
SO <sub>2</sub> [ppm]	15.7	7.5
Particulates [mg/Nm <sup>3</sup> ]	9	1.3
Mercury [ppm]	45	13.1
DXNs [ppm]	0.09	0.03

## Business Scheme of WtE-ACC Case Studies

Business Scheme	Number of cases	In Japan	Outside of Japan	Remark
Public Build (DB) and Operate	21	13	8	Japan, Singapore, Netherland, Italy, Denmark, Finland
DB+O (15yrs)	1	1	0	Japan
DB+O	2	0	2	France, Singapore
DBO (15yrs)	4	4	0	Japan
DBO (20yrs)	10	9	1	Japan, USA
BTO (20yrs)	2	2	0	Japan
BOT (20yrs)	3	0	3	Thailand, Taiwan, India
B00 (25yrs)	1	0	1	Singapore
B00 (22yrs)	1	0	1	Vietnam
-	15			No information
<b>Total</b>	<b>60</b>			

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

### 3. Findings

### 3. Findings

#### 1) Target waste

- The target waste of WtE is **not decided uniformly**.  
**LGUs shall decide or check** the target waste to be treated in their WtE facility their plan.
- The **waste segregation commonly practiced** before treatment by WtE facility.
- The segregation practice, methodology and technology in the preceding countries can be references to the LGUs in the Philippines

### 3. Findings,

#### 2) Combustion Technologies and Treatment Capacity

- **Stoker (moving grate)** is the mostly adopted because of track record, variety of treatment capacity.
- Since, the operation period of WtE facility is long as 20 years or more, the technology **shall be evaluated carefully**.
- The LGUs shall evaluate type of furnace **appropriate for their solid waste amount**.

### 3. Findings, 3) Area

- The area for WtE can be minimized according to availability of land and the conditions of the surrounding area.
- WtE facilities have been constructed and operated in the populated and urbanized area.

### 3. Findings, 4) Energy Recovery

- The electricity generation efficiency has been improved as the treatment capacity of WtE facilities become bigger.
- To achieve very high efficiency of electricity generation, more cost could be required.
- Various methodologies which contribute to improve the efficiency of energy recovery is available

### 3. Findings, 5) Pollution Control

- Environmental standards of WtE facility is set as stricter than the National standards in the existing cases.
- Such stricter standards can be met by installing appropriate pollution control technology and eases making public consensus for its development

### 3. Findings, 6) Ash Handling

- Utilizations of bottom ash as cement aggregate, other construction use are practiced. Such utilization sometime requires additional cost and could be revenue source depending on the conditions.
- Fly ash containing heavy metals or other toxic materials, it is stabilized by cement solidification, chemical treatment, or dispose at hazardous waste landfill site.

### 3. Findings,

#### 7) Business Scheme

- A **solicited approach** was adopted in almost all cases in the case study.
- This is the fact that the WtE projects took this approach could reach to the construction and operation.
- Proposals from the private sector are based on the proponent's interest, which may not be best for waste management in the LGUs.

**THANK YOU FOR YOUR  
ATTENTION!**