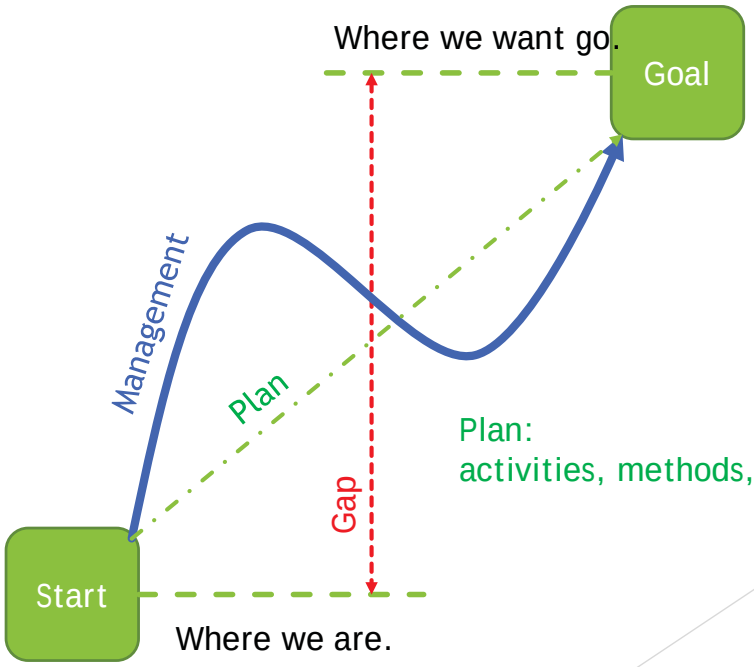
Online Technical Meeting
for
the "Technical Project on Advisor for Marine Plastic Litter Management in the Caribbean Region

- Planning of Municipal Solid Waste Management -

14 June 2022

JICA Advisory Team

What is planning?



Plan:
activities, methods, orders

Objective of this session

- Estimation of future waste amount

What is planning of municipal solid waste management?

Objectives and Goals of the Master Plan

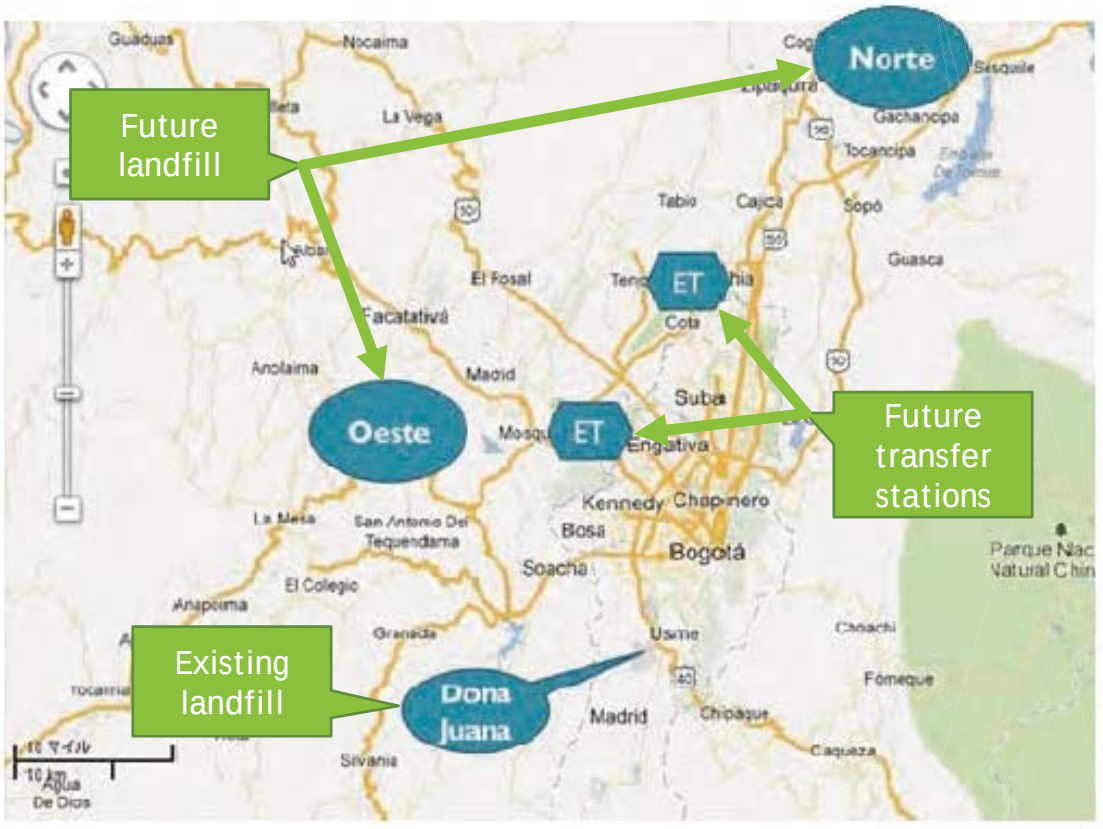
No.	General/Specific Objectives	Present	Short Term 2013-2015	Medium Term 2016-2018	Long Term 2019-2027
1	**Guarantee the quality and continuity of the garbage collection service to the users.**				
1.1	Maintain coverage of the urban area	100%	100%	100%	100%
1.2	Increase coverage of the rural area	30%	100%	100%	100%
2	**Minimize the amount of solid waste**				
	(total minimization rate)	(5.4%)	(10.8%)	(12.7%)	(20.3%)
2.1	Promote recycling of materials (material recycling minimization rate)	Informal Alqueria (5.4%)	85 tons/day to the system (6.2%)	427 tons/day to the system (6.2%)	1,074 tons/day to the system (9.7%)
2.2	Develop and extend the composting system (composting minimization rate)	- (0.0%)	25 tons/day to the system (1.1%)	58 tons/day to the system (2.0%)	249 tons/day to the system (2.8%)
2.3	Develop and extend the combined construction and demolition waste recycling system (cdw minimization)	- (0.0%)	redirect 100% from Doña Juana 850 tons/day to the system (3.5%)	901 tons/day to the system (4.5%)	1,055 tons/day to the system (7.7%)
2.4	Raise awareness and train users to succeed in achieving the reduction, reuse, separation at source and differentiated disposal of solid waste				
3	**Guarantee the proper final disposal of unused/unexploited solid waste**				
3.1	To ensure the operation of the Doña Juana landfill	Optimization Phase I	Phase II (17 million tons)		Master Plan (38 million tons)
3.2	To reduce the vulnerability of the current final disposal system	-	-	-	2 new landfills

Key Indicators in the Master Plan

	Component	Unit	Present 2012	Short 2015	Medium 2018	Long 2027
1	Population					
	Population	thousand	7,565	7,875	8,184	9,114
2	Flow of solid waste					
	Production	tons/day	6,704	7,135	7,566	8,859
	Collection	tons/day	6,340	6,659	6,973	7,784
	Recycled material, total	tons/day	366	473	592	1,074
	Present	tons/day	366	0	0	0
	Transition	tons/day	0	389	165	0
	Plant	tons/day	0	85	427	1,074
	Composting	tons/day	0	103	180	276
	CDW recycled	tons/day	0	850	901	1,055
	Final disposal	tons/day	6,304	6,368	6,604	7,065
	Minimized quantity	tons/day	364	767	962	1,794
3	RBL service coverage					
	Urban area	%	100	100	100	100
	Rural area	%	30	100	100	100
4	Minimization rate					
	Material recycled	%	5.4	6.2	6.2	9.7
	Composting	%	0.0	1.1	2.0	2.8
	CDW recycled	%	0.0	3.5	4.5	7.7
	Total	%	5.4	10.8	12.7	20.3

5	Infrastructure and equipment					
51	RBL Collection, sweeping and cleaning					
511	Collection truck					
	Compacter 25 yd3	nos.	*217	237	251	-
	Compacter 16 yd3	nos.		35	36	246
	Ampliroll 10 M3	nos.	**219	35	36	46
	Van 4,5 Ton	nos.		14	16	11
	Dump trucks 12 m3	nos.		36	39	-
512	Transfer Station					
	Western station	tons/day	-	-	-	4,500
	Northern station	tons/day	-	-	-	2,000
513	Transport					
	Tractor-truck	nos.	-	-	-	66
	Trailer	nos.	-	-	-	70
52	Recycling					
521	Recycled material					
	6 ton Truck	nos.	8	29	143	359
	Gathering center (30tons/day)	nos.	1	3	15	36
522	Composting					
	Plant (100tons/day)	nos.	-	1	2	3
523	CDW recycling					
	Drop-off point (60tons/day)	nos.	-	2	5	12
	Recycling plant (200tons/day)	nos.	-	2	3	3
524	Recycling park					
	Recycling plant	The need for these infrastructures will be analyzed below with the participation of the private sector				
	CATARS					

	Component	Unit	Present 2012	Short 2015	Medium 2018	Long 2027
53	Final disposal					
	Doña Juana	tons/day	6,340	6,368	6,604	2,119
	Western landfill	tons/day	-	-	-	3,532
	Northern landfill	tons/day	-	-	-	1,413
6	Cost (Colombian pesos)					
61	Cost per year					
	FR, commercial	million $	50,454	52,521	54,588	60,789
	BL, sweeping and clean-up	million $	65,035	69,217	73,399	85,945
	RT, recollection	million $	197,188	220,853	227,982	216,210
	Recycling	million $	0	73,852	90,950	116,236
	DT, final disposal	million $	44,668	65,341	67,769	76,031
	PMIRS	million $	3,703	3,940	4,177	4,888
	Total	million $	361,048	485,724	518,865	560,099
62	Unit cost					
	Per generation	$/ton	147,548	186,508	187,885	173,216
	Per population	$/pers.	47,728	61,683	63,398	61,458
63	Cost increase rate (2012 = 100%)					
	Total cost	%	-	35%	44%	55%
	Per generation	%	-	26%	27%	17%
	Per population	%	-	29%	33%	29%



Data and information required for planning

Item	Type	Use
Population	Current and future projection	To estimate waste amount at present To estimate waste amount in the future
Institutional, Commercial and Industrial entities	Number of entities, number of employees, number of tourists, amounts of sales, etc.	To estimate waste amount at present To estimate waste amount in the future
Economic info.	GDP per capita	To estimate waste amount in the future To estimate affordability to pay for MSWM cost
	Household income	To estimate affordability to pay for MSWM service charge
Meteorological data	Temperature, precipitation, evaporation, wind direction	To estimate leachate amount To consider treatment method To consider location of treatment facilities and landfills
Hydrogeological info.	Geological data, underground water, rivers, historical data of flooding, etc.	To consider location of treatment facilities and landfills
Other infrastructures	Sources of water supply, sewerage treatment facility, etc.	To consider location of treatment facilities and landfills

Estimation of future waste amount

First step: Estimation of current waste amount

- Waste Generation Rate (kg/person/day)
  - Waste Generation Rate (household): WGR-household

    = waste amount generated from houses / number of populations
  - Waste Generation Rate (ICIs): WGR-ICIs

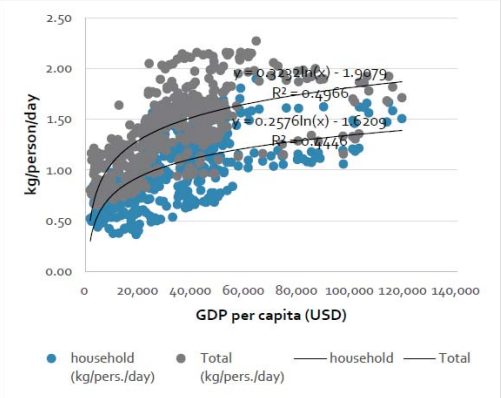
    = waste amount generated from ICIs / number of populations
  - Waste Generation Rate (municipal): WGR-municipal

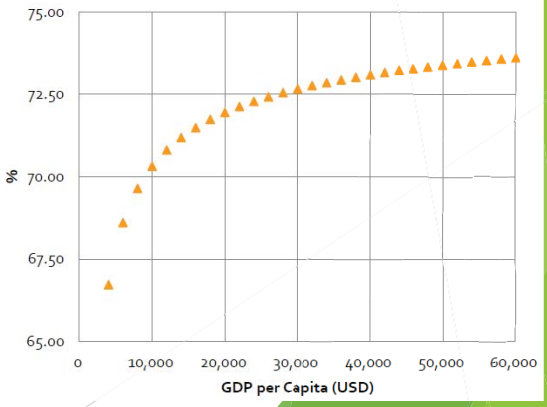
    = (waste amount generated from houses + waste amount generated from ICIs) / number of populations

    = municipal waste amount generated / number of populations

Waste Amount Survey

Waste generation source		Data for estimating waste amount of the entire city
Household	Hight income	Population data by income level
	Middle income	
	Low income	
Other than household (Institutional Commercial and Industrial entities, ICIs)	Offices	number of offices, number of shops, sales amount, number of beds, rooms, etc.
	Shops	
	Restaurants	
	Hotels	





Use of weighbridge data

waste amount generated = self-disposal
+ recycling
+ treatment
+ residue from recycling/treatment
+ clandestine dumping
+ final disposal

d. Estimation of the current waste amount

- Table 1-3: Estimation of Current Waste Amount Generated (example)

Waste generation source		Generation rate (kg/person/day)	Population (nos.)	Total (kg/day)
Household	High income	1.2	10,000	12,000
	Middle income	1.0	30,000	30,000
	Low income	0.8	10,000	8,000
	Total	-	50,000	50,000
	WGR-household = 50,000 kg/day / 50,000 person = 1.0 kg/person/day			

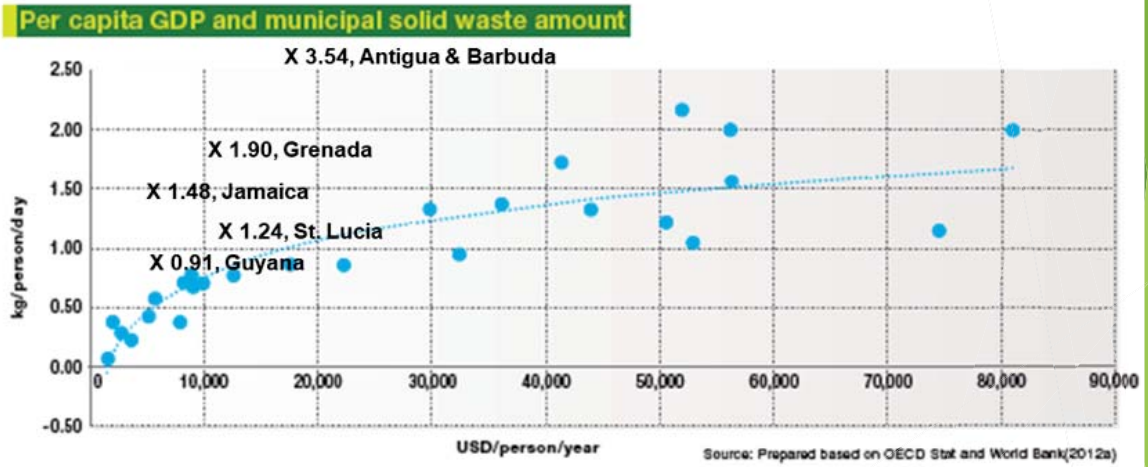
Waste generation source		Generation rate*	Nos.	Total (kg/day)
ICIs	Office	0.2 kg/employee/day	20,000	4,000
	Restaurant	1.0 kg/table/day	10,000	10,000
	Hotel	0.5 kg/bed/day	12,000	6,000
	Total	-	-	20,000
	WGR-ICIs = 20,000 kg/day / 50,000 person = 0.4 kg/person/day			

* Unit of generation rate is different for each generation source.

Municipal waste amount generated: 50,000 + 20,000 = 70,000 kg/day
WGR-municipal = 70,000 kg/day / 50,000 person = 1.4 kg/person/day

Second step: Future waste amount

- a. Change in WGR



Source: Basics of Municipal Solid Waste Management in Africa, p9 (https://africancleancities.org/library/)

Figure 1-3: Correlation between WGR-municipal and GDP per capita

Estimation of waste amount in the future

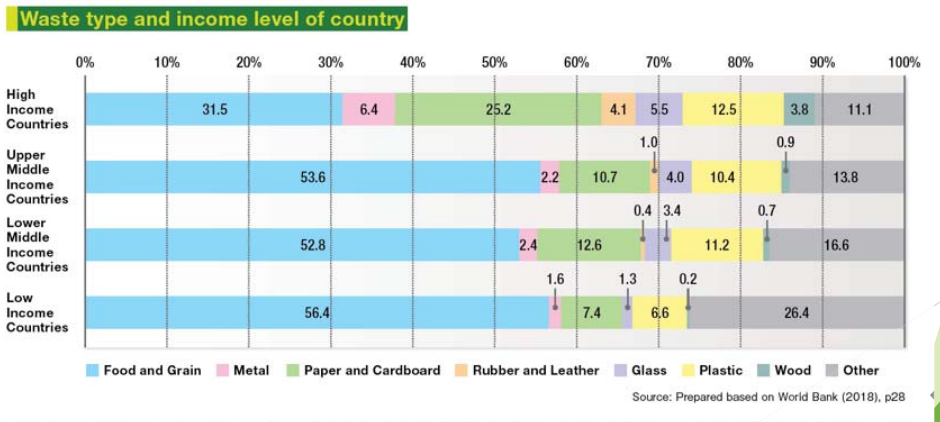
- Waste amount generated = WGR-municipal x population

Table 1-4: Estimation of Future Waste Amount Generated (example)

Item	Unit	20xx	20xx	20xx
WGR-municipal	Kg/person/day	0.8	1.0	1.2
Population	Nos.	80,000	100,000	120,000
Waste amount	Ton/day	64	100	144

Waste composition in the future

- It is not recommendable to consider change of waste composition in preparation of a maser plan.
- It is recommendable to analyse waste composition of target waste If you consider introduction of special treatment such as composting, biogas and incineration.



Source: Prepared based on World Bank (2018), p28

Low (USD1,025 or less), Lower middle (USD1,026-4,035), Upper middle (USD4,036-12,475), High (USD12,476 or more)
Source: Basics of Municipal Solid Waste Management in Africa, p9 (https://africancleancities.org/library/)

Thank you for your attention.

Online Technical Meeting
for
the “Technical Cooperation Project on Advisor for Marine Plastic Litter Management in the Caribbean Region

- Collection and Transport-

12 July 2022

JICA Advisory Team

EX Research Institute Ltd.

NIPPON KOEI

Contents

Collection Route Design

(1) Overall collection and transportation plan
(2) Route design

Preparation of Collection and Transportation Plan and Collection Route Design

Preparation of overall collection and transportation plan
Objectives:
- Planning the procurement and budget preparation
- Allocations of personnel resource

Output:
- Procurement plan of equipment and design of facility
- Planning of budget and personnel allocation

Collection Route Design and Scheduling
Objectives:
- Setting the collection area and routes of collection service
- Checking the effectiveness of collection services

Output:
- Detail collection route design and collection points
- Estimation of collection time and scheduling of each vehicle

Preparation of Collection and Transportation Plan and Collection Route Design

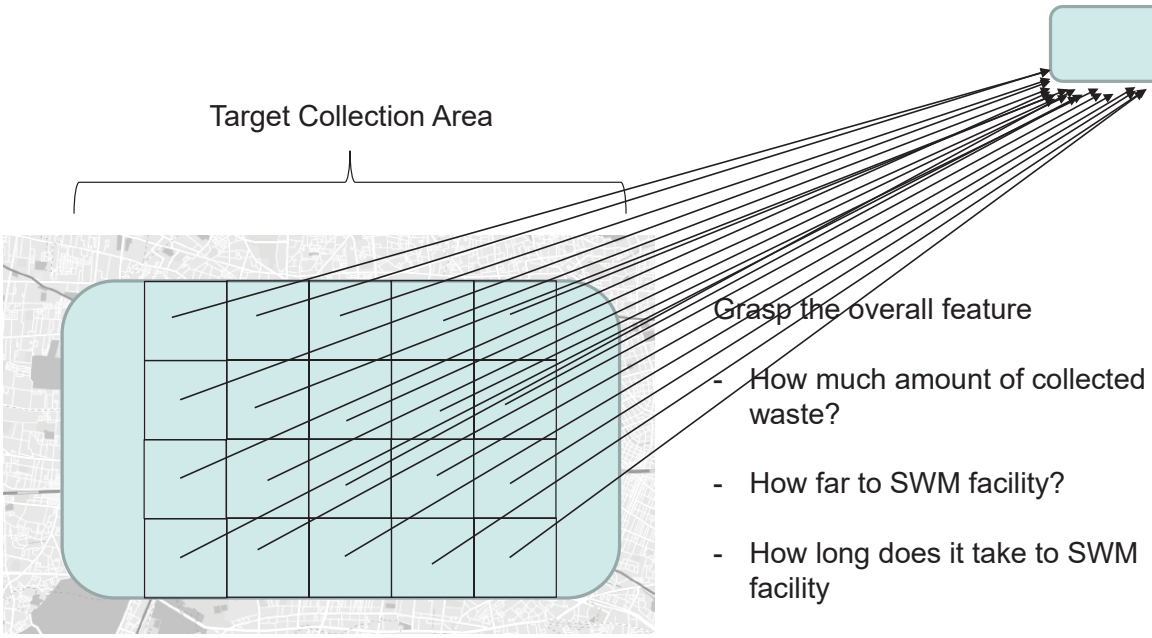
Preparation of overall collection and transportation plan

- Set the target areas for collection and transportation
- Calculate approximate waste quantity in all the target area
- Select the type of waste collection and transportation system with consideration of area characteristics
- Set overall collection and transportation schedule
- Divided into the target area by waste amount to be collected in the area per trip of each collection vehicle
- Calculate collection and transportation time and frequency of target waste for each vehicle
- Allocation each collection vehicle to target area with consideration of approximate total trip time

Collection Route Design

- Collection route design and collection time
- Adjusting collection route by time factor collection points or road condition, etc
- Adjusting collection route by quantity factor due to daily and seasonal fluctuation, etc

Setting Collection Target Area and Calculation of Waste Quantity



Grasp the overall feature

- How much amount of collected waste? → Calculate approximate number of truck
- How far to SWM facility? → Consider transfer station or not
- How long does it take to SWM facility → Consider trip number of vehicle

Basic Calculation for Collection and Transportation

Total Collection Amount

1. Total amount to be collected in the target area

[Total Waste Collection Amount (ton/day)] = [Waste Collection Amount per Vehicle (ton/day/vehicle)] x [Number of vehicle (vehicle)]

2. Collection Amount per vehicle

[Waste Collection Amount per Vehicle (ton/day/vehicle)] = [Capacity of Collection Vehicle (ton/time)] x [Number of trip (times /day)]

Total Collection and Transportation Time

1. Total time

[Total time (hr)] = [Total time per trip (hr/trip)] x [Number of trip (times /day)]

2. Total time per trip

[Total time per trip (hr/trip)] = [Collection time (hr)] + [Transportation time(hr)]+ [Unloading time at SWM facility (hr)] + [Others (hr)]

Select the Type of Waste Collection and Transportation System

Contents	Picture	Feature
Transport by compactor vehicle after the compaction of receiving waste in the vehicle		- Transport waste efficiently by waste compaction - Loading is not so difficult due to lower bucket
Transport by dump truck after the receiving waste in some transfer stations by manual or equipment		- Collect various type of waste such as bulky waste or glass bottle - Not transport waste effectively
Transport by skip container / container carrier		- Collect various type of waste such as bulky waste or glass bottle - No need of loading waste but loading skip or container carrier of each waste

Set the collection and transportation schedule like collection date and collection and transportation time (example)

Mixed collection

	Every type of waste
Area A	Mon & Thu
Area B	Tue & Fri
Area C	Wed & Sat

6 a.m to 10 a.m

Separate collection

	Organic	Inorganic	Recyclable
Area A	Mon & Thu	Fri	Wed
Area B	Tue & Fri	Sat	Mon
Area C	Wed & Sat	Thu	Fri

6 a.m to 10 a.m

Collection Amount

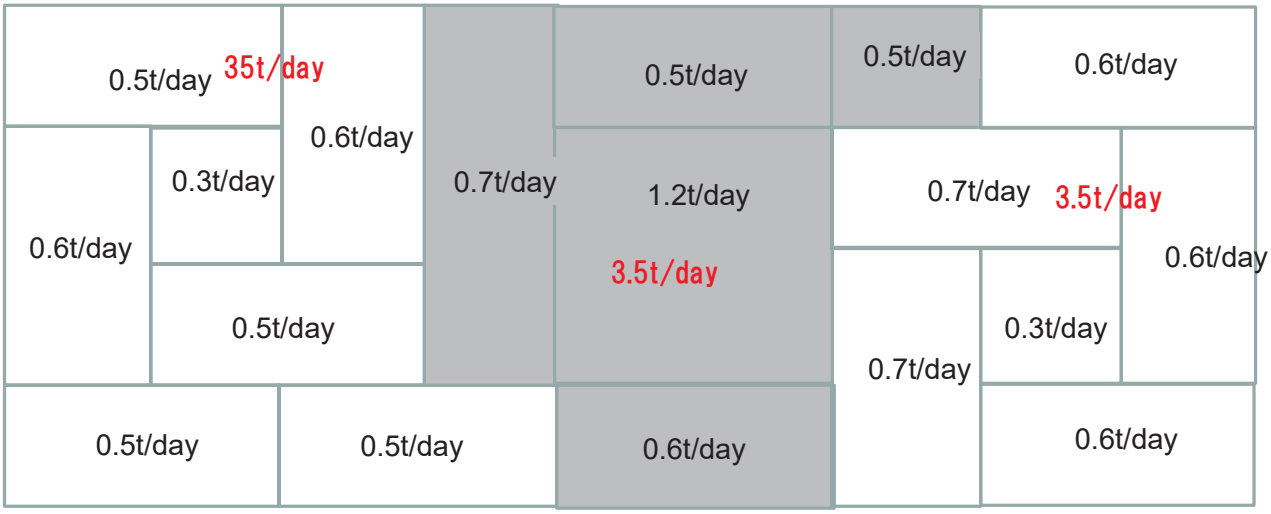
Case I (Mixed collection)

Mon	Mixed	:Amount of 4 days
Tue		
Wed		
Thurs	Mixed	:Amount of 3 days
Fri		
Sat		
Sun		

Case II (Separate collection)

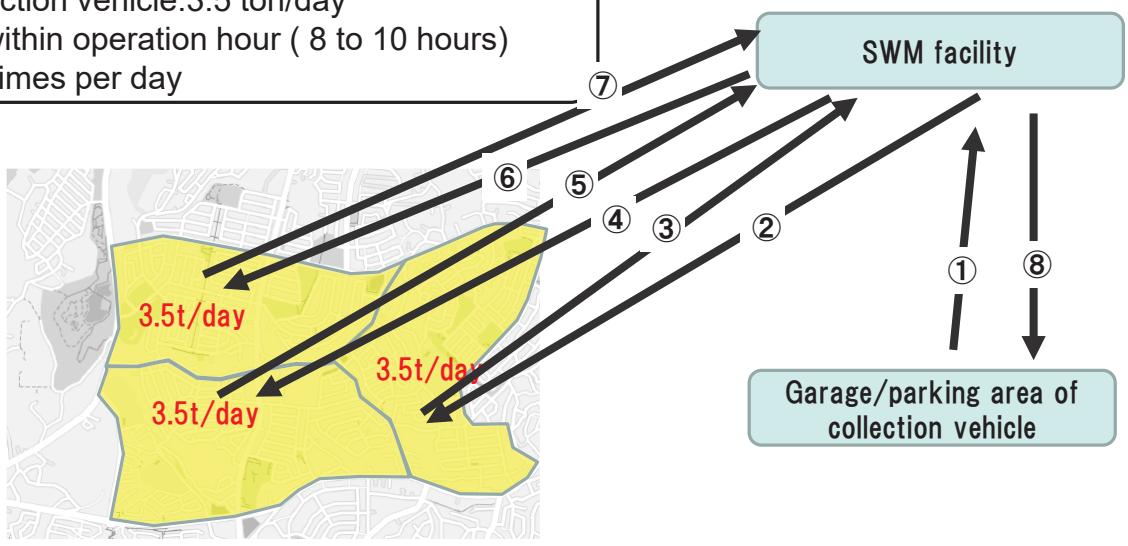
Mon	Organic	:Amount of 4 days
Tue		
Wed	Recyclable	: Amount of 7 days
Thurs	Organic	:Amount of 3 days
Fri	Residual	: Amount of 7 days
Sat		
Sun		

Division into the target area by waste amount to be collected in the area per trip of each collection vehicle

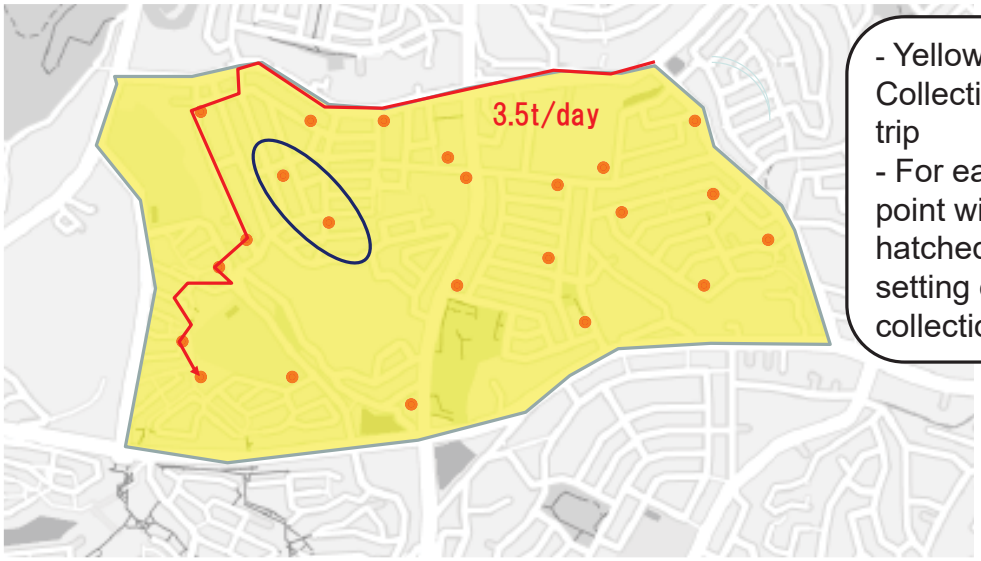


Setting the area for collection

Case
Capacity of collection vehicle:3.5 ton/day
Total trip time : within operation hour (8 to 10 hours)
Trip number : 3 times per day

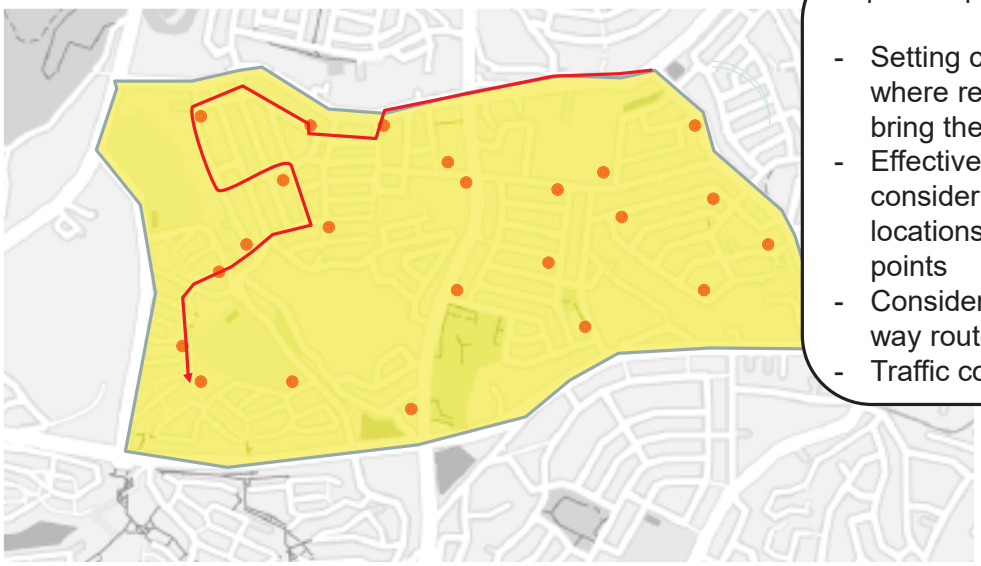


Setting the area for collection points and collection route (No.1)



- Yellow hatched area: Collection area for one trip
- For each collection point within the yellow hatched collection area , setting effective collection route

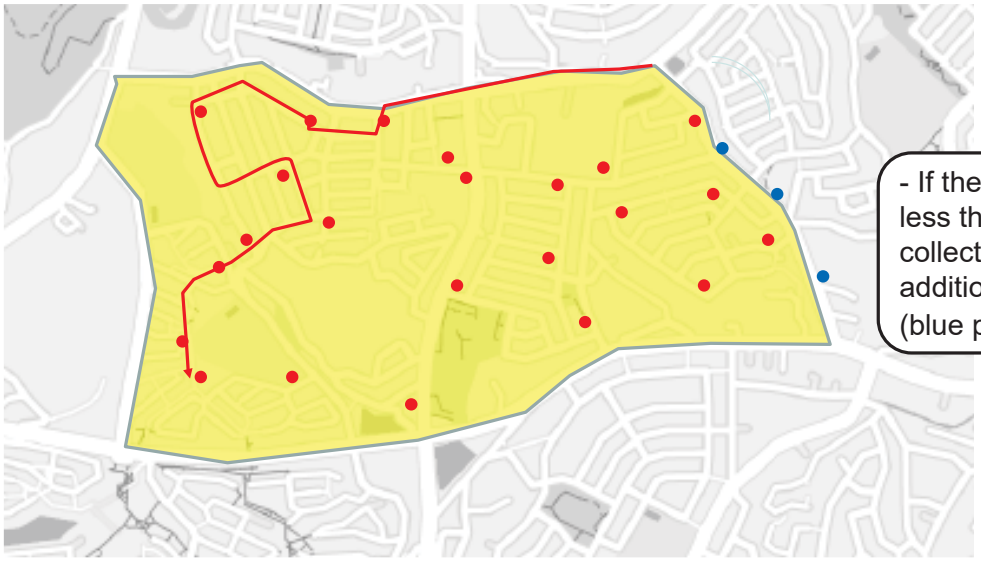
Setting the area for collection points and collection route (No.2)



Important points of setting

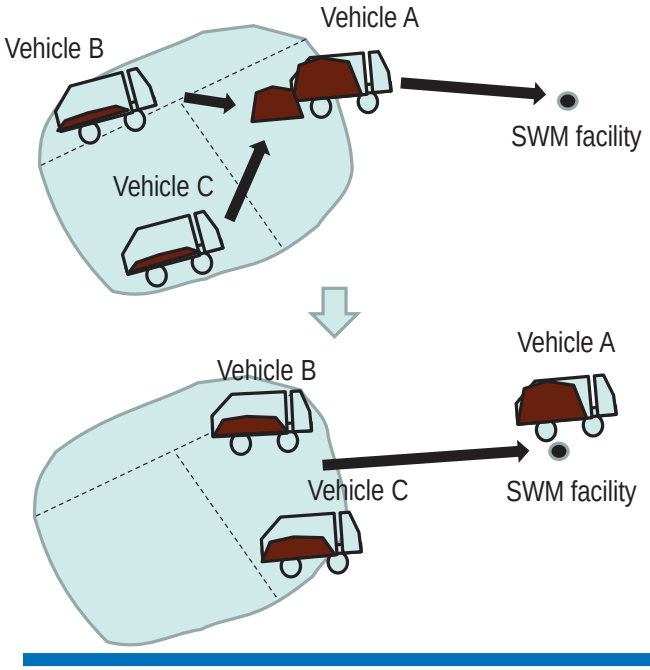
- Setting collection points where residents can bring their waste
- Effective route setting considering the locations of collection points
- Consideration of one-way route
- Traffic congestion

Setting the area for collection points and collection route (No.3)



- If the waste amount is less than capacity of collection vehicle, additional collection points (blue points) can be added.

Measure of Collection and Transportation (Information Sharing among Vehicles of Collection Information)



- Collection route is determined in the area and Some vehicles (three vehicles in left vehicle) collect the waste simultaneously.
- If area is determined, a vehicle (ex. vehicle A) is full, the vehicle communicates the center or other vehicles to assist the area.
- After that the other collection vehicle (vehicle B) will collect the waste
- In that case, the collection and transportation time will be reduced because collection B will start the remaining waste collection in the area of collection A before the collection A returns back from landfill site

Transport and Transfer

(1) Large scale waste transfer

(2) Small scale waste transfer

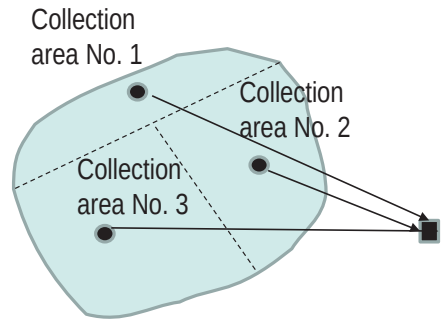
Objective and role of waste transfer station

Waste Transfer System is a system where waste from multiple sources is consolidated into high capacity vehicles to transport to a SWM facility efficiently

Factors of transport efficiency

- Distance from collection area
- Rate of secondary transportation distance from SWM facility to the distance from collection area
- Capacity of transfer station
- Rate of capacity of secondary transportation vehicle to of primary collection vehicle

Measure of Collection and Transportation (Waste Transfer)

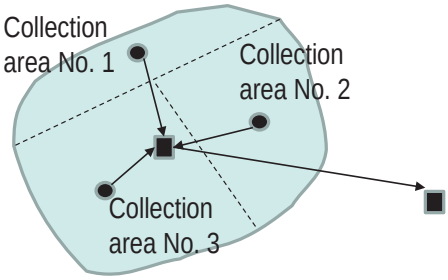


(1) Direct transportation (without waste transfer)

$T_{Ca} = C_1 + C_2 + C_3$

T_{Ca} : Total cost from collection area No. 1 – 3 to waste disposal facility in case of direct transportation

C_1, C_2 , C_3 : Collection and transportation cost from collection area No.1 to No. 3 to waste disposal facility



(2) Waste Transfer

$T_{Cb} = c_1 + c_2 + c_3 + R_c + c_4$

T_{Cb} : Total cost from collection area No. 1 – 3 to waste disposal facility in case of waste transfer

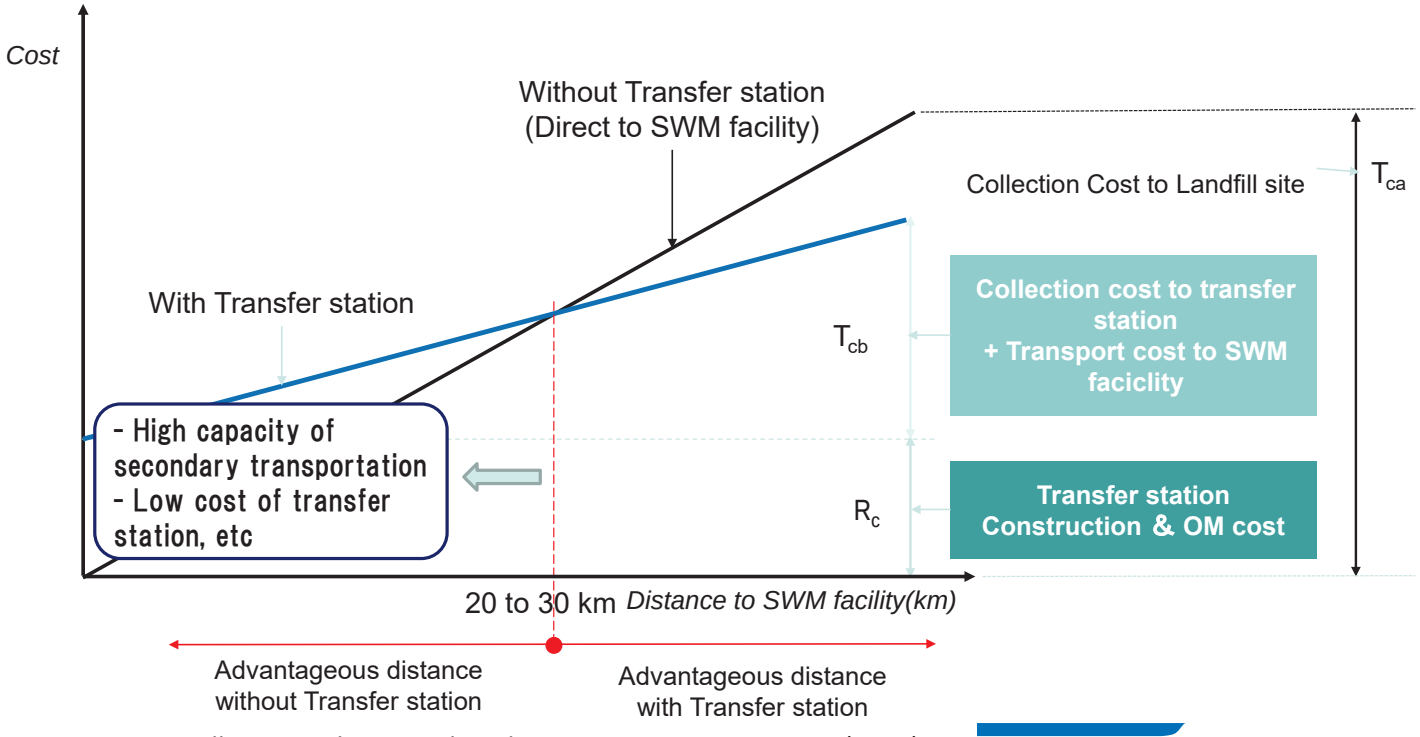
c_1, c_2, c_3 : Collection and transportation cost from collection area No.1 to No. 3 to transfer station

R_c : Construction, operation and maintenance cost of transfer station

c_4 : Transportation cost from transfer station to waste disposal facility

Source : Waste collection – theory and implementation p145, Maruzen (2011)

Measure of Collection and Transportation (Waste Transfer)



Source : Waste collection – theory and implementation p145, Maruzen (2011)

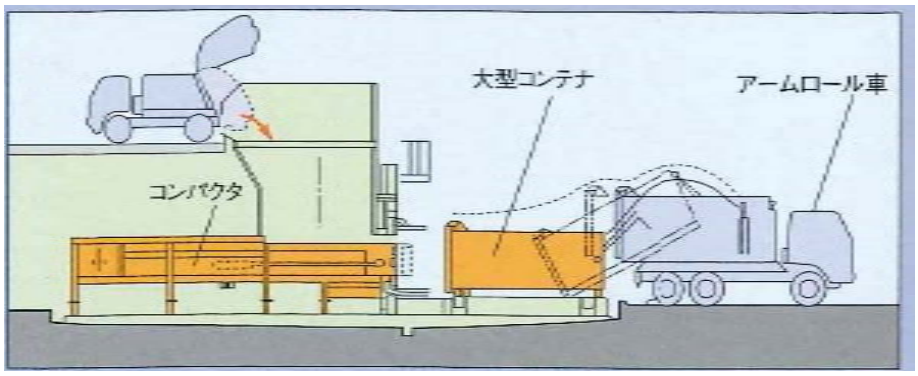
Measure of Collection and Transportation (Waste Transfer)

Open Top Transfer trailers/containers Type Transfer Station

- Waste can be unloaded directly into the “open top” of the trailer or can be unloaded on the tipping floor to allow for materials recovery and waste inspection before being pushed into the trailer or container.
- Large trailers, are necessary to get a good payload when the waste is not compacted.
- This is simple technology that does not rely on sophisticated equipment like compactor or baler

Measure of Collection and Transportation (Waste Transfer)

Compactor-Container Method



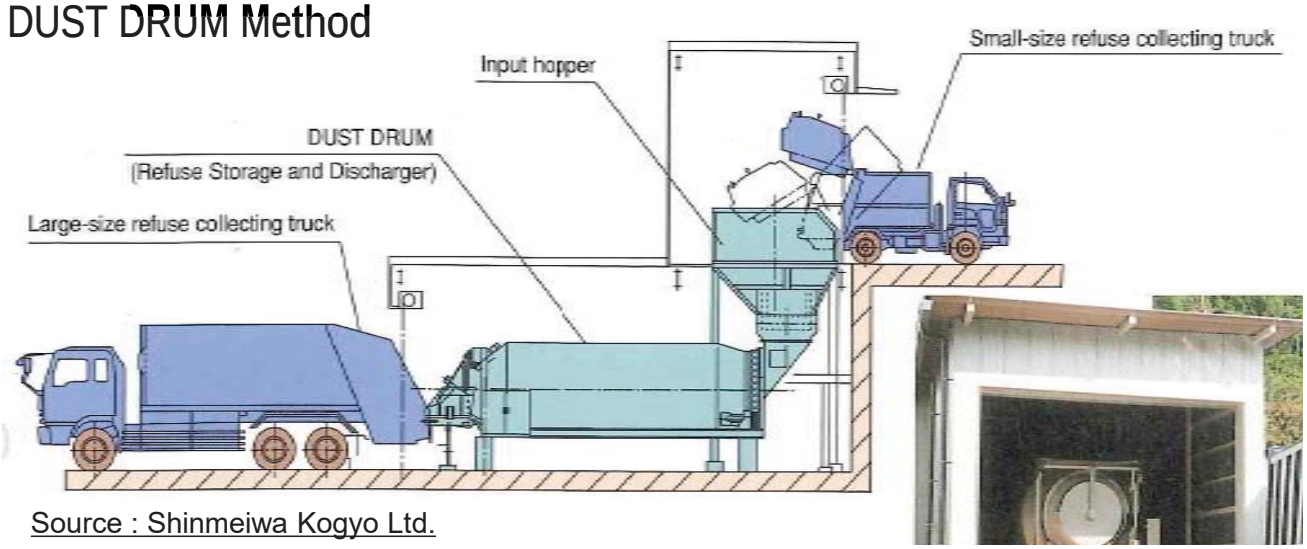
Source : Shinmeiwa Kogyo Ltd.

Semi-compactor 20-40m3

- High efficiency of secondary transport due to the waste compaction in waste transfer station
- Large trailers, are necessary to get a good payload when the waste is not compacted.
- This is simple technology that does not rely on sophisticated equipment like compactor or baler

Measure of Collection and Transportation (Waste Transfer)

DUST DRUM Method



Source : Shinmeiwa Kogyo Ltd.

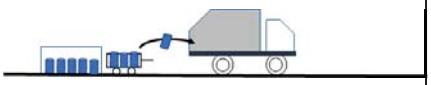
- Small sized transfer station like 20tons or less per day is possible
- The waste collected by small-size refuse collection vehicle is stored in a dust drum and reloaded into a larger refuse collection vehicle for secondary transportation

Measure of Collection and Transportation (Waste Transfer) : by Barge or railway

Secondary Transportation by Barge

Secondary Transportation by Train

Measure of Collection and Transportation (Smaller Scale Waste Transfer)

Contents	Picture	Feature
Utilize the platform with slope for smooth transfer		- Necessary of unloading I the ground - Taking the time and scattering the waste in the site
Utilize waste bin without unloading transfer stations due to being set before		- Not necessary of unloading into the ground - Necessary of loading manually
Mechanical loading by utilizing hydraulic power of refuse collection vehicle		- Not necessary of unloading into the ground - Not necessary of loading manually
Utilize heavy equipment to transfer from rikshaw van to secondary transportation vehicle like dump truck		- Not necessary of loading manually - Scattering the waste in the site

Thank you so much for your attention

4th Online Technical Meeting
for
the "Technical Project on Advisor for Marine Plastic Litter Management in the Caribbean Region"

- Environmental Impact Assessment with focus on solid waste sector -

09 Aug. 2022
Taisuke Watanabe
JICA Advisory Team

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Environmental and Regional Planning, Research and Consulting

NIPPON KOEI

Outline :

1. Introduction

【Importance of EIA】

- Environmental and Social Impact assessment (ESIA) is the important part (often requirement) for the planning stage of solid waste management facility. ESIA affects site selection and the design of the facility to meet the requirements.
- Today important points are on ESIA briefed to the participants, while the procedure and requirement for ESIA depends on the country.

【SEA and ESIA by project preparation stages】

1. Strategic Environmental Assessment (SEA) for master/regional plan, sectoral plan/sector policy stage, if including overall/general planning on waste management facilities.
2. Environmental and Social Impact assessment (ESIA) for project planning stage when construction/major modification of waste management facilities becomes clear in some degree, ex. facility site becomes clear.

1. Introduction

【General Procedure for EIA】

- Scoping
  Scoping is clarifying the scope of the study.
- Study, prediction and assessment of the environmental and social impact
  EIA study is conducted to understand the present condition as baseline, then predict impacts based on the project design and location, then assessing the impacts considering the mitigation measures.
- Evaluation
  For example, comparison of benefit and cost on the impact.
- Public Involvement
  For example, public consultation and information disclosure

2. Impacts in Solid Waste Sector

- 2-1 Impact item
  - ✓ There are many items to consider potential impact. It is important to pick up all relevant impact while some item may cause negligible impact.
  - ✓ Collecting info on present status and requirement item by item

(Reference: JICA Environmental Checklist on waste management)
https://www.jica.go.jp/english/our_work/social_environmental/guideline/gh13tc000000yl22-att/material_14.pdf

5

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3. Strategic Environmental Assessment (SEA)

- 3-1 Needs of SEA
  - ✓ First, the requirement of SEA depends on the EIA legal system in each country. Some countries do not require SEA but recommend conducting SEA in public sector projects.
  - ✓ In SEA, there are two significances. [1] Incorporation of environmental considerations into decision-making from an early stage in the formulation and implementation of policies and plans that affect the environment, and [2] SEA is expected to reduce the environmental impact of the entire system.

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3. Strategic Environmental Assessment (SEA)

- 3-2 Where SEA is applied to
  - ✓ Conceptual diagram on the relation of related plan and SEA

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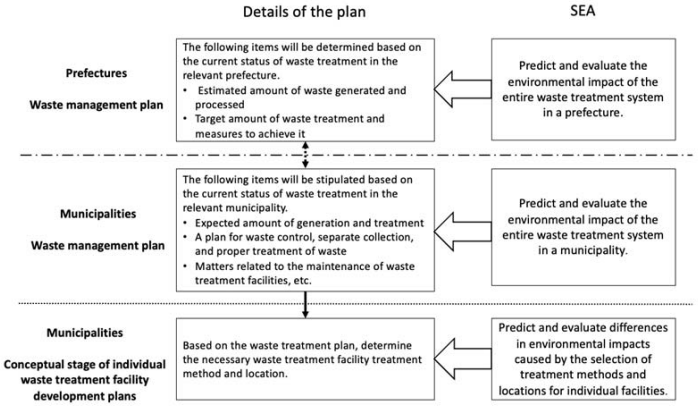

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3. Strategic Environmental Assessment (SEA)

- 3-3 Evaluation
  - ✓ In SEA, it is necessary to conduct a comparative evaluation of several proposals (alternatives). However, it is not always necessary to narrow down to one proposal in the SEA. Rather, the comparisons of the advantages and disadvantages of several proposals in terms of environmental conservation may be carried out to allow the selection of a proposal through a comprehensive judgment of the planning process.

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4. Environmental and Social Impact Assessment (ESIA)

- 4-1 Requirement of ESIA
  - ✓ The EIA legislation of the targeted country should be checked first. In the waste sector, intermediate treatment facilities and disposal facilities may be targeted. In addition, depending on the impact items that need to be considered, the legal system should be checked. The main points to be checked are Target project, Procedures and scope.
  - ✓ It is important to clarify the what procedure for what facility required from the legislation.
  - ✓ Depends on the country, there are two type of procedure, full ESIA and Initial Environmental Examination (IEE).

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4. Environmental and Social Impact Assessment (ESIA)

- 4-1 Requirement of ESIA
  - ✓ Often, the project entity commissions EIA study work to the consultants.
  - ✓ Preparation of TOR for the EIA study is critical to proceed the procedure. So, the project entity needs to understand the requirements carefully to design the EIA study.
  - ✓ Note additional work is entailed by other legislation, ex. in the case of land acquisition/resettlement.

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4. Environmental and Social Impact Assessment (ESIA)

- 4-2 Major concerns on solid waste sector (landfill case) (Depends on technology for the facility)
  - ✓ Siting
  - ✓ Leachate generation
  - ✓ Breeding of domestic flies and their maggots
  - ✓ Methane (CH4) and carbon-dioxide (CO2) gas emissions
  - ✓ Vegetation damage
  - ✓ Community health effects
  - ✓ Fire hazards in waste dump

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4. Environmental and Social Impact Assessment (ESIA)

➢ 4-3 Concerns on siting of landfill
There is the NIMBY tendency and tends to attract people's concern.
✓ Land ownership
✓ Residential or agriculture area nearby
✓ Access to the site
✓ Balance bet. distance from urbanized area and transportation cost
⇓
➢ Measures to involve and reflect public opinion

4. Environmental and Social Impact Assessment (ESIA)

➢ 4-4 Impact item (Example)
✓ Water quality case- present situation
- Check latest surface and ground water quality
- Check standards such as effluent standard, ambient water quality standard and ground water quality standard.
- Check water utilization nearby area both for surface water and ground water
- For ground water, check geological condition to understand the coefficient of permeability.

4. Environmental and Social Impact Assessment (ESIA)

➢ 4-5 Impact item (Example)
✓ Water quality case- prediction and mitigation
- Estimate leachate water quality and design leachate treatment method to meet at least effluent standard
- Check the geological data and design prevention measure for leachate filtration.
- Design monitoring of discharge and ground water quality

5. EIA legislation in participating countries

Country	Legislation
Antigua and Barbuda	Physical Planning Act, 2003
Grenada	Physical Planning and Development Control Act, 2016
Guyana	Environmental Protection Act, 1996
Jamaica	Natural Resources Conservation Authority Act, 1991
St. Lucia	Physical Planning and Development Act, 2005 Waste Management Act, 2004 (as waste management plan)

Source: Legislative Framework for Environmental Impact Assessment in the Caribbean, Caribbean Law Institute Centre, 2018

Reference

13 Waste Management, Environmental Checklist, JICA
https://www.jica.go.jp/english/our_work/social_environmental/guideline/ref.html
Environmental, Health and Safety Guidelines for Waste Management Facilities, IFC, 2007
Technical EIA Guidance for Common Municipal Solid Waste Management Facilities, Ministry of Environment and Forests, India, 2010
Guidelines for Environmental Impact Assessment For Waste Management In Rwanda, Rwanda Environment Management Authority, 2009

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Thank you!

Will keep in touch!

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Online Technical Meeting
for
the “Technical Cooperation Project on Advisor for Marine Plastic Litter Management in the Caribbean Region

- Material Recycling and Composting -

13, September, 2022

JICA Advisory Team

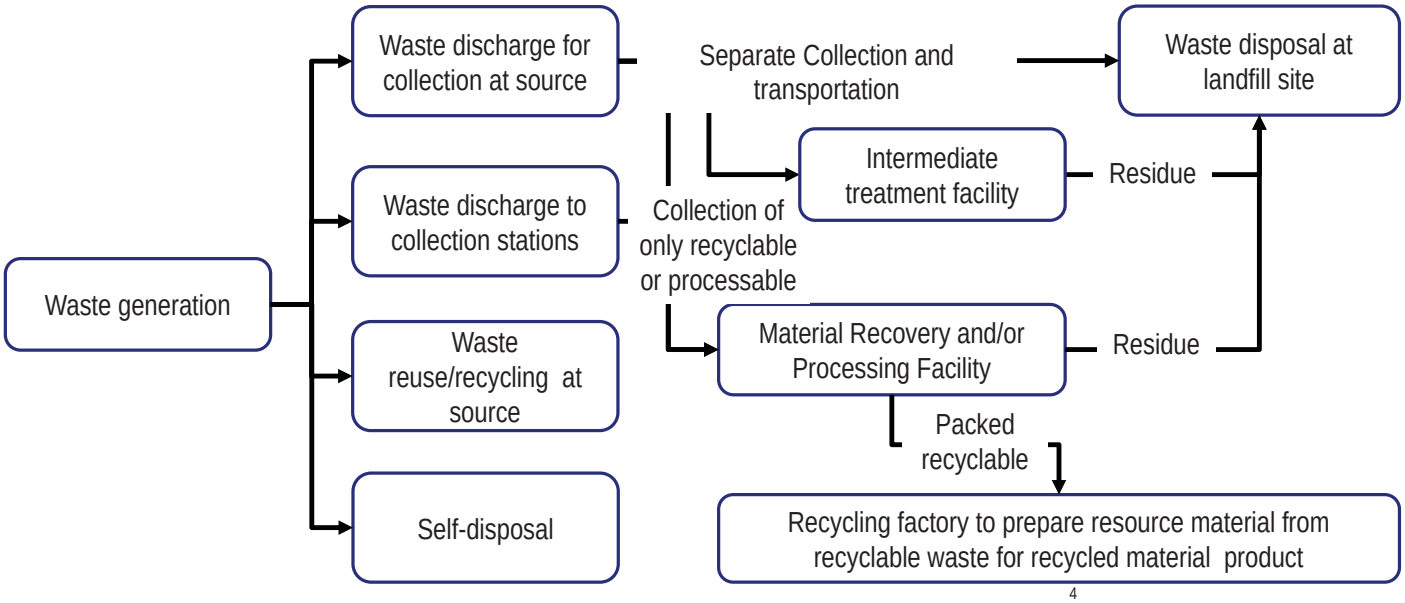
EX Research Institute Ltd.

NIPPON KOEI

Contents

Material Recycling for Diversion of Inorganic Waste

General Waste Stream



Current Situation of Recycling in Caribbean Countries

- There are some companies related to recycling activities
- Total amount of recyclable waste is not so much.
- Most of companies only package recyclable waste and transport to the other countries
- Recycling market is unstable and sale price of the recyclable waste often cannot cover the transportation cost or the expense of packaging of the recyclable waste, etc

Issues and Possible Solutions

- There are some companies related to recycling activities
- Total amount of recyclable waste is not so much.
- Most of companies only package recyclable waste and transport to the other countries
- Recycling market is unstable and sale price of the recyclable waste often cannot cover the transportation cost or the expense of packaging of the recyclable waste,etc

- How to cover the transportation cost and expense of packaging recyclable waste?
- How to correspond the market flow of stabilize ?
- How to collect and recycle recyclable waste to satisfy feasible quantity for the operation

- Utilizing possible technology regarding recycling
- Each actor such as waste discharger, local government and private sector should share financial and physical responsibility

Examples of existing technologies regarding plastic recycle in Japan

Classification	Method of recycle	Final product
Material Recycle	Reutilization : as plastic material and/or plastic product	PET bottle, plastic sheet, molded product, plastic film, fiber, etc
Chemical Recycle	Resource material and/or monomer	PET bottle after monomer
	Reducing agent and fuel for blast furnace	Blast furnace gas for power generation
	Chemical resource for coke furnace	Cokes, cokes furnace gas for reducing agent
Thermal Recycle	Fuel for cement factory, Waste to energy, RPF or RDF	Thermal energy and energy for power generation

Recycling of inorganic waste (Plastic)

Unloading inorganic waste

Manual sorting Impurity removal

Baling machine

Baled product

Storage after bailing

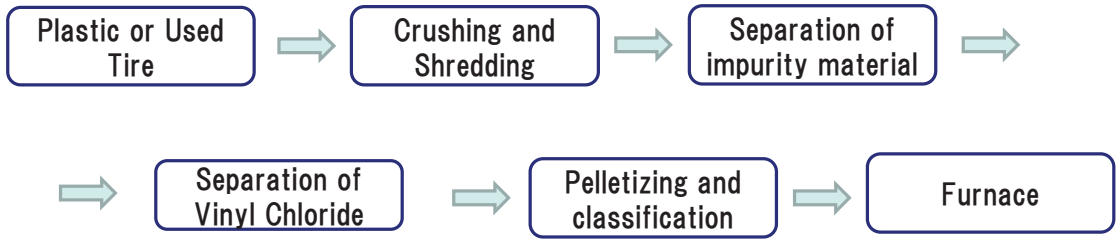
Flake

Pellet

Source : JAT prepares based on the information of Plastic Waste Management Institute in Japan

Recycling of inorganic waste (Mixed plastic utilization in factories)

- Mixed plastic and tire has high lower calorific value. According to Japan cement association, mixed plastic has approximately 8000 kcal/kg (33,440 kJ/kg) and tire has 8100 kcal/kg (33,858 kJ/kg).
- The material of high lower calorific value can be utilized as fuel for cement processing
- Mixed plastic includes chloric components to be removed before their going to the furnace in cement processing



Recycling of inorganic waste (Plastic)

Regulation for export of waste-derived plastics **in Japanese Basel Act** under Basel convention

- Y48 Plastic waste, including mixtures of such waste, with the exception of the following:
- Plastic waste that is hazardous waste pursuant to paragraph 1(a) of Article 1
- Plastic waste listed below, provided it is destined for recycling in an environmentally sound manner and almost free from contamination and other types of wastes:
- Plastic waste almost exclusively consisting of one non-halogenated polymer, including but not limited to the following polymers:
  - Polyethylene (PE)
  - Polypropylene (PP)
  - Polystyrene (PS)
  - Acrylonitrile butadiene styrene (ABS)
  - Polyethylene terephthalate (PET)
  - Polycarbonates (PC)
  - Polyethers

Recycling of inorganic waste (Plastic)

Exemption from the regulation of export in Japanese Basel Act under Basel Convention

Pelletized plastics (Pure plastics)

Single-colored plastic flakes (Pure plastics)

>> These kinds of the primary manufactured products need high quality control and cost for manufacturers.
It will take the time to procure equipment to prepare pelletized plastic and/or single colored plastic flake.

It is difficult to establish the recycling facility in each country in case of Caribbean Region to satisfy the requirement of Basel Convention. Therefore, it will be also necessary to establish recycling network within the region and to make the agreement with the countries which have suitable facilities for recycling.

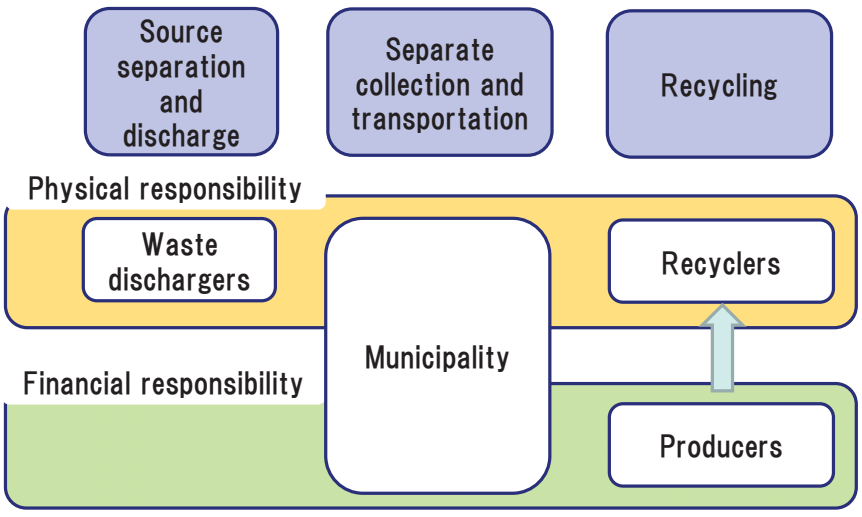
Introduction of Recycling System of Container and Packaging Waste in Japan

Background

- 60% of plastic waste is package waste
- Container and Packaging Waste has short lifetime and they inevitably become waste

Direction of this System

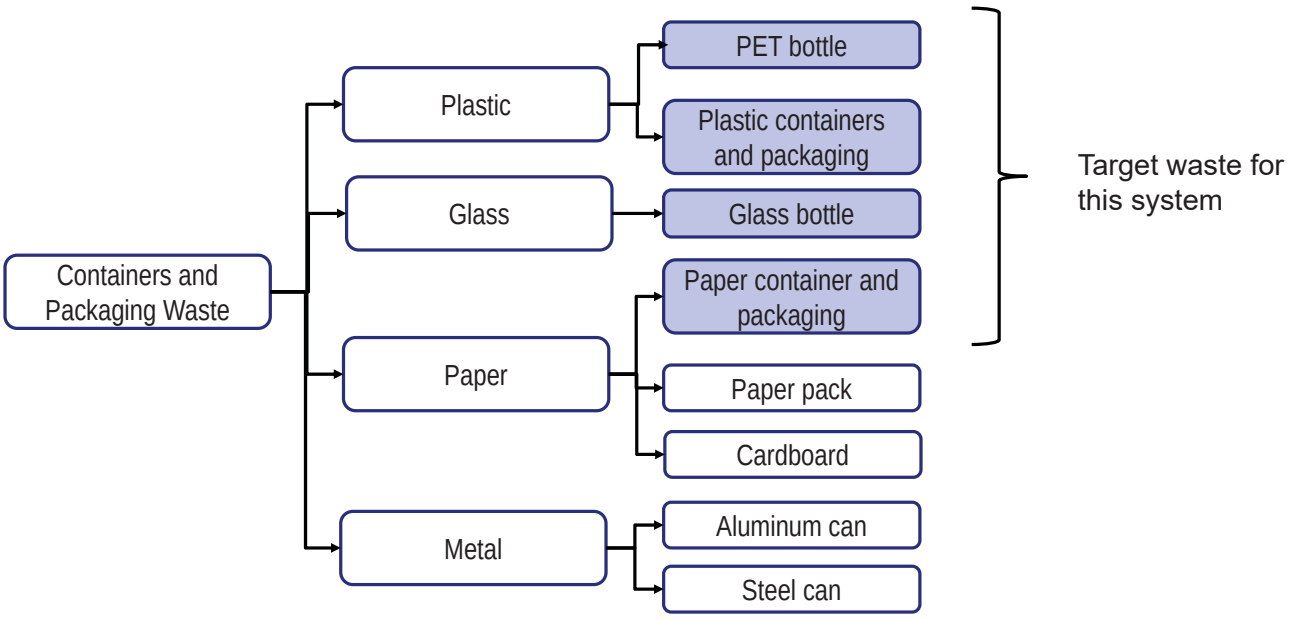
- Shifting of physical and/or financial responsibility toward producers and away from municipalities; and
- Provision of incentives to producers to take environmental considerations into account when designing their products.



Each Responsibility of Separation, Collection and Transportation and Recycling

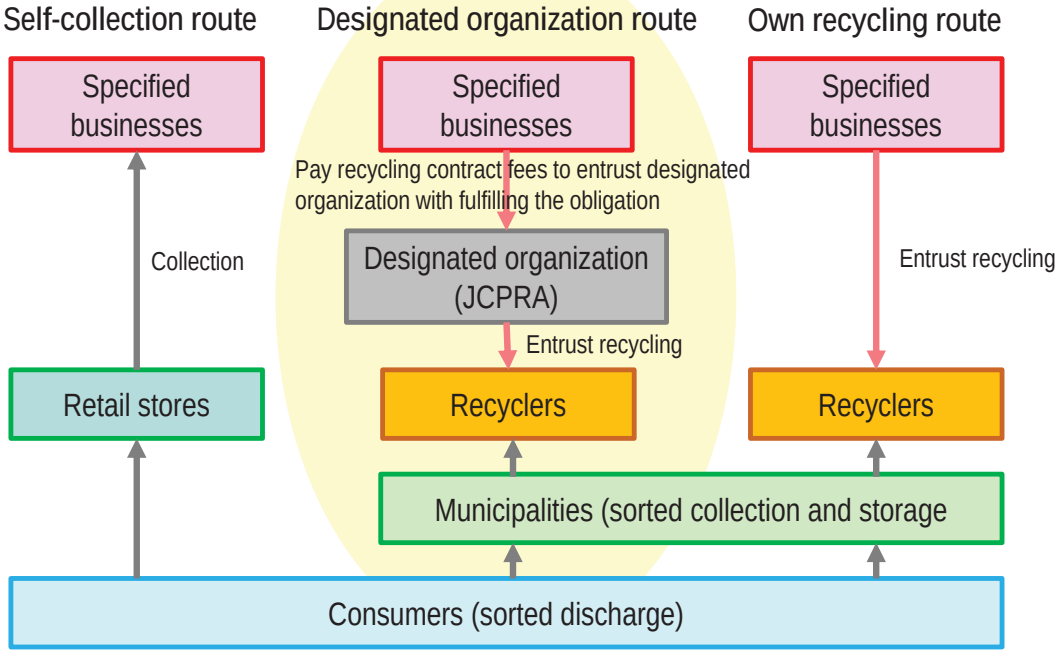
Source: Japan Containers and Packaging Recycling Association (JCPRA)

Containers and Packaging Waste to be Targeted for Separate Collection and Recycling



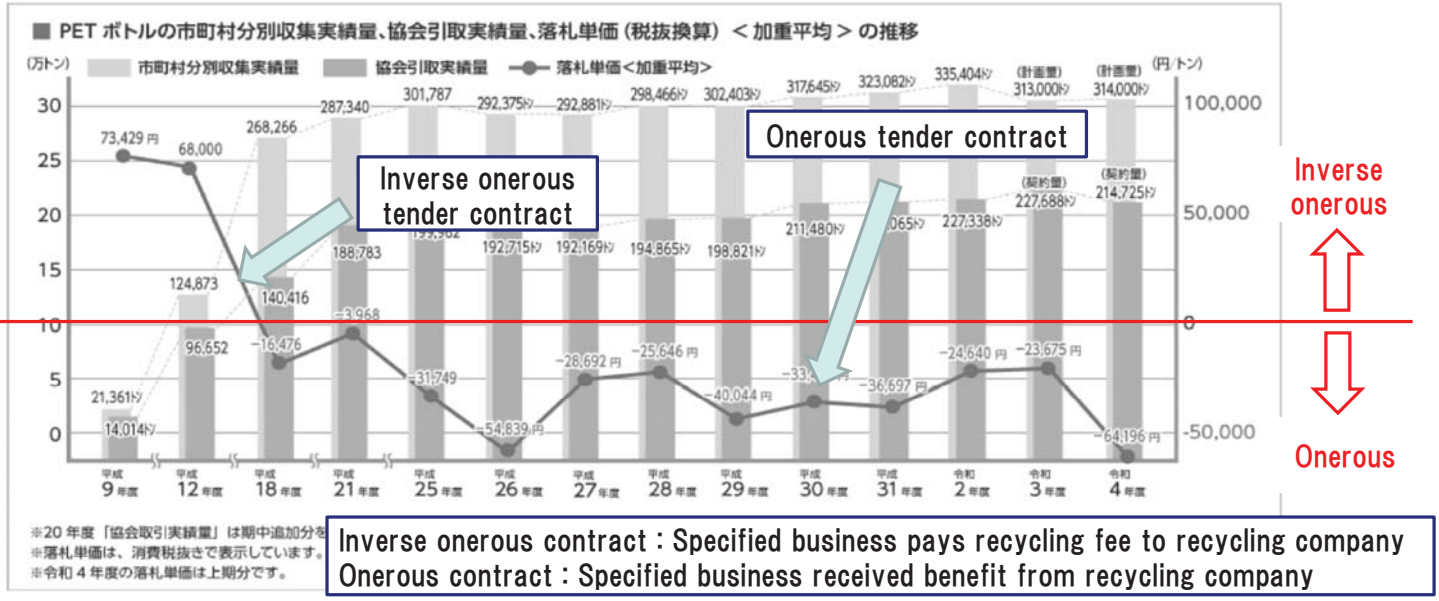
Source: Japan Containers and Packaging Recycling Association (JCPRA)

Collection route of containers and packaging waste



Source: Japan Containers and Packaging Recycling Association (JCPRA)

Collected PET bottle by separated collection, PET bottle to be recycled and contract price of PET bottle



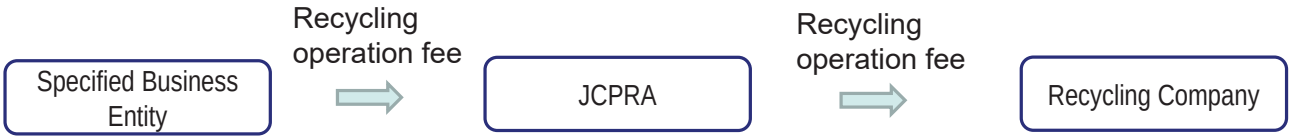
Inverse onerous contract : Specified business pays recycling fee to recycling company
Onerous contract : Specified business received benefit from recycling company

Source: Japan Containers and Packaging Recycling Association (JCPRA)

Recycling Operation Contract Fee by Specified Business Entities

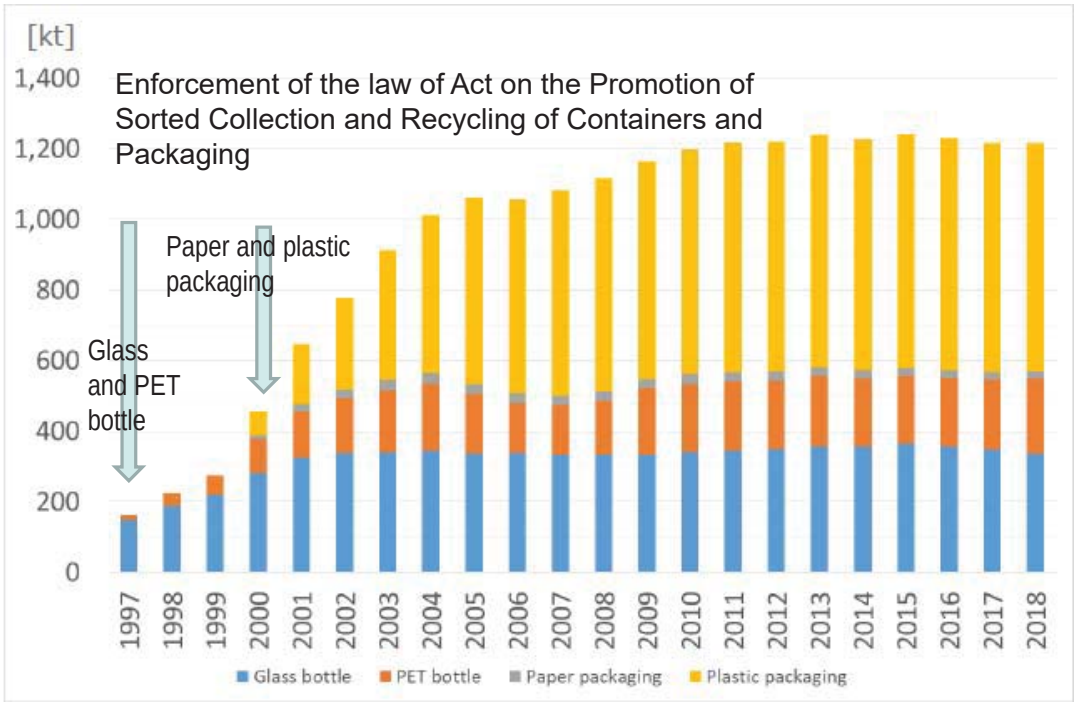
The recycling operation contract fee is a commissioned fee that specified business entities should disburse to the Japan Containers and Packaging Recycling Association (JCPRA) in return for processing waste on their behalf.

- (1) Recycling operation contract fee (commissioned fee)



- (2) Payment for rational recycling to municipalities

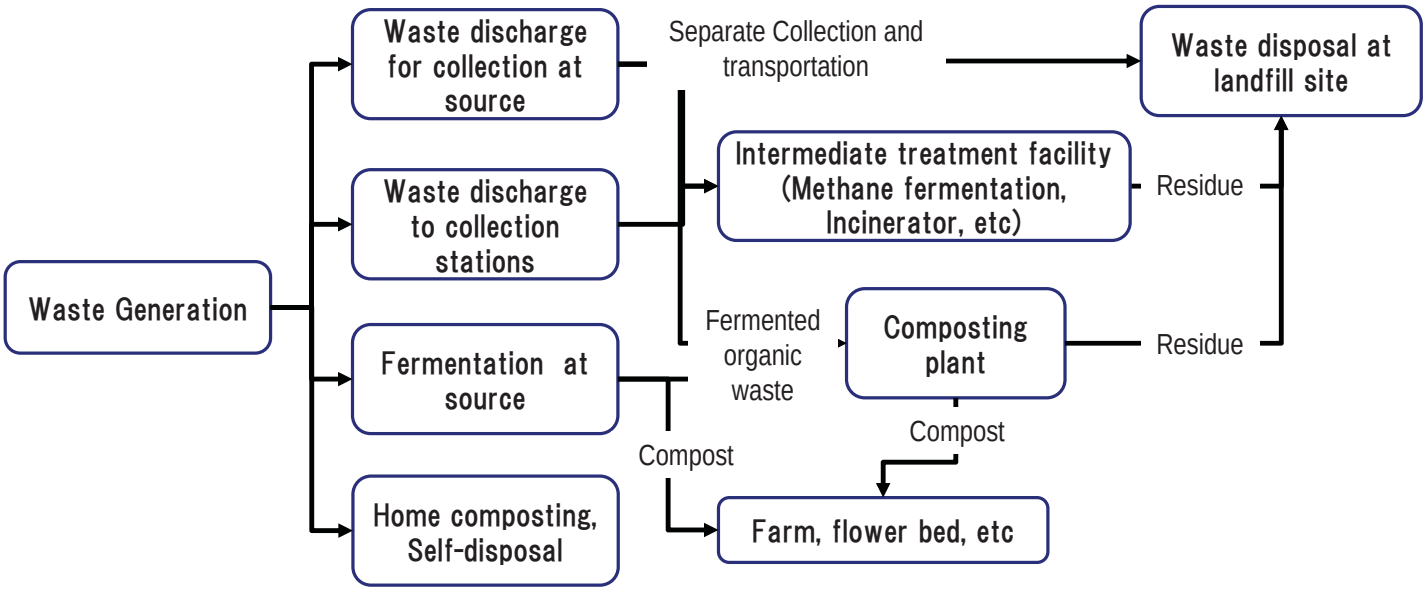
Historical Overview of Waste Collected from Municipalities



Source: Japan Containers and Packaging Recycling Association (JCPRA)

Composting for Diversion of Organic Waste

General Waste Stream of Organic Waste



Current Situation of Organic Waste in Caribbean Countries

- Organic waste comparatively occupy large portion in total waste generation amount
- Community composting and/or home composting has been tried in some countries.
- There is no quality control of compost for utilization
- Organic waste causes odor at landfill site and cause high BOD of leachate
- Energy recovery facility such as bio-gasification technology or carbonization technology will be costly.

Purpose of Composting

In waste management, composting is one of the means of "reduction and recycling of organic waste. In order to promote the reduction and recycling of organic waste, it is important to use the compost created, and it is necessary to create compost that is effective for agriculture and horticulture, etc., which are the destinations of compost utilization. The purposes of composting organic matter are follows;

-Decomposition of unstable organic matter

The composting process can decompose and stabilize unstable organic matter in the feedstock.

-Improvement of C/N ratio

During the composting process, the carbon content of the organic matter is released into the atmosphere as carbon dioxide, thus reducing and improving the C/N ratio.

-Organic matter sanitization

During the composting process, the raw materials are exposed to high temperatures of 50-80℃, which inactivates most of the pathogenic bacteria, disease-causing insect eggs, harmful insect eggs, viruses, and weed seeds, making them harmless to plants and persons.

Comparison of Technology for Home Composting

Name	Setting location	Temperature measurement	Time	Advantage	Disadvantage
Cardboard Composting	Indoor (to prevent rainfall)	Necessary	Around 3 month	Low cost and easy to handle	Everyday care like mixing or temperature control
Cover compost bucket to soil	Outdoor	Not necessary	Around 3 month	Easy to prepare large amount of compost	Necessity of filling place of organic waste
Bio reactor	Indoor	Not Necessary	Around 1 day	A little labor	Necessary of initial and operation cost

Measure of Organic Waste Recycling (home composting)

Preparation of Container which allow to pass through easily from outside

Preparation of sheet on the inner side of container to prevent spillage and cover by cloth or something to prevent insects from outside

Segregate and cut organic waste for suitable size (smaller is better)

Prepare cut organic waste and seed compost (compost product including microorganism)

Keep hot temperature and mix a few times a week to obtain oxygen for decomposition

Finish fermentation process and mature a few weeks for compost or soil conditioner

Low temperature : heat moderately and keep temperature around 60 to 70 degree
High moisture contents : put husk or rice

Second fermentation may be necessary by local authority due to keeping compost quality.

Cases of Promotion of Home Compost in Japan

Each municipality is trying to divert organic waste. Some municipality promote home composting as follows.

(1) Kitakyushu City

1) Food Waste Composting Lecture

The preparation method of container for composting is are introduced.

Also, the participants learn how to make compost from their own food waste.

2) Receiving the product of home compost product

Shopping points are provided for sufficiently dried fermented organic waste.

(2)Sapporo City

1) Supporting equipment procurement

Financial support for purchasing composter or closed type container including fermentation accelerant are provided

2) Exchange compost and vegetable ticket

After receiving compost from each household, they are exchanged to the ticket for purchasing vegetable

Measure of Organic Waste Recycling (Community Composting)

Basic Understanding of Composting Process

Process		Contents
Pre treatment	Shredding	Crushing to accelerate the decomposition of organic waste, and to accelerate the evaporation of moisture from vegetable waste with high moisture content.
	Auxiliary material mixing	To adjust to reduce moisture content, add fermentation bacteria and improve aeration, auxiliary materials such as return compost, rice husks, sawdust, etc., are mixed into the raw material.
Fermentation	First fermentation	Air ventilation and mixing are used to decompose easily degradable organic matter in the raw material and evaporate moisture. Inactivation of pathogens and other organisms in the compost material is carried out at the same time by mixing the material to a temperature of 70° C or higher.
	Second fermentation	The fermentation is designed to produce good quality compost without impairing the growth of crops. In secondary fermentation, the reaction is smaller than in primary fermentation.
Preparation of product	Sorting	Trommel and vibrating sieves are used to remove foreign substances such as metals and plastics, as well as those that are not sufficiently decomposed.
	Packaging	Packaging for selling and/or utilizing products

Cases of Promotion of Community Compost in Japan

There are not so much community scale compost in Japan. Some municipality tries to community compost of food waste collected from households as follows.

(1) Shibushi City
In case of Shibushi city, organic waste from household is composted in organic factory which contracts with the city.
Residents discharge the waste to special bucket for food waste. The city collects the waste 3 times a week.
The compost is utilized for farmers and garden of flower shop

(2) Minato City in Metropolitan Tokyo
Minato city is located in the center of Metropolitan Tokyo and is business town.
They started to set the compost container in a park where neighborhood bring food waste.

Let’s Discuss Diversion Methods of Inorganic and Organic Waste

Thank you so much for your attention!

Technical Meeting for the "Technical Cooperation Project on Advisor for Marine Plastic Litter Management in the Caribbean Region

- Solid Waste Intermediate Treatment -

11th of October 2022

JICA Advisory Team

EX Research Institute Ltd.

NIPPON KOEI

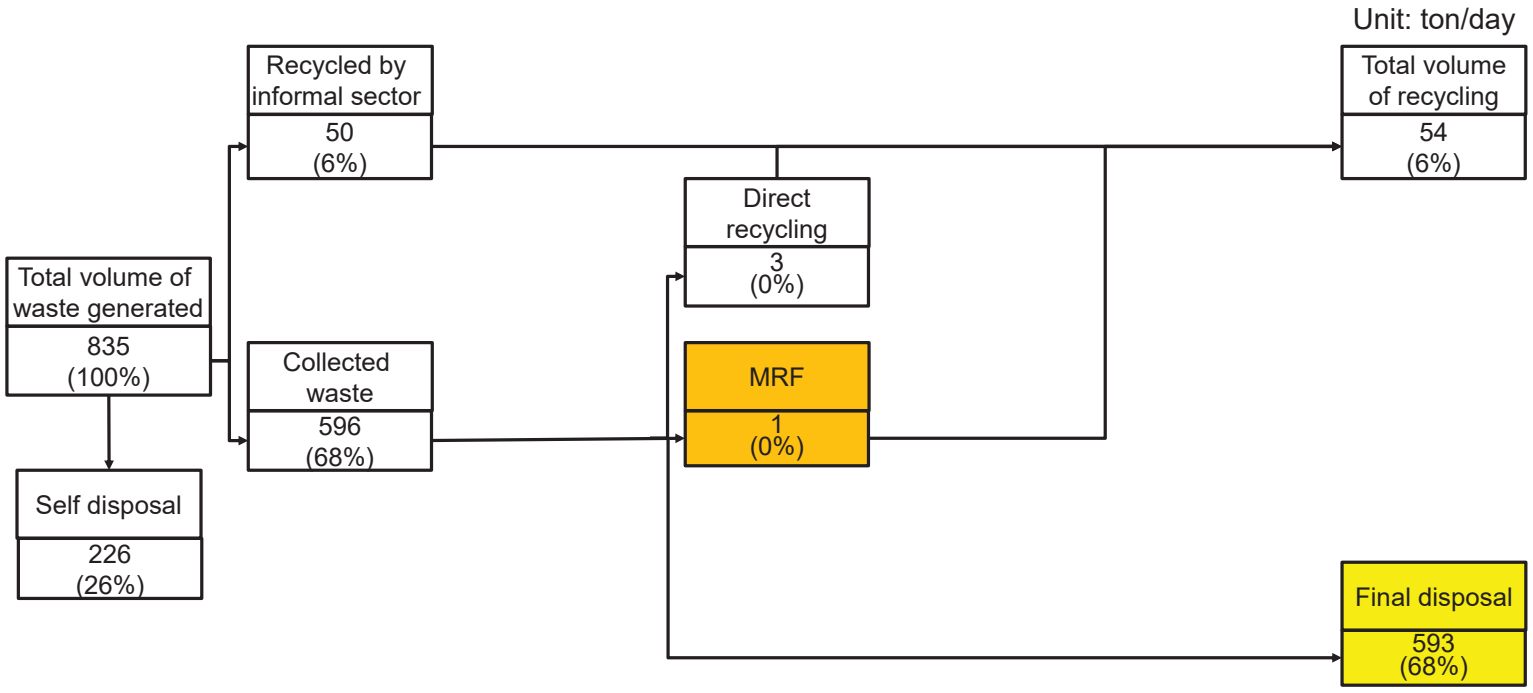
Contents

1. Function of waste intermediate treatment in a waste stream

Waste generated is not disposed of directly in landfills, but is incinerated, sorted and other processed, collectively known as 'intermediate treatment'.

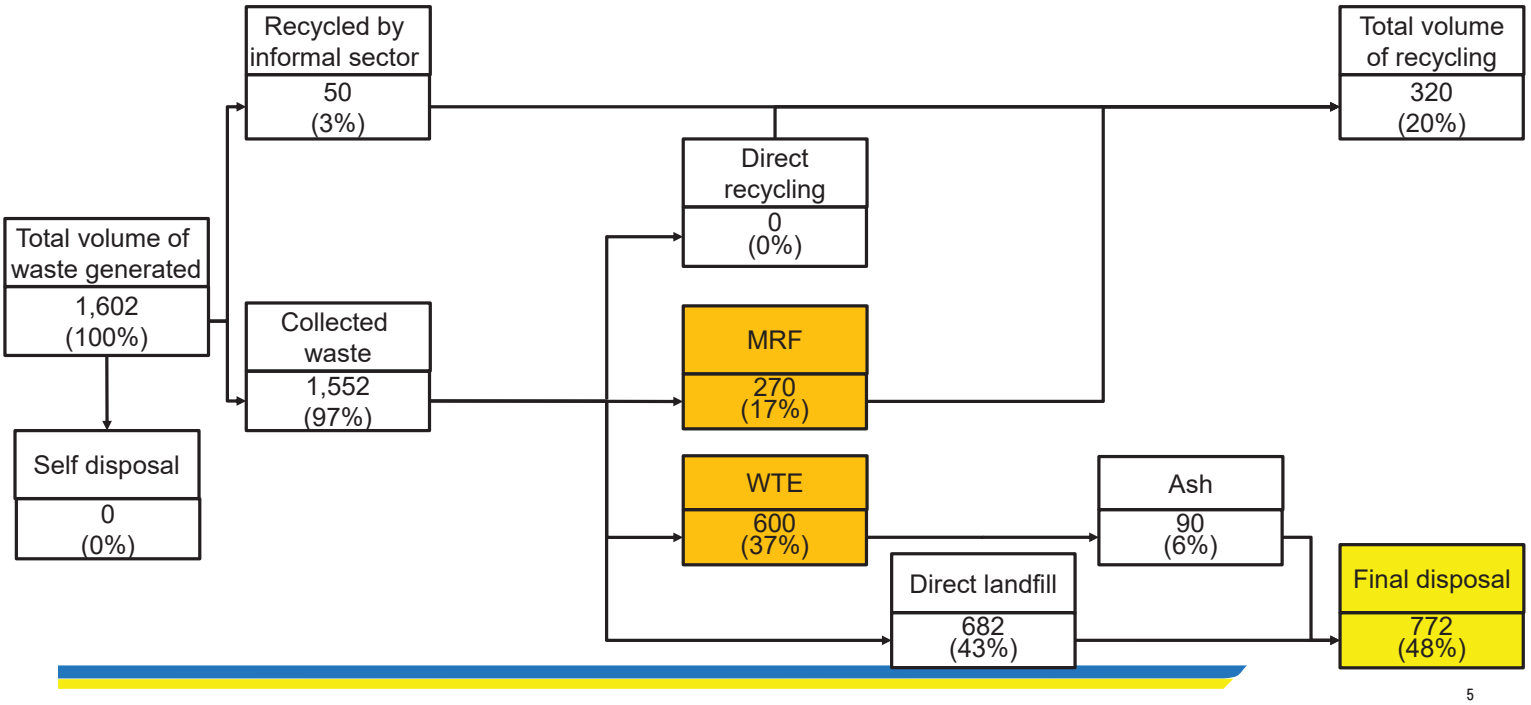
Intermediate treatment has the effect of reducing the volume of waste itself and sorting out what can and cannot be recycled.

Waste stream in the current state



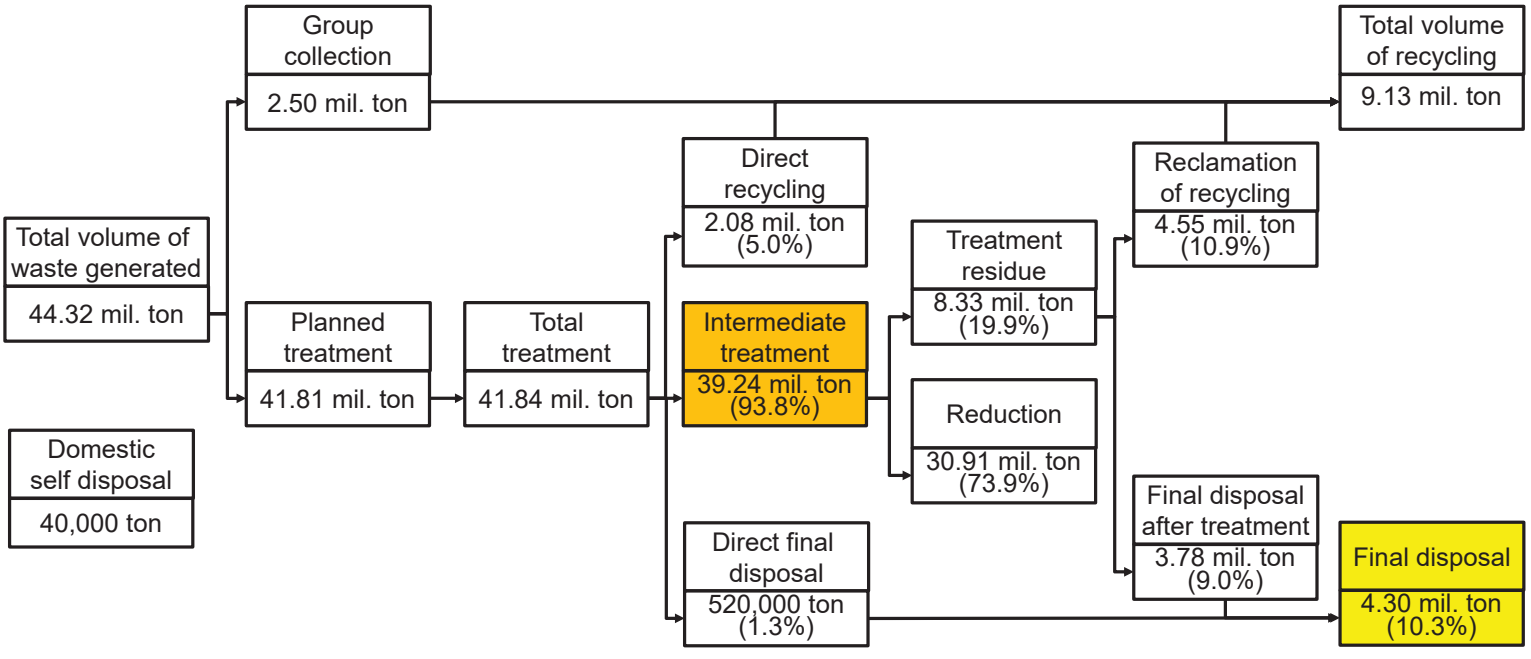
Waste stream in 30 years

Unit: ton/day



Waste stream in Japan

- Municipal Solid Waste



2. Various kinds of intermediate treatment technology

a. Incineration

The purpose of incineration is to reduce the volume of waste by burning it to ashes.

b. Shredding / Crushing

The purpose is volume reduction of waste.

c. Sorting

Sorting is to sort waste according to type and purpose.

d. Stabilization

Some wastes, such as waste acid and alkali, are harmful to human body and the environment in their original state. Stabilization is the process of neutralizing such waste and returning it to a stabilized state.

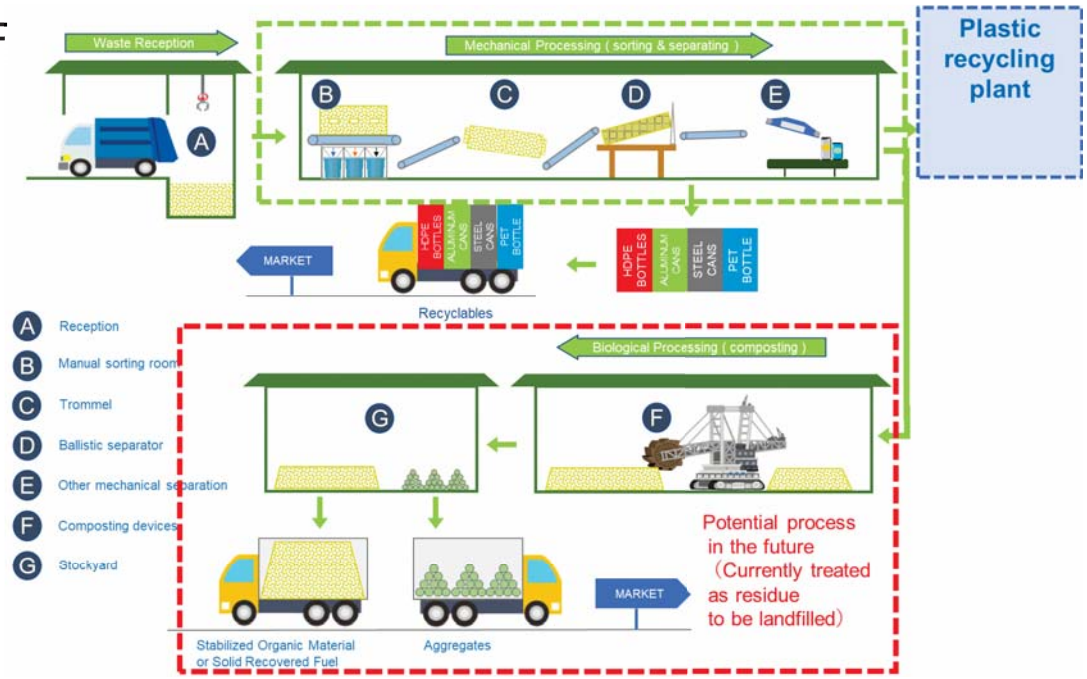
2. Various kinds of intermediate treatment technology

e. IWMF (Integrated Waste Management Facility)

- To separate recyclable materials that are later sold/handed over to private sector companies or used in public works that could save virgin materials
- To reduce amount of waste going to landfills, especially organic wastes, and increasing landfill lifetime
- To reduce organic waste that contributes to methane gas emission at landfills
- To reduce organic waste that causes the risk of unintentional fire
- To create a lot of job opportunities around the sites
- To obtain solid waste treatment skills

2. Various kinds of intermediate treatment technology

Example of IWMF



Final destination of processed waste

Component	Potential final product	Common current state	Observation
Organic	Compost / animal food / mulching material	Only project basis	Organic waste is a major part of municipal solid waste, therefore, it should be reduced with the most concern.
Paper / Cardboards	Paper / carboards /fuel	A market exists in other countries?	Paper without contamination should be sorted.
Glass	Civil work material	For bottles, a market exists?	Only glass bottles should be sorted.
Metal	Metal	For aluminum, a market exists in other countries?	Should be sorted even if contaminated.
Plastic	Plastic / Fuel(RDF/SPF)	A market exists for selected plastics in some countries	Should be recycled but there is limitation of material recycling due to its quality as raw material.
Other	Other	Dumped in a dumpsite	All for landfilling

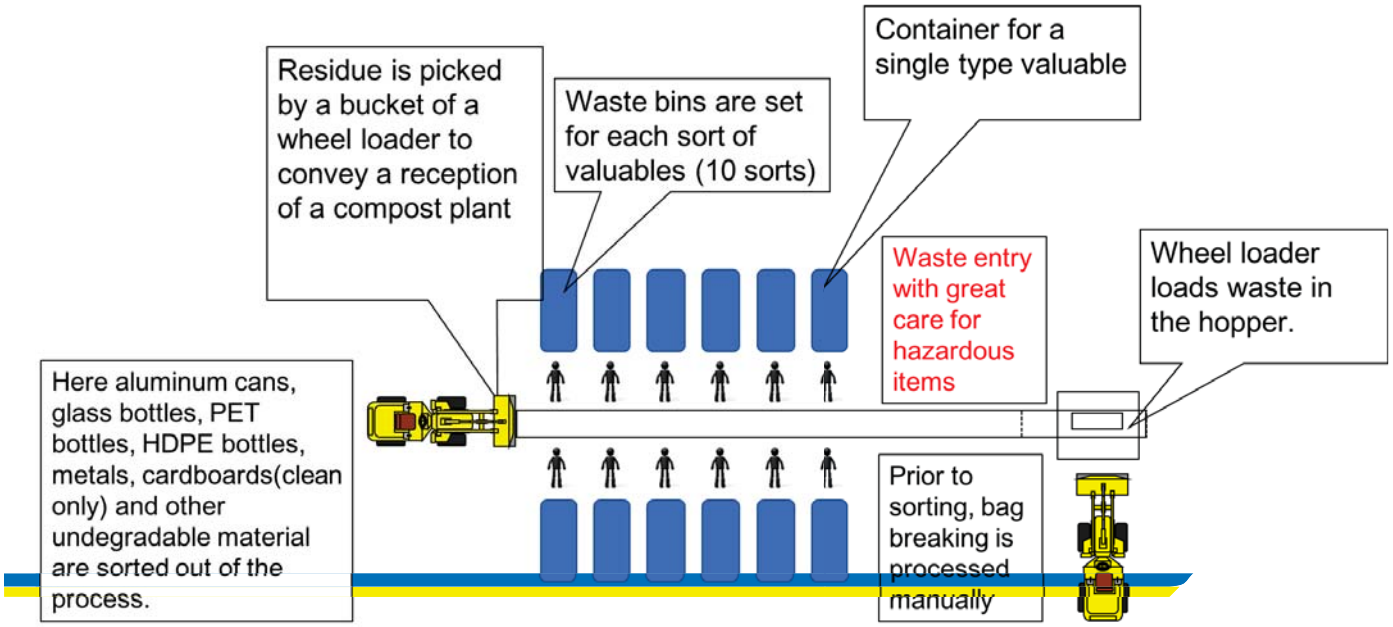
2-1 Recycling plant

2-1 Recycling plant

A Reception: Flat concrete floor for waste tipping

2-1 Recycling plant

Ⓑ Manual sorting: Single-line and long conveyer for manual sorting



2-1 Recycling plant

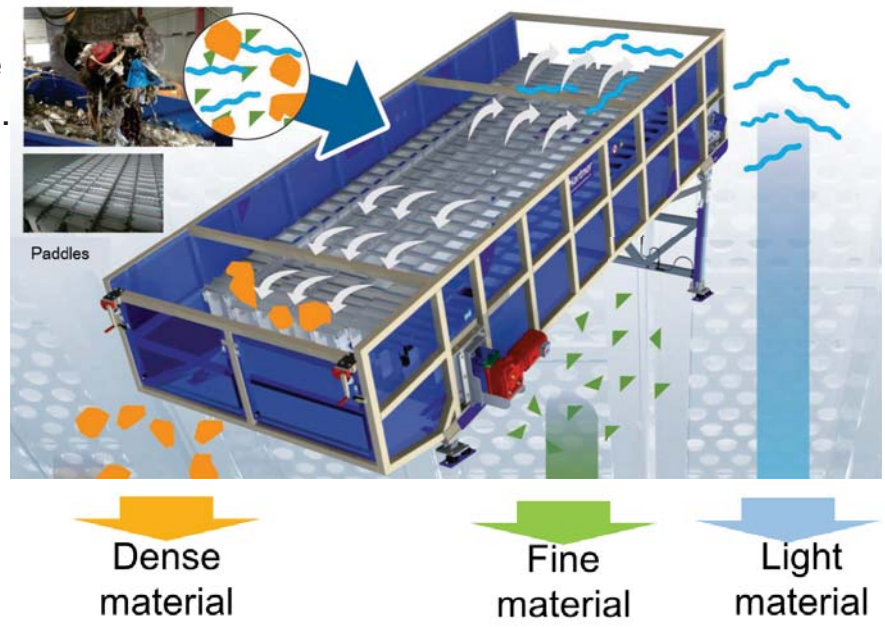
Ⓒ Trommel screening:

Bulky waste is eliminated and the rest of waste is untangled.

2-1 Recycling plant

D Ballistic separator:

Plastic bags and papers are sorted by the upflowed wind from fans.



2-1 Recycling plant

Baling:

Sorted materials are packed in this baling process.

2-1 Recycling plant

Stockyard:

All the sorted items are stocked in sacks and arranged in a stockyard under roofs.

2-1 Recycling plant

Equipment arrangement option

Equipment	Mandatory (M) or optional (O)	Cost	Remarks
Manual sorting system	M	-	
Trommel screening	O	●	Similar function to a ballistic separator
Ballistic separator	O	●●●	Similar function to a trommel screen. For RDF production, it is necessary.
Baler	M	-	
Stockyard	M	-	

Note: ●: Very low, ●●:Low, ●●●:high, ●●●●Very high

2-2 Composting plant

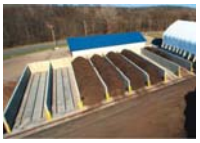
2-2 Composting plant

a) Necessity of compost plant

- Organic waste collected is landfilled at a dumpsite as it is. Organic matters can be decomposed for a certain period, However, the speed of the decomposition is slower than expected. In many cities, this causes mainly shorter life expectancy of landfills.
- Moreover, remaining organic waste produces GHG such as methane gas, which enhances greenhouse effect.
- Challenges for organic waste recycling have been done in many places, however, there are many cases that have been abandoned the composting system. Tokyo Metropolitan gave up composting processes in 1970's.
- With composting process, organic waste can be changed into recyclable products. Even if compost product cannot be for sales, composting process can reduce the volume of organic waste at least by 20 to 30% of original volume and it can be the material which is easy handling, which can be easily handled be used as mulching material or cover material for landfilling.

2-2 Composting plant

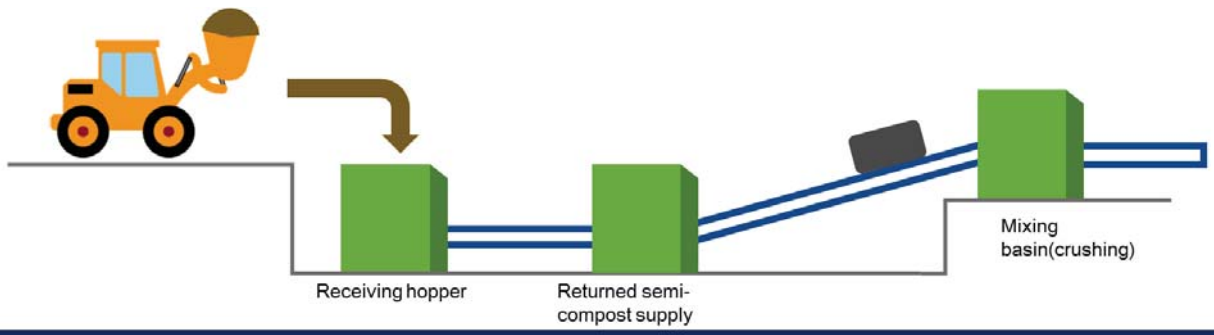
Composting method comparison

Type	Image		Method	O&M	Investment Cost	O&M cost	Building Space	Time of compost process	Advantage	Disadvantage
Windrow Compositing			Aerobic Mechanical /Manual	Moderate	Low	✓Manual : low ✓Mechanical: Moderate	Large	Long	✓ Simple method ✓ Small and large amount of bio-degradable waste can be treated ✓ Investment cost is low	✓ Environmental issue is easily happened ✓ Success of operation depends on the capacity of supervisor ✓ Time of compost process is the longest
Passively Aerated Windrow			Aerobic Mechanical /Manual	Moderate	Low	✓Manual : low ✓Mechanical: Moderate	Large	Moderate	✓ Simple method ✓ Small and large amount of bio-degradable waste can be treated ✓ Investment cost is low	✓ Environmental issue is easily happened ✓ Success of operation depends on the capacity of supervisor
Forced Aerated Windrow			Aerobic Mechanical	Easy	Moderate	Moderate	Moderate	Short	✓ Small and large amount of bio-degradable waste can be treated ✓ Environmental issue can be mitigated ✓ Time of compost process is short	✓ Electricity charge is required
In-Vessel / Mechanical Composting			Aerobic Mechanical	Operation: easy Maintenance : not easy	High	High	Small	Short	✓ Environmental issue can be mitigated ✓ Easy operation ✓ Time of compost process is short	✓ Small amount cannot be treated. ✓ Electricity charge is required

2-2 Composting plant

Process1: Reception and feeding equipment

: Flat concrete floor for tipping of residues.

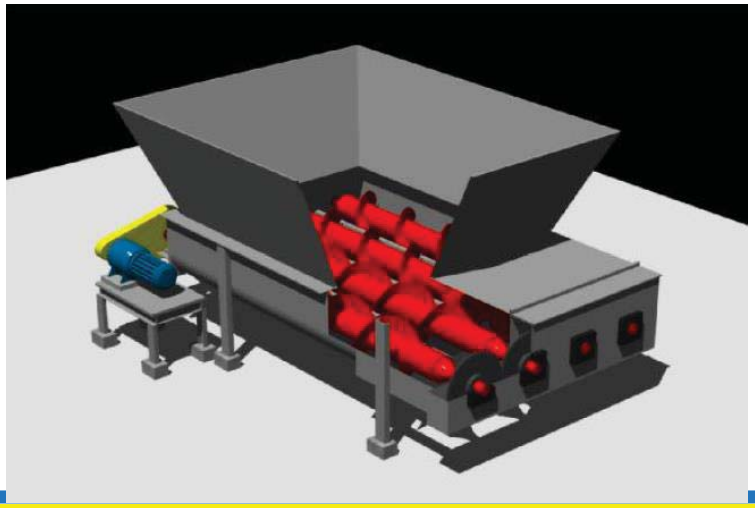


Raw material of compost is covered with returned compost and is conveyed to a mixing basin by a belt conveyer.

2-2 Composting plant

Process2: Crusher (Screw Conveyer):

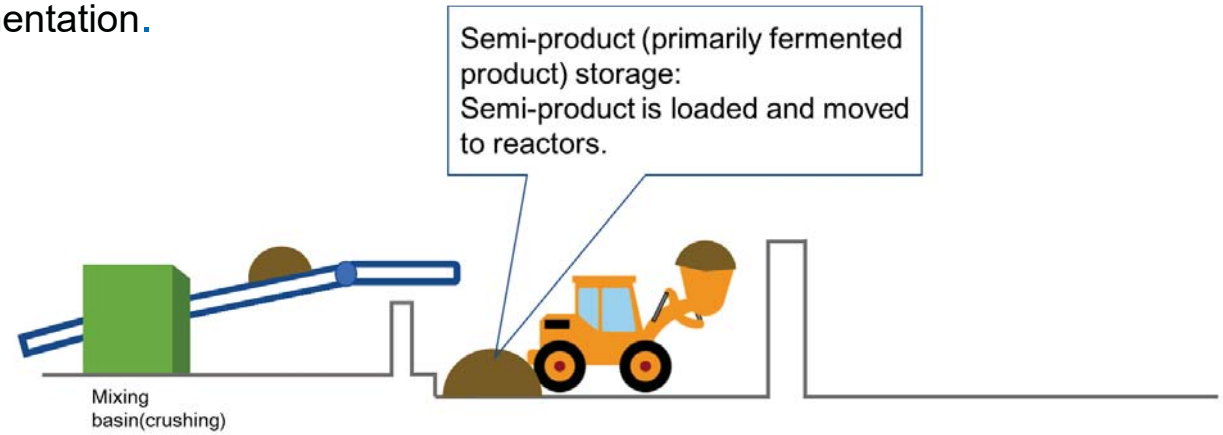
The device crushes the residues until it is grainy.
In the process of material feeding into semi-product storage, a screw conveyer can crush the material and feed to the storage.



2-2 Composting plant

Process3: Mixing basin:

Fermented material is mixed with fresh grains for the purpose of enhancing fermentation.

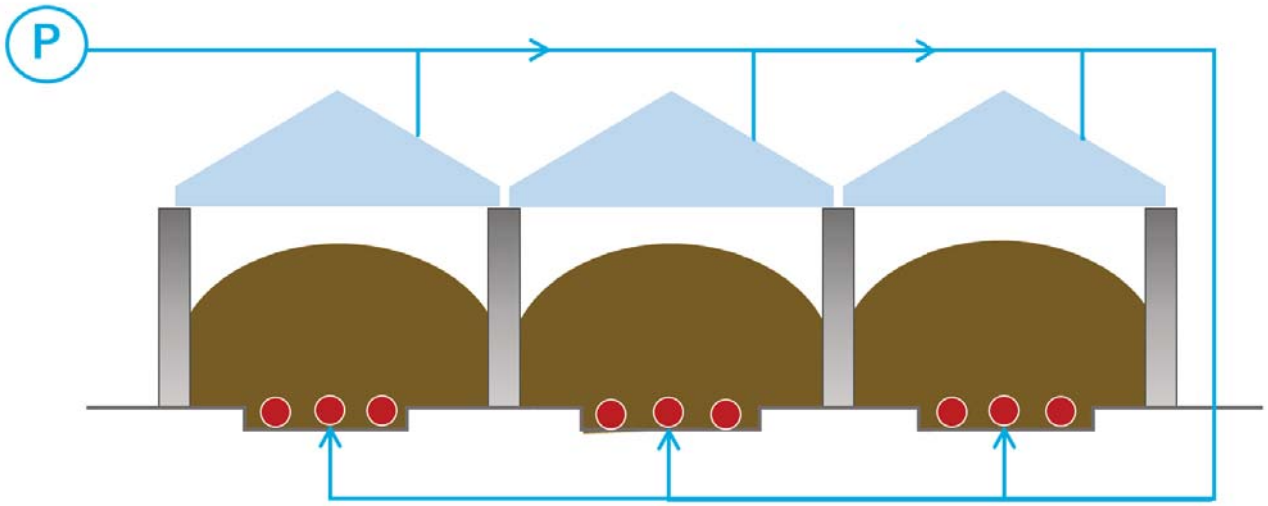


After mixing process of the returned material, the mixture is conveyed from the semi-product storage to reactors by a wheel loader.

2-2 Composting plant

Process4: Reactor:

The grained material is fermented aerobically.

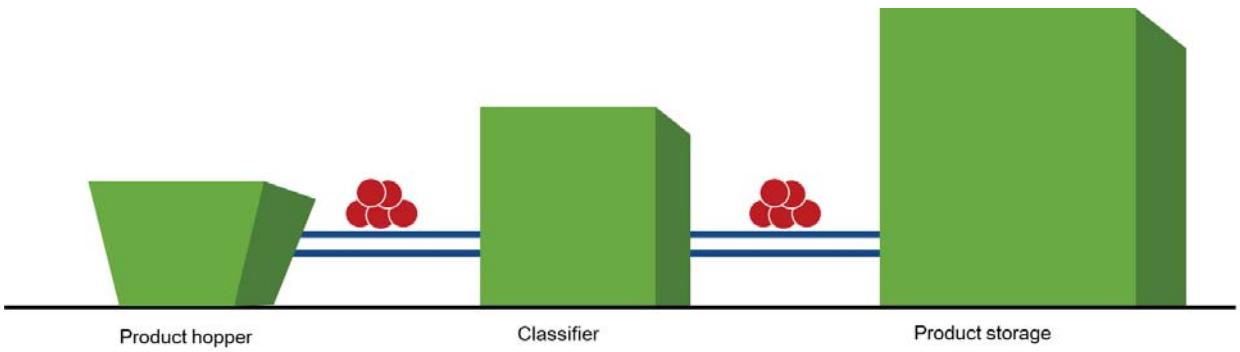


The semi-product is accumulated in the reactor and left to stand for 8 days.
By blowing fresh air, compost in good quality is produced.

2-2 Composting plant

Process5: Classifier and packager:

Compost is aligned in particle size with a classifier for sales products.



After receiving with a product hopper, the product is classified in grain size.

2-2 Composting plant

Process6: Storage and Shipping

Photo: Packing device

The product goes to:
- A landfill for use as cover soil
- Public park for use as mulching material
- Planted zones along highways as mulching material
- Schools for growing flowers

The shipment of the products is implemented after packing process.
However, the packing process is optional, and practically, the product is transported to a landfill for cover soil.

2-3 Plastic recycling

RDF production

Sorted material:
- Plastic bags
- Plastic caps and lids
- Food package
- Drink package
- Papers

→ Shredding → Baling Wrapping by plastic film → Storage for shipment

Shredder
- Single axe type
- 20kW

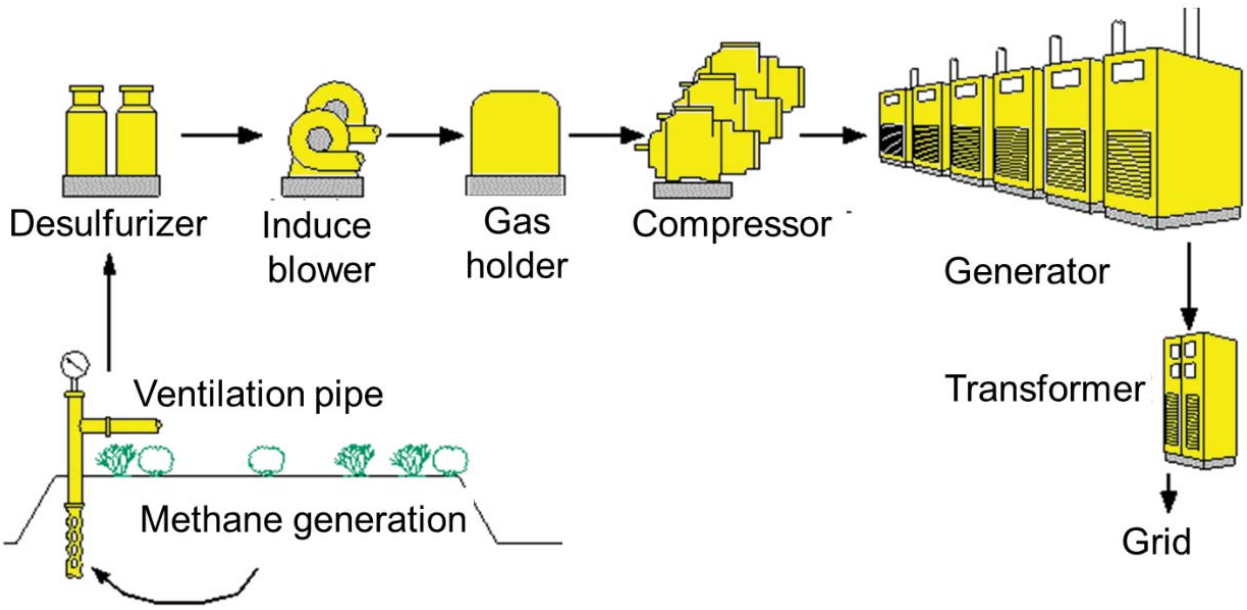
2-4 Necessary staff and equipment (example)

Capacity	90 tons/day	30 tons/day
Recycling plant	Receptionist :2 Sorting worker: 40 Loader operator: 2 Forklift operator:4 Worker: 10 Engineer: 3 Wheel loader: 2 Forklift:4	Receptionist :2 Sorting worker: 16 Loader operator: 2 Forklift operator:2 Worker: 10 Engineer: 3 Wheel loader: 2 Forklift:2
Compost plant	Loader operator: 2 Worker: 10 Engineer: 2 Wheel loader: 2	Loader operator: 2 Worker: 6 Engineer: 1 Wheel loader: 2
RDF production	Loader operator: 1 Worker: 6 Wheel loader: 1 Forklift: 1	-

2-5 Waste-to-Energy Technology

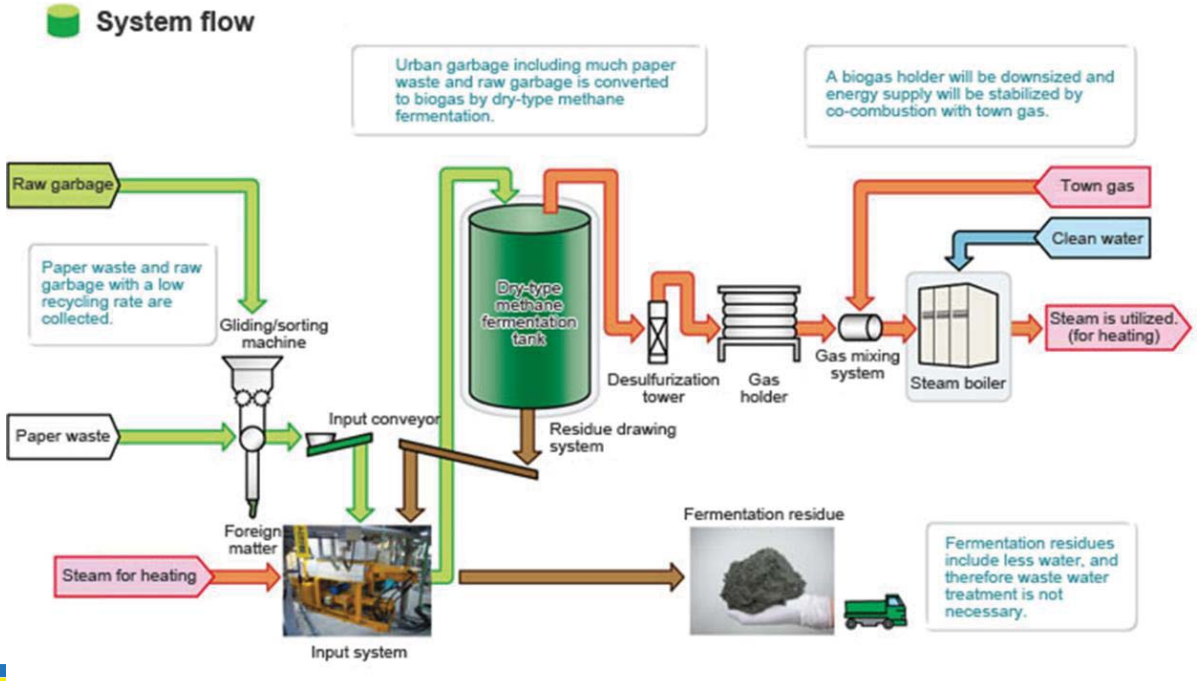
2-5 Waste-to-Energy Technology

a) Landfill Gas Recovery Technology



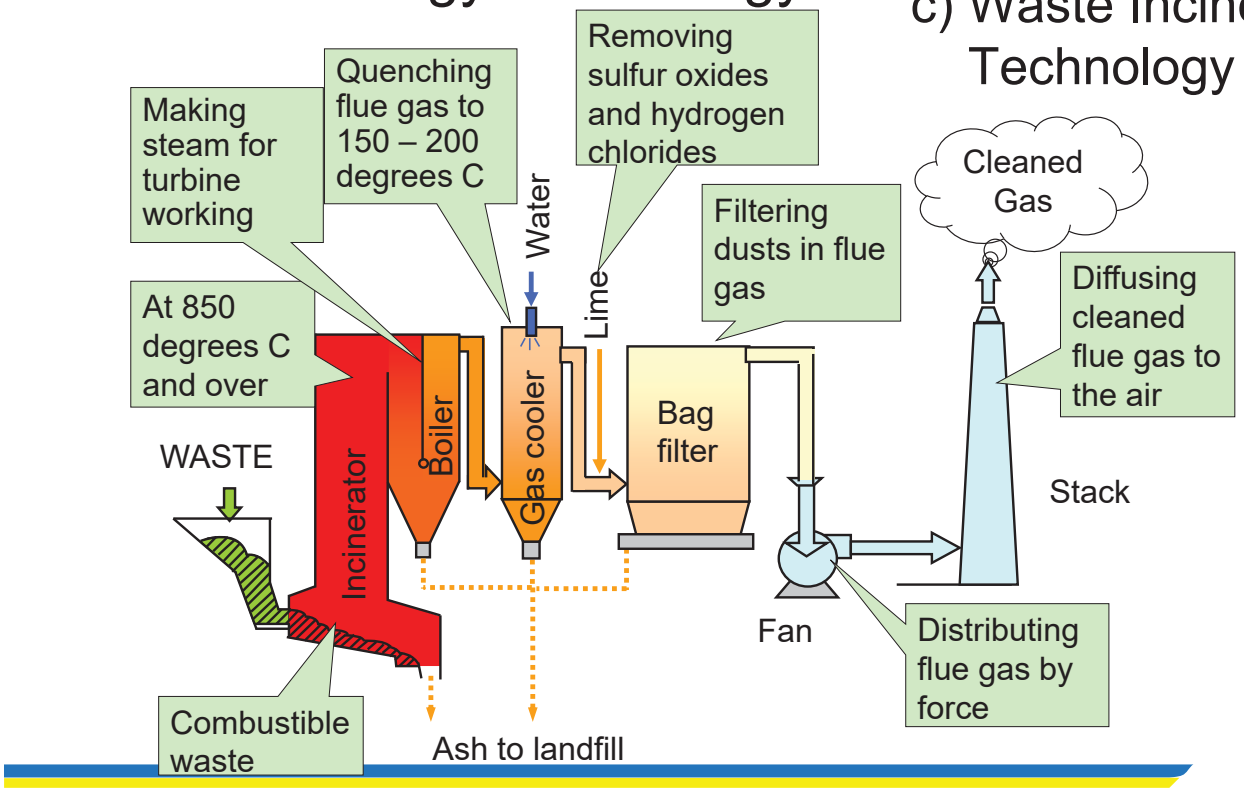
2-5 Waste-to-Energy Technology

b) Bio-gasification Technology



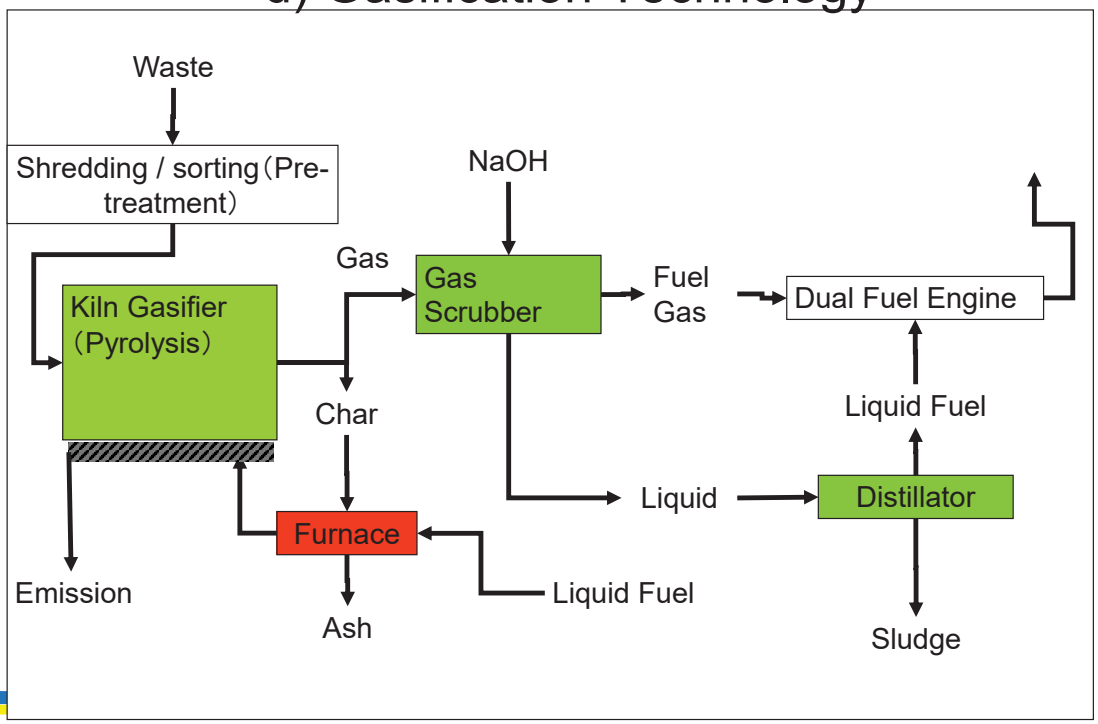
2-5 Waste-to-Energy Technology

c) Waste Incineration Technology



2-5 Waste-to-Energy Technology

d) Gasification Technology



2-5 Waste-to-Energy Technology

Alternatives of Technology

Method	Availability for Component		
	Organic matter	Plastics	Inorganic matter
Landfill gas power generation	○	×	Acceptable
Organic waste methane Fermentation	○	×	×
Incineration with power generation	○	○	A few amount can be accepted.
Gasification with power generation	○	○	A few amount can be accepted.

Legends show ○:processable, ×: non-processable

2-5 Waste-to-Energy Technology

Power Generation Rate (Example)

Method	Organic matter (60%)	Plastics & Others (40%)	Total kWh/t-waste
Landfill gas power generation	**100kWh/t-waste**		**100**
Organic waste methane Fermentation	**200kWh/t**	**0**	**120**
Incineration with power generation	**350kWh/t-waste**		**350**
Gasification with power generation	**350kWh/t-waste**		**350**

2-5 Waste-to-Energy Technology

WtE Technical Comparison (Example)

Method	Experience for 500t-MSW/d up	Additional Fuel	Initial Cost	Power Sales	Volume Reduction Rate
Landfill gas	+++	-	+++	+	+ 50%
Methane Fermentation	+	+	++	++	+ 60%
Incinera-tion	+++	+++	+	+++	+++ 95%
Gasifica-tion	+	+	+	+++	+++ 95%

+++:Excellent ++:Good +:Fair

2-5 Waste-to-Energy Technology

WtE Comparison Criteria (Example)

[Experience] Waste treatment is “experiential engineering.”

- Number of MSW Treatment Plants in Operation with a Certain Capacity

→Incineration: 500up

Methane fermentation: 100up

….Number of bio-gasification plants in operation over 10years is still few.

Gasification: 50up

….No procurement in the last few years without Japanese market.

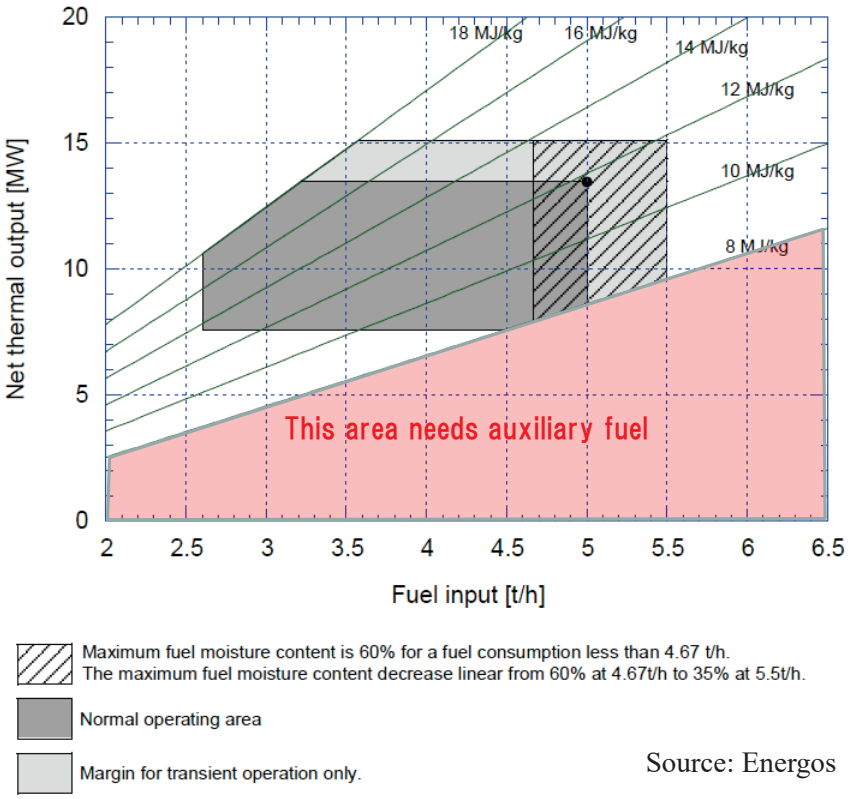
[Energy Saving]

- Additional Fuel Consumption for the waste with the Calorific value ranging 1,000 – 1,400 kcal/kg-MSW

And [Cost/Revenue] [Environment Protection]

2-5 Waste-to-Energy Technology

Diagram for the relationship between fuel consumption rate and heat generation for Gasification process



Source: Energos

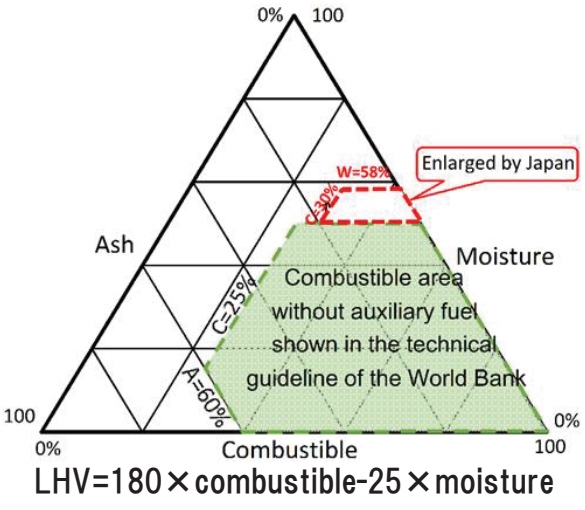
2-5 Waste-to-Energy Technology

Acceptance capability of waste fluctuation

A Waste-to-Energy plant needs the necessary function and equipment of facility in order to respond to fluctuation of waste characteristics in short and long term.

See a ternary diagram.

For the waste in lower calorific value (LHV) than ones in Japan and Europe, the area of the combustion without auxiliary fuel should be as big as possible.

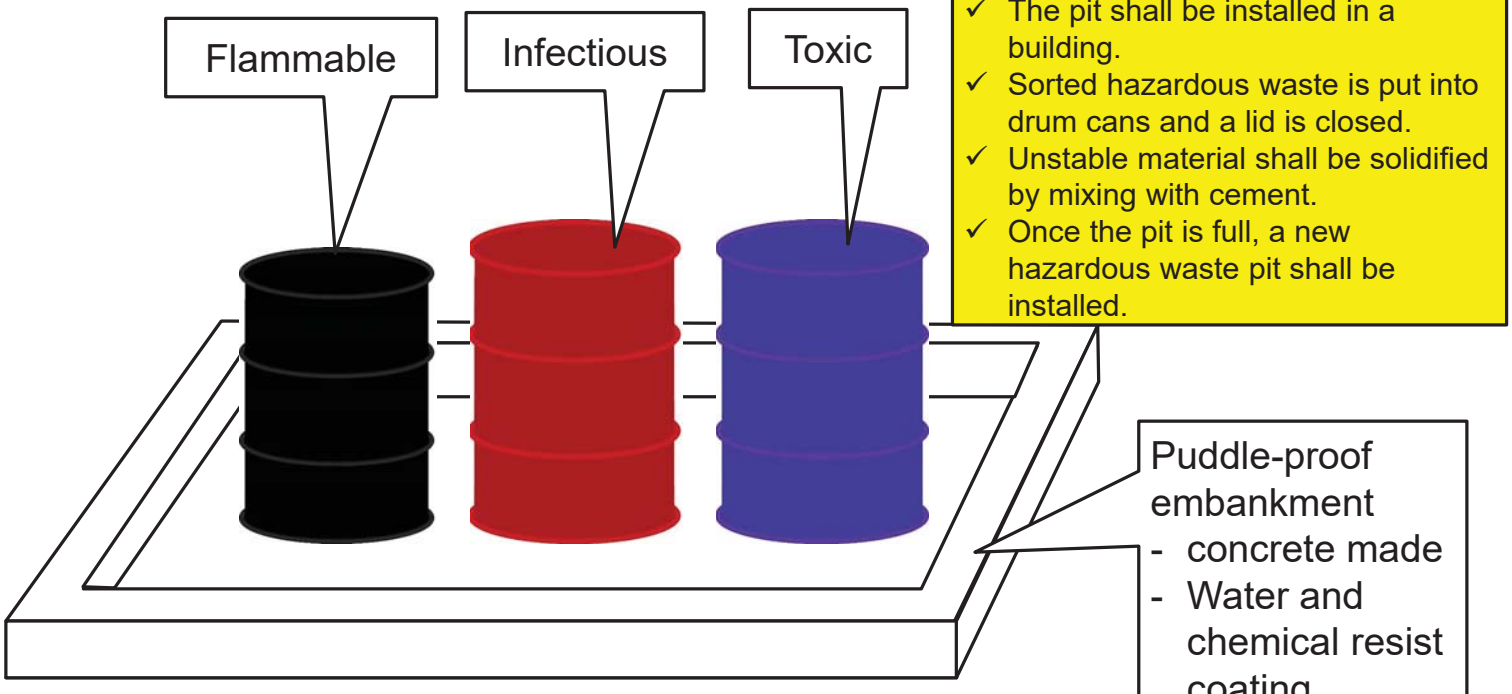


2-6 Hazardous waste facility

Electronic appliance	Spray can, fluorescent lamp, alkaline battery	Other hazardous waste
	  	

- Incoming municipal waste in a landfill includes a small amount of hazardous waste.
- In order to manage landfilling safely, hazardous waste shall be sorted and isolated from other municipal waste.

Hazardous waste pit



- ✓ Decaying organic matter is not accepted.
- ✓ The pit shall be installed in a building.
- ✓ Sorted hazardous waste is put into drum cans and a lid is closed.
- ✓ Unstable material shall be solidified by mixing with cement.
- ✓ Once the pit is full, a new hazardous waste pit shall be installed.

Optional Recycling Method: Optical sorter

- https://vdrs.com/tomra-optical-sorting/

3. Discussion

- In order to select the suitable technology, we should determine:
- Objective of introduction of the technology
- Capacity of plant
- Characterization of target waste
- How to treat with the output of the process including market survey

- Question – What extra items should we need for the introduction of those technologies? We are living in islands, or our population is small.

Thank you for your attention.

Technical Meeting
for
the “Technical Cooperation Project on Advisor for Marine Plastic Litter Management in the Caribbean Region

- Final Disposal of Solid Waste -

13th of December 2022
JICA Advisory Team

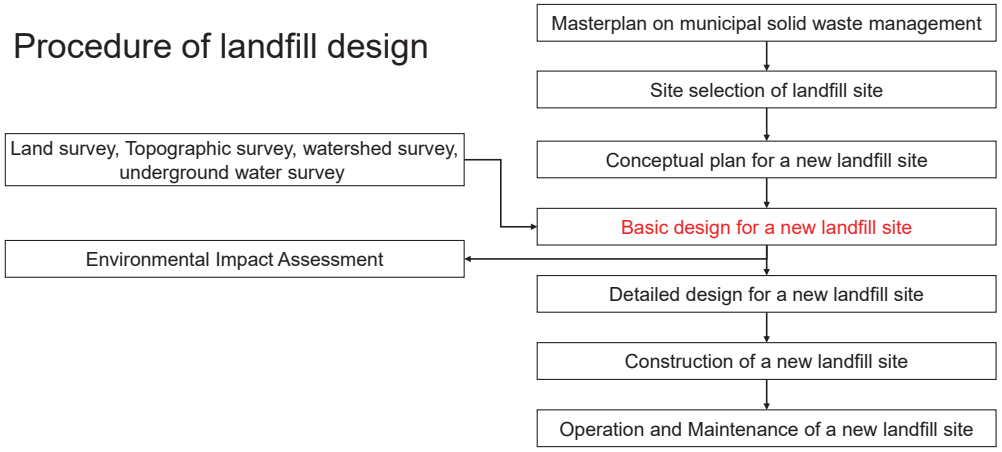
NIPPON KOEI

Content

- Final disposal plan and design
- Semi-aerobic landfill structure
- Waste management in Japan
- Landfill facility
- Safe closure of landfills
- Maintenance of landfills
- Recent technology

Final disposal plan and design

Procedure of landfill design



Final disposal plan and design

Items of the design

- Confirmation of solid waste to be landfilled Specific gravity
- Grand layout plan
- Land improvement design
- Storage structure
- Underground water collection system
- Liner structure
- Storm water drainage system
- Leachate collection system
- Leachate treatment system
- Gas ventilation system
- Weighing system
- Monitoring system
- Administration building
- Internal roads

Final disposal plan and design

List of basic design documents and drawings

item	name
Basic Design Drawings	Land use plan (after land development)
	Land use plan (after landfilling)
	Main section
	Storm water and drainage layout plan
	Standard section drawings of storm water and drainage
	Leachate collection layout plan
	Leachate collection equipment standard drawing
	Gas ventilation standard structure drawing
	Underground drainage layout plan
	Underground drainage standard section plan
	Drainage basin map
	Balancing reservoir standard structure
	Standard road section drawing
Flow rate calculation report	Discharge flow rate calculation
	Balancing reservoir capacity calculation
	Design of leachate collection pipe diameter
Stability calculation for landslide	Stability calculation for landslide
	Result of the calculation
Quantity calculation report	Quantity calculation report

Semi-aerobic landfill structure

Features of semi-aerobic landfill method

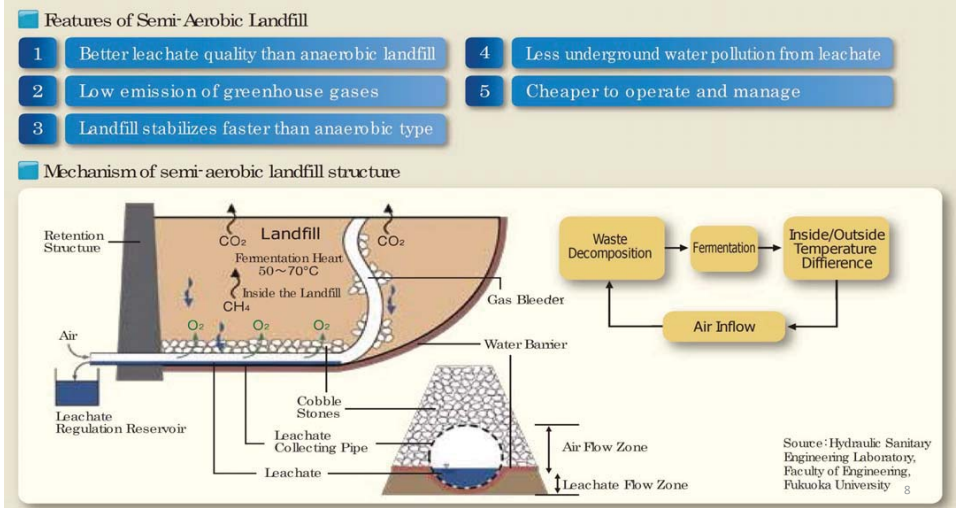
- In many Asian city‘s waste landfill sites, waste is dumped and burned openly. Japan used to be the same; however, a joint research by Fukuoka University and Fukuoka City in 1970s produced and applied a semi-aerobic landfill structure for landfills that is sanitary and presents no environmental problem.
- Compared to anaerobic landfill, the semi-aerobic landfill technology quickly stabilizes landfill sites after the land has completed its role as landfill, enabling it to be used for parks and open space for sports. This technology was accredited as CDM methodology by the UN CDM Executive Board.

Semi-aerobic landfill structure

Features of Fukuoka Method

- A leachate collecting pipe is set up at the floor of the landfill to remove leachate from the landfill, so that leachate will not remain where waste is deposited. Natural air is brought in from the open pit of the leachate collecting pipe to the landfill layer, which promotes aerobic decomposition of waste. This enables early stabilization of waste, prevents the generation of methane and greenhouse gases, which make it effective technology in the prevention of global warming.
- Generally, the air present in an aerobic environment transforms carbon in organic matter into carbon dioxide, nitrogen to nitrification denitrification, and sulfur to sulfur ion, which reduce the generation of foul odor and flammable gas. Moreover, an aerobic environment increases the activity of microorganisms that decompose waste, accelerating the stabilization process.
- On the other hand, in an anaerobic environment, where oxygen is not present, organic matter is transformed into volatile organic acids, such as acetic acid, and then become methane gas or carbon dioxide, and nitrogen and sulfur are transformed to ammonia, amine, hydrogen sulfide, and mercaptan, which emit foul odor and negatively affect the living environment of the surrounding area.

Semi-aerobic landfill structure



Semi-aerobic landfill structure

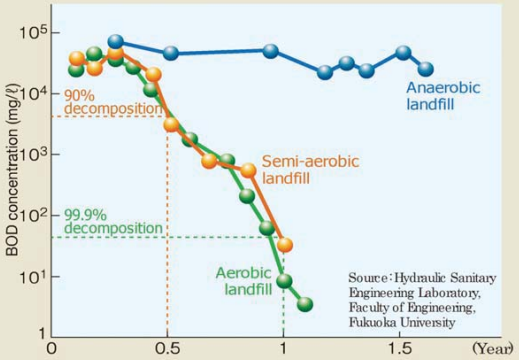
Composition of gas generated from landfill

	Semi-aerobic landfill	Anaerobic landfill
Methane	30%	60%
CO_2	70%	40%

The global warming coefficient of methane, one of the greenhouse gases, is 21 times that of CO_2

The quality of the leachate improved significantly with a significant drop in BOD one year after the semi-aerobic landfill structure was introduced. NH_3-N also showed a significant drop within one year. Anaerobic landfill, on the other hand, shows very little drop.

Landfill structure and changes of BOD in leachate over time (combustible waste)



Semi-aerobic landfill structure

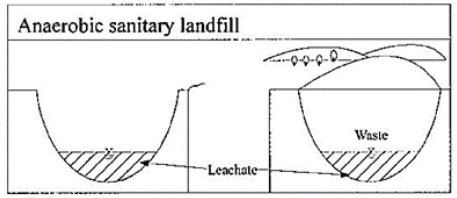
Comparison of Landfilling methods

	Semi-Aerobic	Anaerobic
Lead time for land use after closure	Short 5-10 years	Long 10-20years
Generated gas	CO_2, H_2O	CH_4, H_2S
Odor	Less	More
Capacity of leachate treatment facility	Big	Small

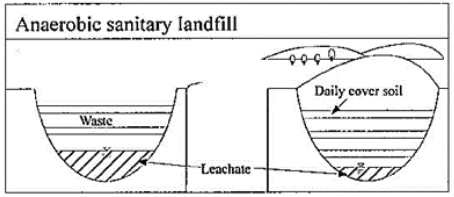
Waste management in Japan

History of landfill disposal

- Until1950's: Anaerobic type landfilling / without any cover soil / water treatment facility / just dumped into the pits that were excavated at the level ground or valley



- Anaerobic type landfilling / several layers of cover soil



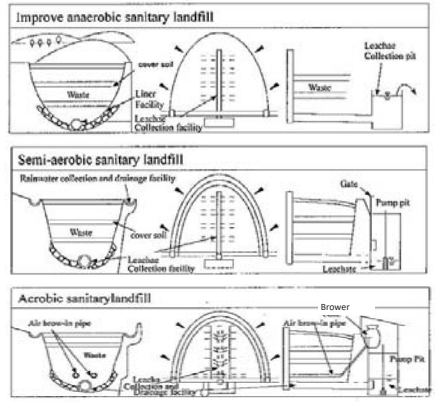
Waste management in Japan

History of landfill disposal

Anaerobic improved type : water collection pipe system / anaerobic in case of much water.

Semi-aerobic: Sufficient size of water collection pipes open to the atmosphare.
Moisture content is smaller and the oxygen supplied through water collecting pipes keeps the landfill aerobic.

Aerobic: Air blowing pipe system
The inside waste is kept much aerobic.



Waste management in Japan

Situations with the Tokyo Metropolitan area #8 landfill

Waste management in Japan

Situations with the Tokyo Metropolitan area landfill at “Yumeno-Shima” (1964)

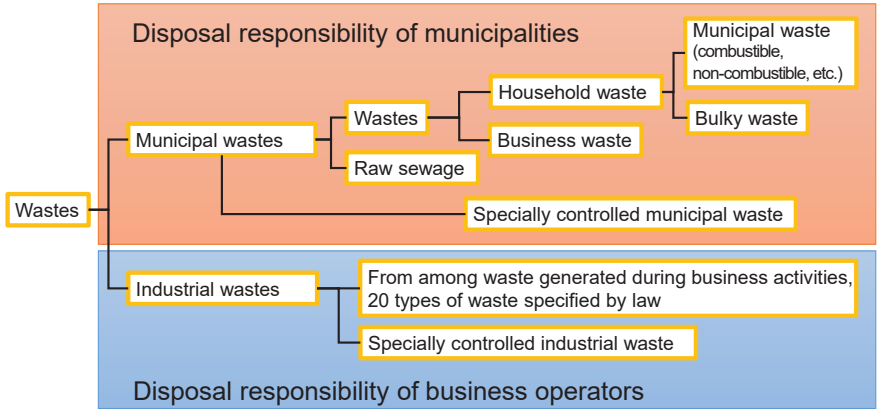
Waste management in Japan

Legal framework for solid waste management

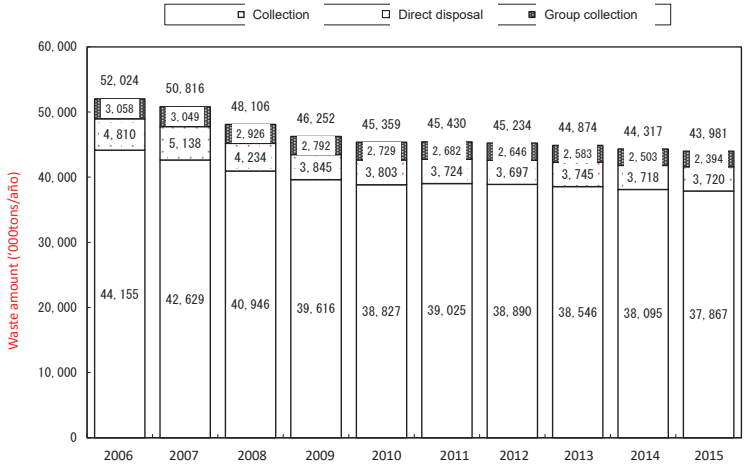
Year	Laws and regulations
1890	Filth Cleansing Law
1954	Public Cleansing Law
1970	Waste Disposal Law
1976	Amendment to Waste Disposal Law
1977	Technical Standards for Landfill
1979	Guidelines for Landfills
1988	Amendment to Guidelines for Landfill
1991	Amendment to Waste Disposal Law
1997	Amendment to Waste Disposal Law
1998	Amendment to Technical Standards for Landfill
2001	Directions for Landfill Planning and Construction

Waste management in Japan

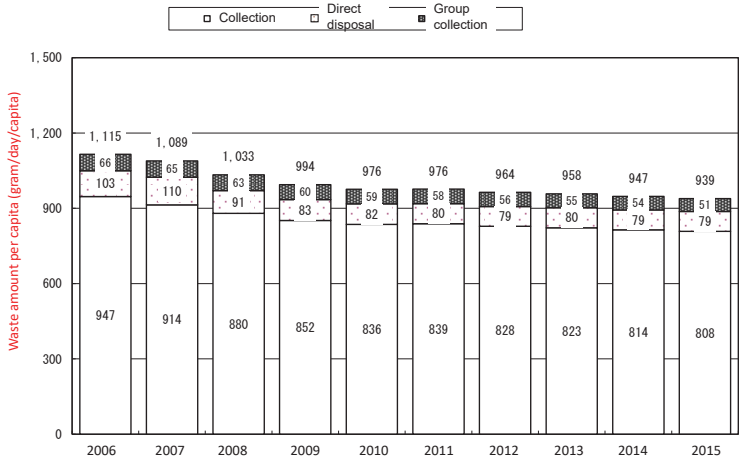
Legal framework for solid waste management



Waste management in Japan



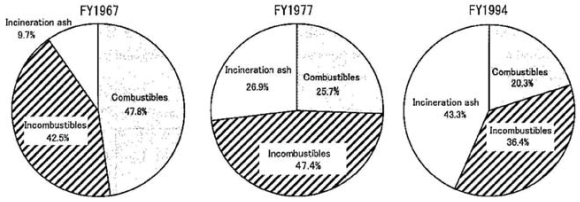
Waste management in Japan



Waste management in Japan

Waste characterization profile

- The percentage of direct landfilling has decreased from 42% in 1976 to 24.6% in 1986; and to 12.8% in 1994. Meanwhile, the percentage of direct incineration has increased from 56.8% in 1976 to 71.8% in 1986; and to 77.3% in 1994, indicating that the composition of MSW landfilled is shifting toward the incinerated residue and incombustibles.



Landfill facility

Necessary facilities for landfill

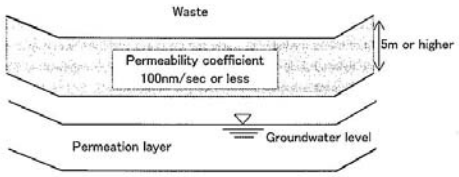
- Storage facility (structures)
- Landfill waterproofing systems (structures)
- Leachate treatment facility
- Groundwater collection/drainage facility
- Leachate collection/drainage facility
- Rainwater collection/drainage facility
- Disaster prevention facility
- Waste reception and weighing facility
- Internal roads
- Monitoring facility

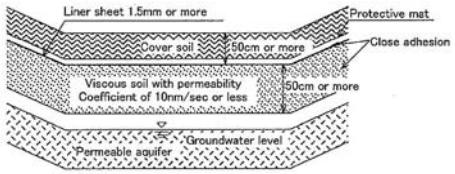
All items are to be designed related to each other item.

Landfill facility

Liner structure (1)

- Landfill waterproofing systems (structures) – acceptable examples to the regulation

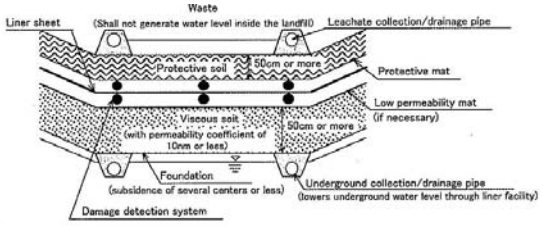


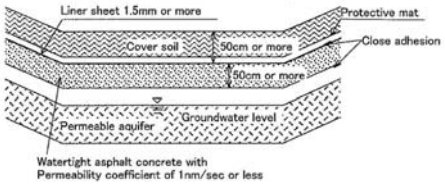


Landfill facility

Liner structure (2)

- Landfill waterproofing systems (structures) – acceptable examples to the regulation

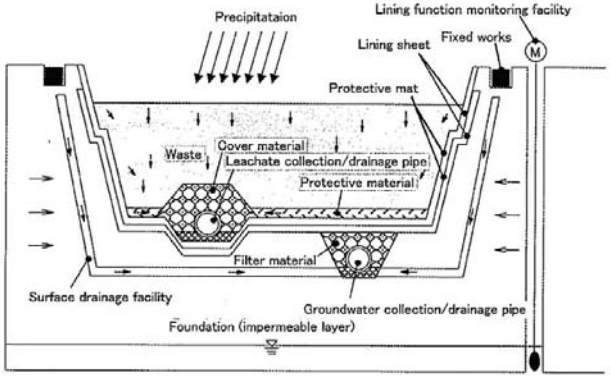




Landfill facility

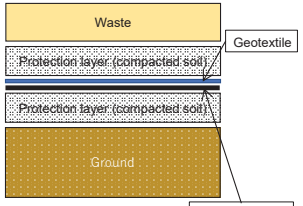
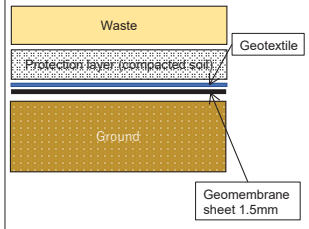
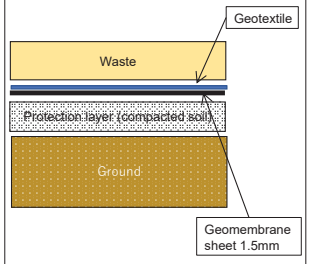
Liner structure

- Comprehensive concept for liner structure



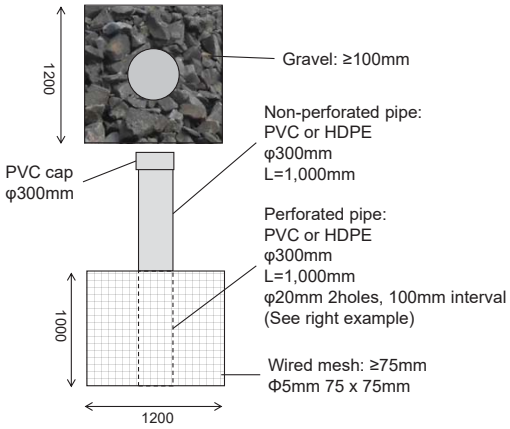
Landfill facility

Liner structure

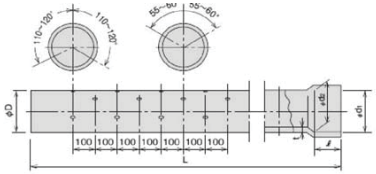
	Standard	Simple	Natural clay layer exists
Type of liner structure			
Unit cost of liner structure	Unit cost XXUSD/m^2 (100%)	Unit cost XXUSD/m^2 (70%)	Unit cost XXUSD/m^2 (50%)

Landfill facility

Gas ventilation unit

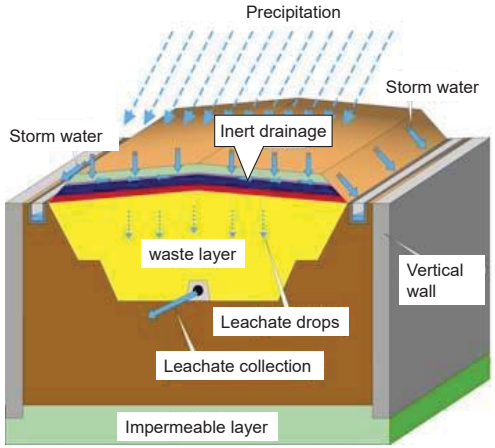


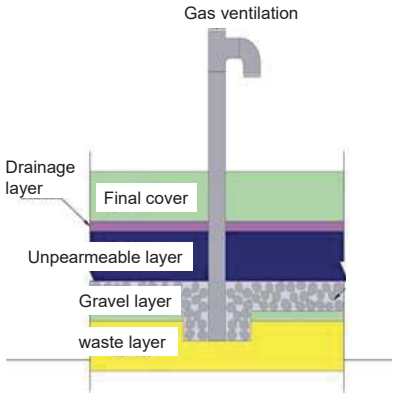
Requirement:
- Each ventilation unit can stand alone.
- Wooden frames can be assembled for the unit.



(Example of perforated pipe)

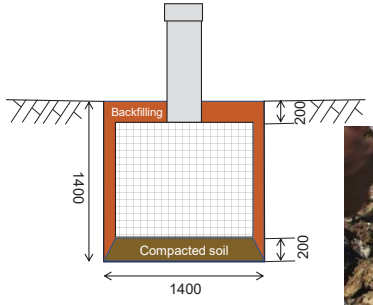
Safe closure of landfills





Landfill facility

Installation of gas ventilation units



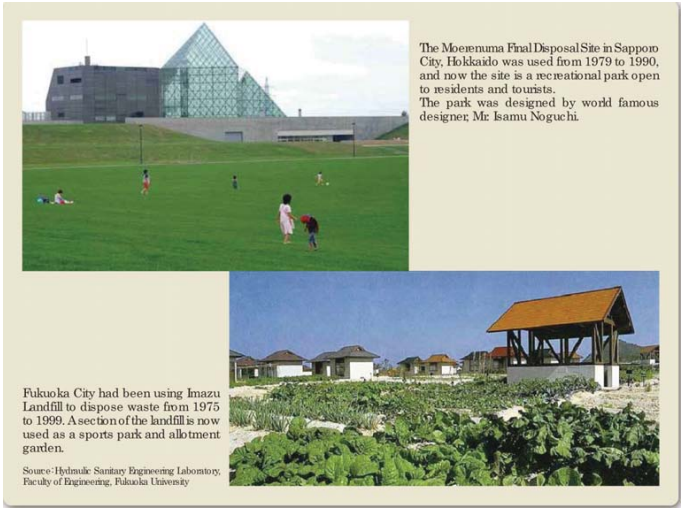
Safe closure of landfills

RYUGASAKI
EX-LANDFILL
Ibaraki,
Japan

Total area 36,000m^2 Landfill area 16,000m^2

Capacity	128,000m^3	Land improvement	120,000m^3
Vertical liner	22,017m^2	Capping area	21,950m^3

Safe closure of landfills



Maintenance of landfills

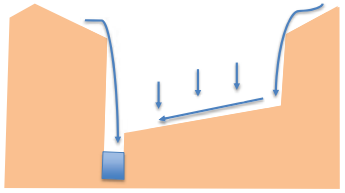
Importance of drainage

- If there is no drainage, rainwater can certainly damage the foundation of access roads.
- No exits, no drainage.
- Not only surface water but water in the layer still stay.

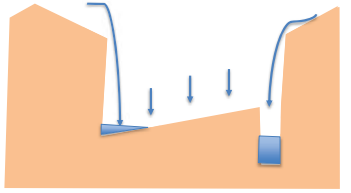
- If drainage installed, the water goes by gravity.

Maintenance of landfills

Drainage basics



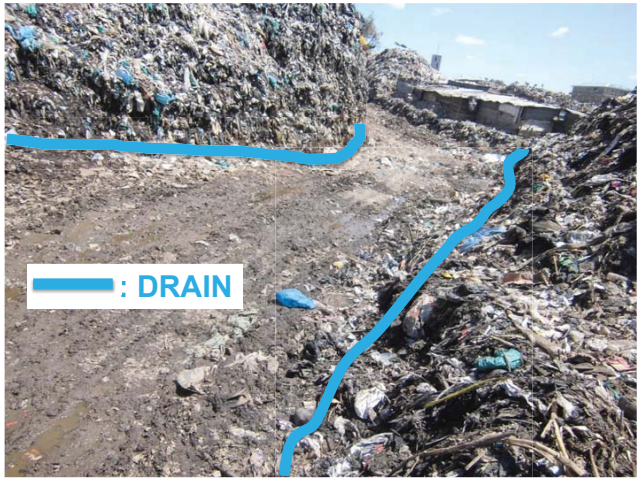
Downstream



Upstream

Maintenance of landfills

Practical recovery



Maintenance of landfills

Practical recovery

Maintenance of landfills

Practical recovery

Maintenance of landfills

Good example (from Deglos)

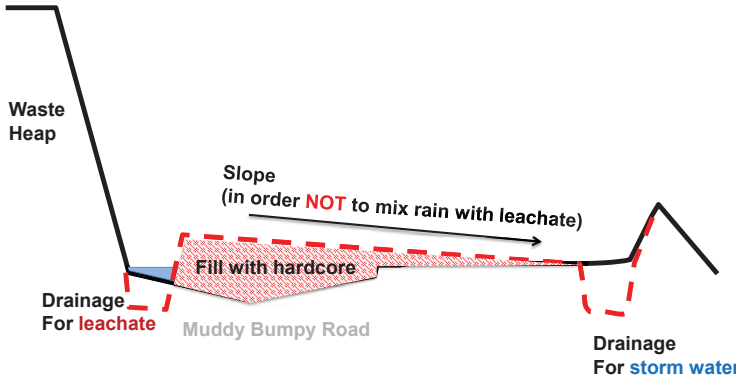
Maintenance of landfills

Practical recovery

Maintenance of landfills

Practical recovery

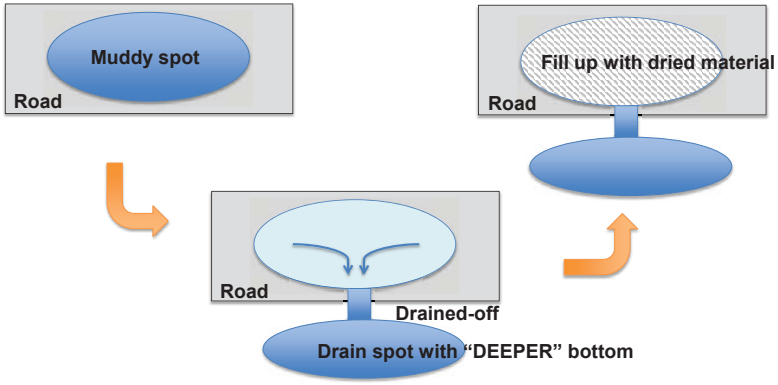
Drainage installation



Maintenance of landfills

Practical recovery

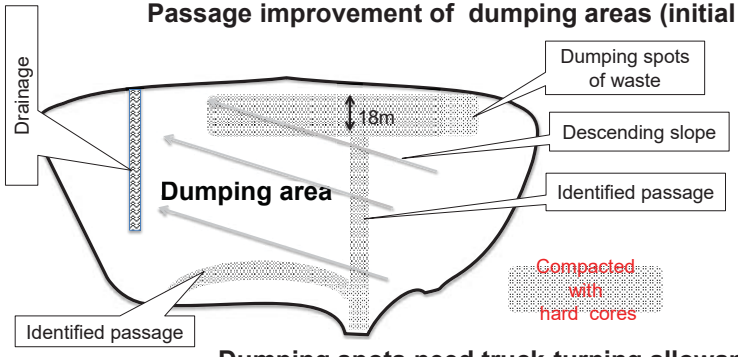
Temporary drainage spot



Maintenance of landfills

Practical recovery

Passage improvement of dumping areas (initial phase)

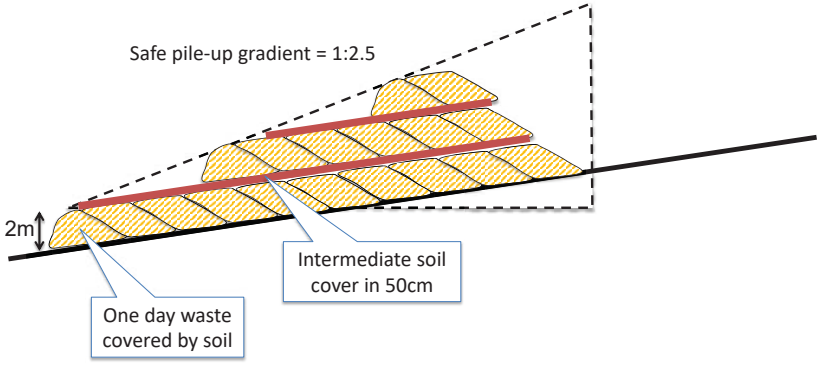


- **Dumping spots need truck-turning allowances.**
- **Compacted area is only the passage of trucks.**
- **Bottom of drainage is the lowest level of the area.**

Maintenance of landfills

Practical recovery

Pile-up waste practice and soil cover



Recent technology

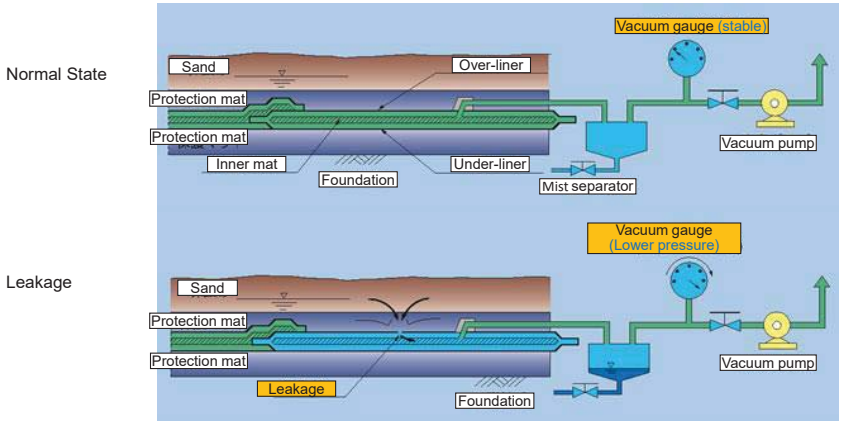
Landfill with movable roofs

Location: Wakkanai, Hokkaido, Japan
Total area: 17.34ha
Landfill area: 28,700m2
Capacity: 189,000m3
Operation start: 2007.10
Project Scheme: BTO（Build Transfer Operate）
Constructed by Penta-Ocean Construction Co., Ltd.

Location: Ochi town, Kochi, Japan
Total area: 2.8ha
Landfill area: 2,400m2
Capacity: 19,000 m3
Operation start: 2007.10
Constructed by Kumagai Gumi Co., Ltd.

Recent technology

Leakage detection



Thank you for your attention.

Parameters for site selections (from an existing case) 1/2

[Primary Selection]

1. Exclude sites where it would be difficult to locate a landfill (site avoidance zones)

- National park
- Natural environment conservation areas
- Erosion control area
- Landslide prevention area
- Near an active fault line
- Flood-prone areas
- Within 1 km of water source protection area

Select sites outside the site avoidance zone where a disposal site is considered feasible.

- Contiguous area over 10 ha
- Site located within 2km from existing roads

46 sites were selected

[Secondary Selection]

1. Environmental conditions
- Rare flora and fauna
- Important areas in the Red Data Book
- Distance from houses, etc.

2. Topography, road conditions, etc.
- Topography and road conditions
- Snowfall intensity
- Transportation efficiency

3. Procedures for legal restrictions, etc.
- Location avoidance zones
- Agricultural land areas
- Other regulated areas

20 sites were selected.

4. Public offering from landowners and local chief executives

2 cases from A City were applied.

Parameters for site selections (from an existing case) 2/2

[Third Selection]

1. Environmental conditions
- Water use in the downstream area
- Impact on the living environment
- Impact on the natural environment
- Impact on roadside

2. Construction conditions
- Construction conditions
- Topography
- Security of water and electric power
- Landowner status

3. Transportation conditions
- Transportation efficiency
- Maintenance of roads for delivery
- Snow accumulation conditions

11 sites were selected.

[Fourth selection] (On-going)

1. Site conditions (field survey)
- Land use
- Road conditions
- Topographical and geological conditions
- Vegetation condition
- Others

2. Re-evaluation of items up to the third round of selection
- Environmental conditions
- Construction conditions
- Transportation conditions

3. Outline design plan (4) Estimated project cost

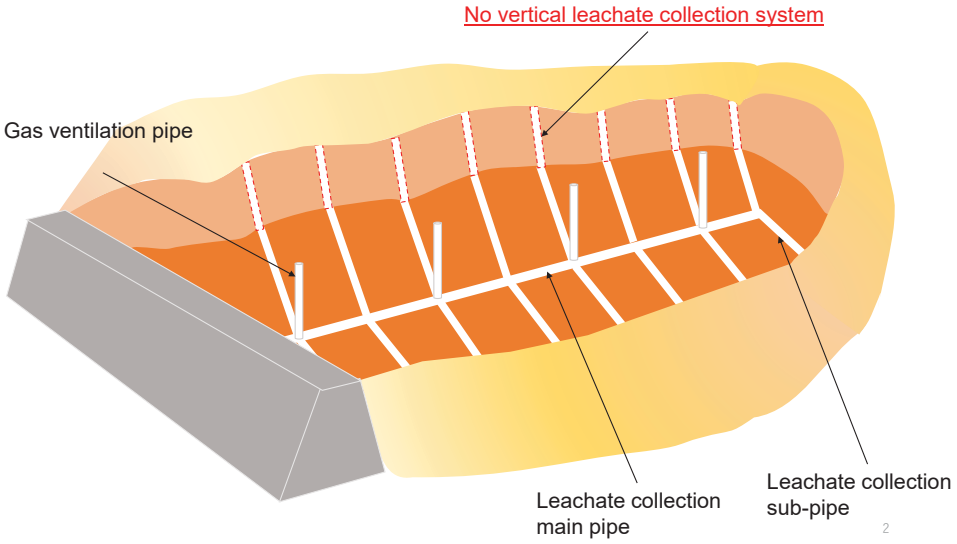
4. Estimated project cost

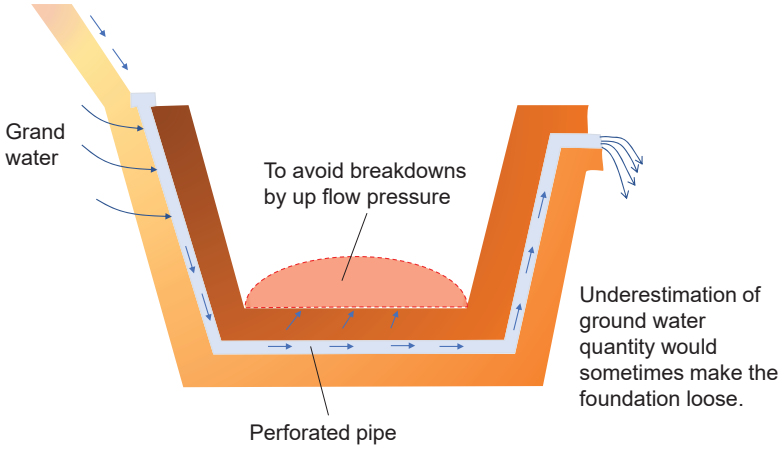
Supplement
Lessons from technical assistances from Japan

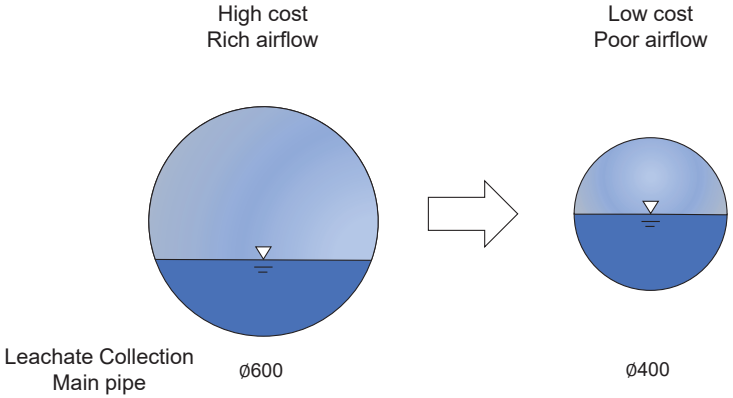
Final Disposal of Solid Waste

January 2023

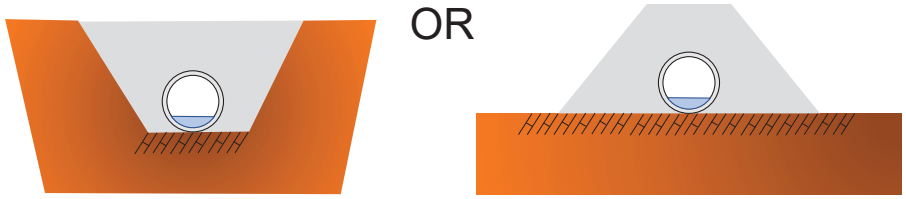
JAT

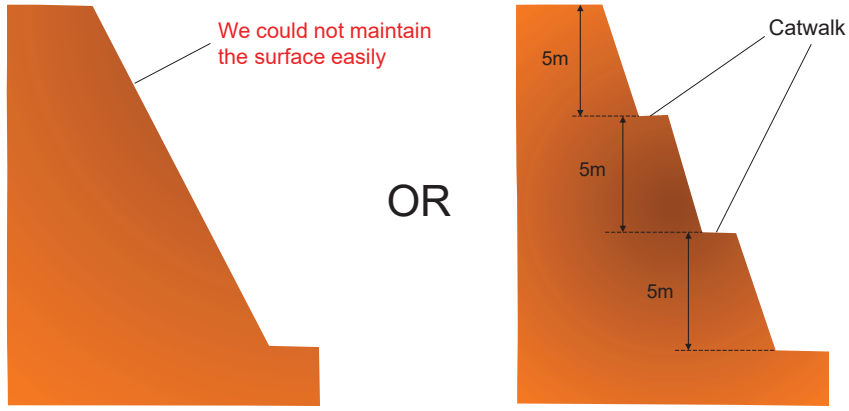


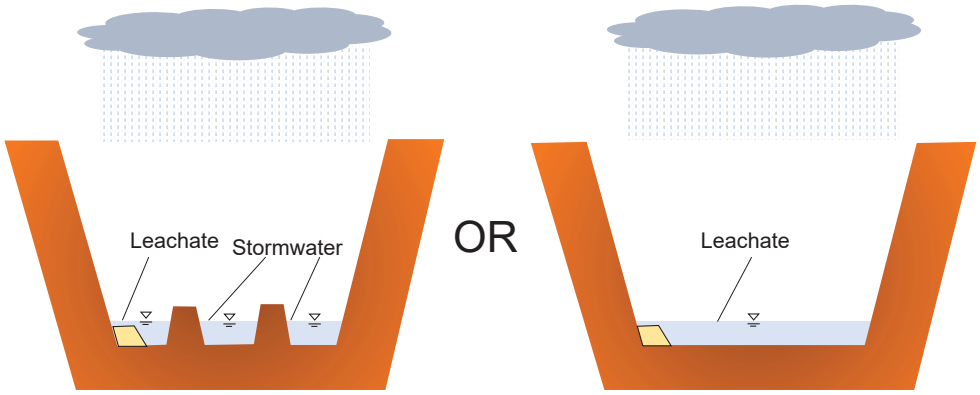




Piling up of pipe covering material needs more work but back-filling material would make difficult on0site work.







OR

The any cell would accept all the rainfall that would be changed into leachate.

Needs gas

Source : https://www.genbaichiba.com/shop/pages/mag-20220510.aspx

Needs electricity

Technical Cooperation Project on
Advisor for Marine Plastic Litter Management in the Caribbean Region

- SWM finance focusing charging fees –

Feb. 14, 2023
Taisuke Watanabe
JICA Advisory Team

NIPPON KOEI

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Contents

(Note) This material does not cover financing of investments

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1. Background and Objective

- As the SWM sector is an underbudgeted sector, for responding to increasing expenditure and cutting cost is not easy, raising revenue is the first thought coming to mind.
- Also participants are familiar with the expenditure (cost) side, today discuss the revenue side, focusing on charging fees.
- Tax and fee are the major the revenue tool, while the tax revenue tends to be incorporated into the general income. Today's focus is SWM specific charge (fee), as fees are understood as a payment for a service and there is more possibility to make SWM budget by the fee revenue than tax.

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1. Background and Objective

- The objective for the discussion today is
  1) To provide basic knowledge toward the design of waste fee
  2) To better understand the practical issues on waste fee

  Toward the sustainable financing.

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2. Revenue

Tendency on financing

- Experience shows that it is easier to mobilise funds for investment financing than it is to generate those needed to cover the recurrent operational needs of the system.
- The revenue flows needed to cover system operating, asset replacement and long-term liability costs must be covered almost exclusively out of municipal resources. Defining and generating the annual revenue necessary to maintain system and financial sustainability on a continuous, reliable and predictable basis is a far more complex and seemingly intractable issue that must be faced by the municipal authorities.

(World Bank, Bridging the Gap in Solid Waste Management)

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2. Revenue

To appeal the sustainable financing

- It is crucial that the municipality and its waste management department knows the full costs of operating its waste management services and the individual components that comprise them.
- To determine its financing needs, a municipality must first establish the full costs of its current services, of its planned investments and of the associated operations.

(World Bank, Bridging the Gap in Solid Waste Management)

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2. Revenue

Sources of revenue

⇒Once current costs and revenues are understood, the process of forecasting future revenues and expenditures may commence. Forecasts of future revenues are required to set user charges.

Type of revenue	Description
Budget transfer from Government	Allocation in the government budget (often development budget and operating budget) Typically through budget request/proposal from the competent department/ministry
Tariff/ fee revenue	Depends on the design and implementation
Sales	Sale of recyclable, compost etc.

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2. Revenue

Revenue collection mechanism

- Different revenue collection mechanisms are possible, including a tax, a user charge or a combination of both.
- Revenue collection methods need improvements in the service and awareness-raising campaigns in order to ensure public acceptance.
- Penal rules and implementation is important factor for compliance.

(Reka Soos, Financial Aspects of Solid Waste Management)

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3. General Requirements of Waste Management Fee

Waste management fees have to follow a lot of different requirements. General requirements include the following:

- The User Pays
- Tariffs better incorporate/represent an incentive to support the system's policy (such as the 3R)
- Keep It Simple, Stupid (Reduces administration efforts, Reduces regulatory requirements and Improves transparency)
- Tariffs are due on a regular (monthly to yearly) basis
- The differentiation between:
  - "household waste" (which remains under the Municipality´s responsibility in any case)
  - "institutional, commercial and industrial waste "

(ISWA, How to Design an Appropriate Waste Fee)

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3. General Requirements of Waste Management Fee

When we say "The User Pays", what this mean and what is the goal?

- All the cost is covered by the user fee (so-called full cost recovery) (this is difficult to realize, while financial institutions make it as principle) or
- Some cost (ex. collection cost) is covered by the user fee →

(Expenditure side)

Is the fee collected to fulfill the specific expenditure, collected fee is incorporated to the SWM budget or incorporated to general budget (not only for SWM) ?

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4. Types of Fee

- **Gate fee at disposal**

Establishing a gate fee for disposal is a good practice that is likely to encourage recycling, given that control of illegal dumping is carried out by the environmental authorities and the municipality.

Full cost of waste disposal − Revenues from sale of recovered materials Revenues from gate fees by third party users who bring in their waste = Revenue requirement/ Subsidy requirement

Revenue requirement/ Subsidy requirement / Tonne handled = GATE FEE

(Reka Soos, Financial Aspects of Solid Waste Management)

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4. Types of Fee

- **User charges, tariffs**

The principles usually used to design tariff-setting methodologies include:

Cost recovery, Affordability, Equity and fairness , Polluter pays and Behaviour change

Full cost of waste management − Non-tariff revenues = Revenue requirement/ Subsidy requirement

Revenue requirement/ Subsidy requirement / Number of users = MACRO-TARIFF

(Reka Soos, Financial Aspects of Solid Waste Management)

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4. Types of Fee (Another category)

➢**Fixed charges, tariffs**

A fixed tax or rate per private household or apartment; or as a variable tax or rate per unit area of apartment floor space or number of residents.

Fixed rate taxes and charges apply uniformly to all users (the fee base) and result in a predictable revenue stream. Variable rate taxes and charges relate to a variable physical attribute of the user (the fee base).

(World Bank, Bridging the Gap in Solid Waste Management)

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4. Types of Fee (Another category)

➢**Quantity based charges, tariffs**

Quantity-based (variable-rate) charging schemes (also known as pay-as-you-throw schemes) relate to the amount of waste collected.

They aim to give service users incentives to adjust their behaviour in ways that help meet governments' waste management policy objectives. Incentives take two forms:

- To encourage users to reduce the amount of waste they produce. The charging scheme is designed to meet waste minimisation objectives.
- To encourage users to reduce the amount of waste they produce and to separate their waste into recyclable and residual fractions. Users face choices related to both (i) the total amount of waste they put out for collection and (ii) the amounts they put out for recyclable material and residual waste collection, for which differential charge rates apply

(World Bank, Bridging the Gap in Solid Waste Management)

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5. Fee Collection

Important elements of successful fee collection include:

➢Service that has value to users

➢People are usually willing to pay for a good waste collection service. However, if the service fails to ensure clean and healthy environments, they are less likely to want to pay.

➢Financial flows of the revenues controlled by the Municipality

A good revenue collection system is one in which:

➢Enforcement of payments is possible through administrative or financial penalties

➢The municipality can control the quality of the services and impose financial penalties on the operator in case of non-performance

(Reka Soos, Financial Aspects of Solid Waste Management)

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5. Fee Collection

Efficient revenue collection methods:

➢ The collection of revenues in the form of a property tax and revenue collection linked to billing procedure to a public utility bill

Fee Collection methods	Pros	Cons
Property tax	• Low administrative cost as it is collected once a year	• May not be affordable for poor households to payout a big amount of money once a year
Public Utility	• High payment rates • High cost efficiency	• Potential issues with the legality of sanctions such as cutting off users from electricity or water supply in case of non-payment

(Reka Soos, Financial Aspects of Solid Waste Management)

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5. Fee Collection

Type of fee collection (linked to the fee system)

- Indirect billing by government

  Billing of a waste management fee (tax) linked to an existing tax such as property tax

- Direct billing by government

  The government is responsible directly for all aspects of preparing and maintaining service population registers, establishing waste charges, billing users, collecting payments, chasing up arrears and enforcing payments.

- Direct billing by the operator

  The government appoints licensed private municipal waste management company to be responsible for both waste management operation and fee collection.

(World Bank, Bridging the Gap in Solid Waste Management)

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5. Fee Collection

Issues on non-payment

There are typically no sanctions for non-payment.

- Enforcement of payments is possible through administrative or financial penalties

  The government can control the quality of the services and impose financial penalties on the operator in case of non-performance

(World Bank, Bridging the Gap in Solid Waste Management)

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6. Consideration Points

1. Willingness to Pay (WTP) and Affordability

- When proposing to introduce new or expanded waste fee, an important factor is is the concept of users' WTP. WTP for a service reflects the economic value an individual attaches to the service (the perceived level of satisfaction he derives from it). 'Willingness' encompasses both the 'ability' and the 'desire' of the user to pay for the service
- WTP can be assessed using a variety of research techniques, but the approach mostly used in the municipal waste sector is the 'contingent valuation' method, whereby survey and questionnaire-based tools are used to assess the WTP by residents of a community for improved service levels
- Compared to the costs for other public services (electricity, water supply, transport etc.) expenditures for waste collection and disposal are low. However, it is not usually reflected in the citizens' general perception.

(World Bank, Bridging the Gap in Solid Waste Management)

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6. Consideration Points

2. Required data

Each fee model requires data which has to be administrated

- The minimum data which is required includes:
  - Address of the property
  - Name and address of the owner
  - Name and address of the person who pays the waste management fee (if different from the owner).

Example case:
If waste is collected from containers situated in public places, the fee cannot be based on single containers. In such a case, the fee has to be based on measurable data related to a single premise on which the waste is being generated. Such data can be, for example, the number of residents, floor space, or the value of the property.

(ISWA, How to Design an Appropriate Waste Fee)

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6. Consideration Points

3. Cost factors to be covered – fixed and variable costs

Cost analysis is critical to explain the needs of revenue.

- Fixed costs
  - all administrative costs
  - all costs for public relations
  - costs for the collection of recyclables
- Variable costs
  - treatment of waste
  - a small part of collection costs

(ISWA, How to Design an Appropriate Waste Fee)

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6. Consideration Points

4. Citizens' behaviour

- The fee system should contain elements to award desired behaviour with a financial incentive
- Avoidance of fee payment often takes place. Need public awareness and easy payment system.

5. Fees for Private companies

- Integrating the management of institutional, commercial (and industrial) waste into municipal waste management helps municipalities receive a contribution to the fixed costs.

(ISWA, How to Design an Appropriate Waste Fee)

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7. Lessons from cases

Based on the eight case studies on result-based financing by the World Bank, the following are found as important for the successful development of the financial model.

Collection of sufficient baseline information to address the needs of the sector

- Allows fee models tailored to the challenges and needs of each city or country.
- Baseline information may include:
  - MSW practices
  - Solid Waste collectors
  - Equipment and method of waste collection
  - Treatment and disposal of MSW
  - Policies and regulations

(World Bank, Results-Based Financing for Municipal Solid Waste)

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7. Lessons from cases

Active involvement of all stakeholders from the early stages

- This could be done through:
  - Consultation of stakeholders and actors through workshops or/and targeted surveys
  - Involvement of the national and local governments, private and informal waste collectors, and community members and leaders.
  - Discussion of the proposed design in a final stakeholder workshop where each actor is given the opportunity to voice their opinions.

(World Bank, Results-Based Financing for Municipal Solid Waste)

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7. Lessons from cases

Ensuring project prerequisites in early project implementation stages

- Prerequisites may include:
  - Established and institutionalised SWM subject committees and operational units
  - SWM strategies and service improvement plans (SIPs)
  - Established performance and service delivery monitoring systems, etc.

Fundamental changes in behavior that can take time to establish, so setting realistic targets is important

- Expectations should be set for gradual improvements over time

Institutional arrangements and flow of funds must be simplified, as much as possible, taking into account the capacity of the implementing agency

Supplementing financial subsidies with educational outreach and technical assistance provides greater leverage

(World Bank, Results-Based Financing for Municipal Solid Waste) 25

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8. Case from Phnom Penh, Cambodia

Phnom Penh Case

- The private company which awarded exclusive rights for solid waste collection (also collected fee by the invoice together with the electricity invoice) was denied its license by the Prime Minister. The Phnom Penh city started the waste collection by selecting the collection companies and fee collection by themselves from 202. New fee table is set for non-business (by type of house) and business (36 categories).
  - ✓Established the payment system with several tools including electronic payment through mobile APPs
  - ✓Warned non-payers on the risk additional penalties including publicly naming in social media and the loss of operating licenses for businesses
  - Established performance and service delivery monitoring systems, etc.

(World Bank, Results-Based Financing for Municipal Solid Waste) 26

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Reference Document

- ISWA (International Solid Waste Association), How to Design an Appropriate Waste Fee - Principles, Practices and Applications of Waste Management Fees, 2011
- Reka Soos, RWA Group, Financial Aspects of Solid Waste Management, 2017
- World Bank, Bridging the Gap in Solid Waste Management – Governance Requirements for Results, 2021
- World Bank, Results-Based Financing for Municipal Solid Waste, 2014

For further reding:

- Environmental Affairs Department, Republic of South Africa, Municipal Solid Waste Tariff Strategy, 2012
- Environmental Affairs Department, Republic of South Africa, Solid Waste Tariff Setting Guidelines fo Local Authorities, 2012

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Thank you!

Contact: Taisuke Watanabe (Mr.)

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Online Technical Meeting
for
the “Technical Cooperation Project on Advisor for Marine Plastic Litter Management in the Caribbean Region”

- Information, Education and Communication -

March 14th, 2023

JICA Advisory Team

Contents

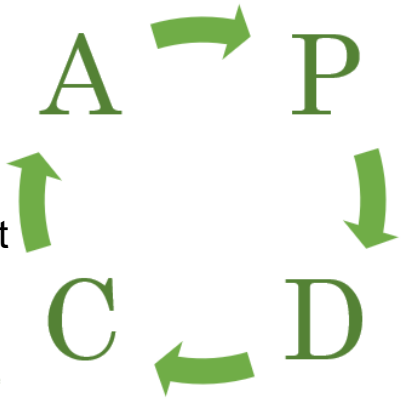
1. Thoughts for improving IEC
2. Introduction of IEC tools

We all agree that Information, Education and Communication are very important, but how do we know they are effective?

PDCA cycle for IEC

Act: In this stage, based on the evaluation and analysis of the data, corrective actions are taken to address any gaps or deviations identified in the Check stage. The lessons learned are used to make modifications to the plan and to identify areas for further improvement.

Selection and concentration might be necessary.



Plan: In this stage, a plan is developed to address a specific problem or issue.

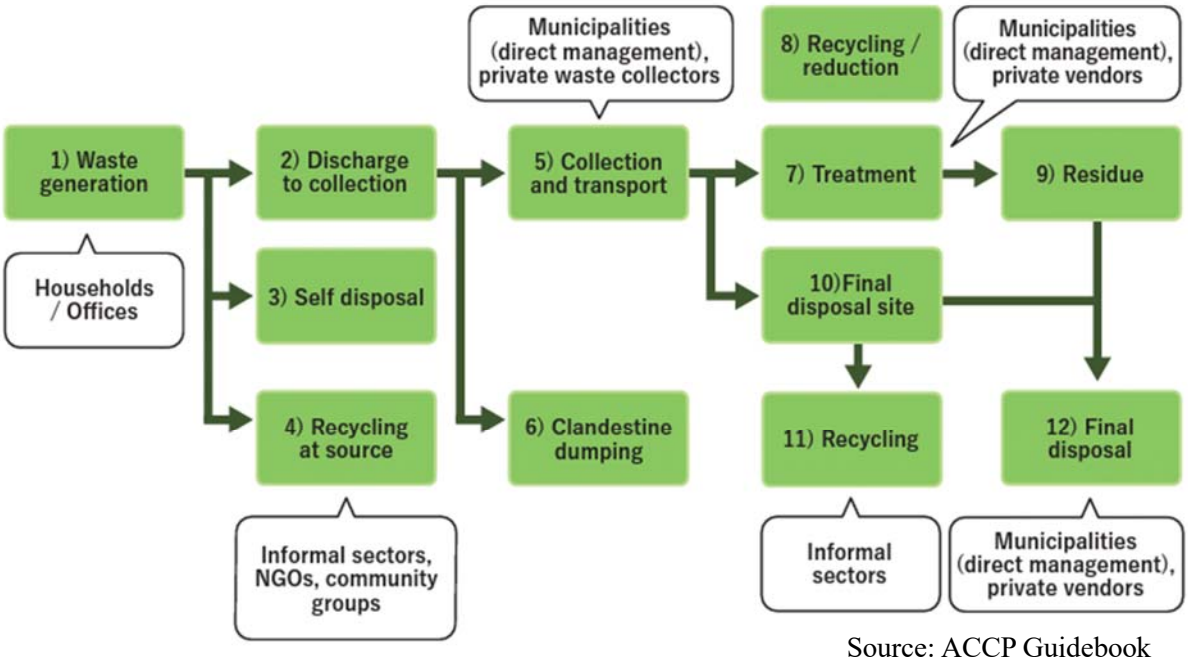
Clarify your objectives **!**

Check: In this stage, the results of the actions taken are evaluated against the objectives set in the planning stage. The data collected is analyzed to determine whether the objectives have been achieved or not.

Do: In this stage, the plan is implemented, and the actions outlined in the plan are carried out. Data is collected to measure the effectiveness of the actions taken.

Try to collect data for effectiveness

Target audiences at each stage of the waste flow



Source: ACCP Guidebook

Available Resources for IEC

Resources	Examples
Man power	Local government, NGO, community organizations, teachers, local/international experts, etc.
Materials	Goods and tools such as computers/printers, existing teaching materials, cleaning equipment (e.g. for a beach clean-up event), etc.
Money	Budgeted public funds, subsidy, donation, etc.
Time	weekly, seasonal, commemorative day every year, etc.
Opportunities	Festivals, community events, school subject, etc.
Information	Implicit and explicit knowledge of the target audience.

How can we utilize these resources efficiently and effectively?

PDCA: Check & Act

- KPIs:
  - Awareness level
  - Feedback and response
  - Behavioral change
- Data collection methods:
  - Questionnaires
  - Focus groups
  - On-the-ground observations
  - Social media analytics
  - Web analytics

- Action:
  - Analyse the data
  - Review the objectives
  - Reassess the strategy
  - Evaluate the activities and materials
  - Identify lessons learned
  - Formulate recommendations
  - Create an activity manual for the next time

Tools and Activities for IEC

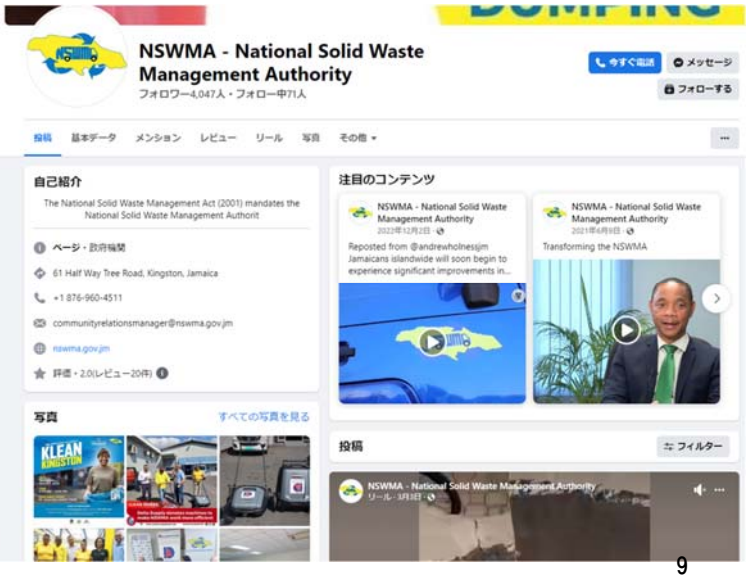
- Information
  - Web site, Radio &TV promotion, YouTube, video clip, newsletter, flyers, signage and tags
- Communication
  - Facebook, Instagram, Twitter
  - NSWMA's App, SLSWMA with Fulcrum
- Education
  - School visit
  - Landfill site tour
  - Movie of GEF Island
  - Clean up activity in Guyana, Jamaica
  - RePLAST Public Relations

IEC Tools: Facebook

Grenada

Antigua and Barbuda

Jamaica



IEC Tools: Facebook

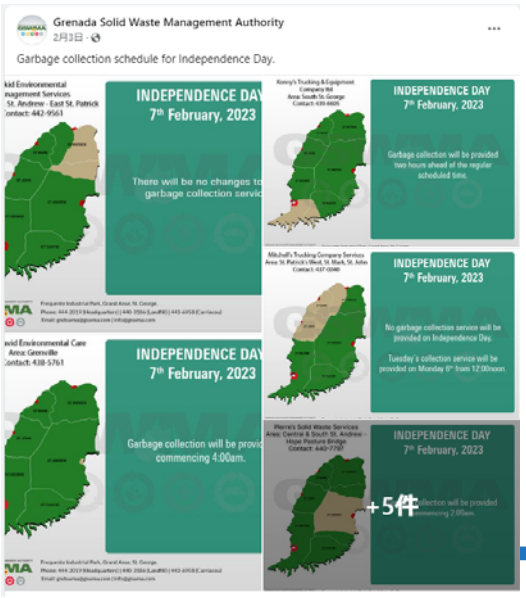
Guyana

Saint Lucia

IEC Tools: Facebook

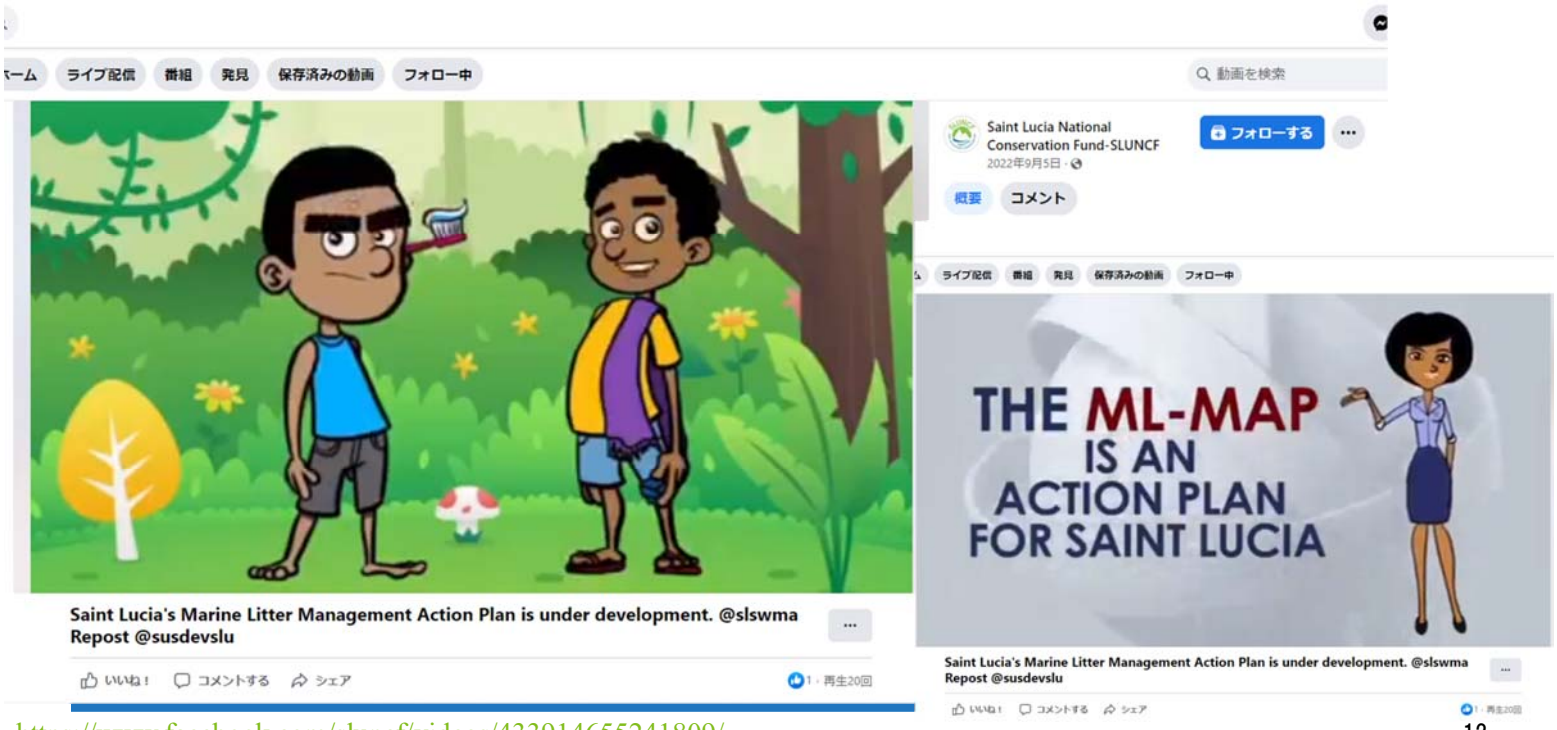
- Public holiday and bulky waste day announcement.

Grenada



Saint Lucia

IEC Tools: Video Clips

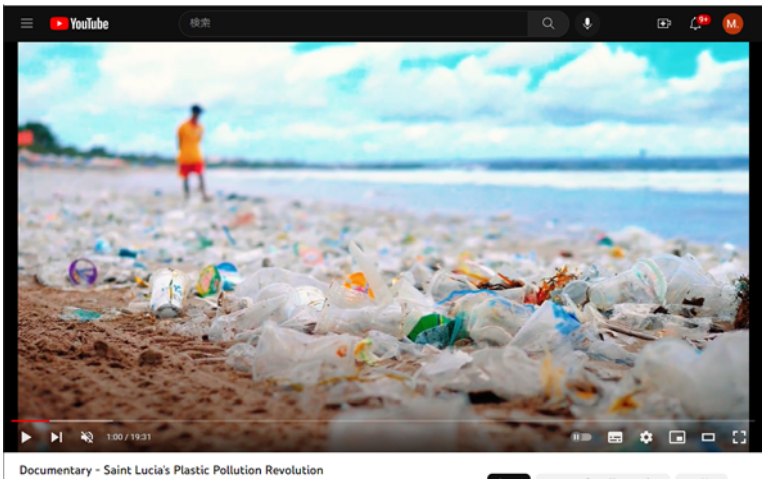


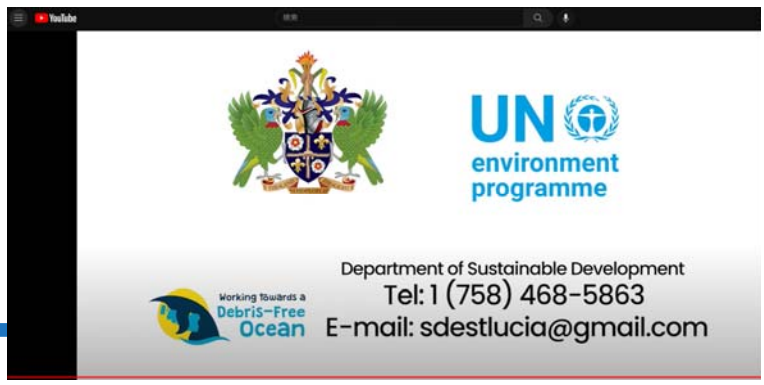
https://www.facebook.com/sluncf/videos/433914655241809/

IEC Tools: Video Clips

https://www.facebook.com/GSWMA/videos/425055496421201/

IEC Tools: YouTube
Case of Saint Lucia





https://youtu.be/yyr4mOKEdtY

IEC Tools: Video Clips

Mottainai Grandma, Japan

"Mottainai" is a Japanese expression that can be translated as "it's a waste" but actually means more than not being wasteful. It is a mindset based on respect and gratitude for nature and people.

To transmit this simple yet powerful phrase to younger generations, Japanese author Mariko Shinju created "Mottainai Grandma", a children's picture book series that conveys the meaning and importance of the word "mottainai" to children. The main character is a cheerful (though a little scary) grandma who explains the right attitude. The book series has been animated and translated in many countries to tell the importance of Japanese "Mottainai" to children around the world.

https://mottainai-baasan.com/en/

IEC Tools: Signage

Garbage attracts more garbage

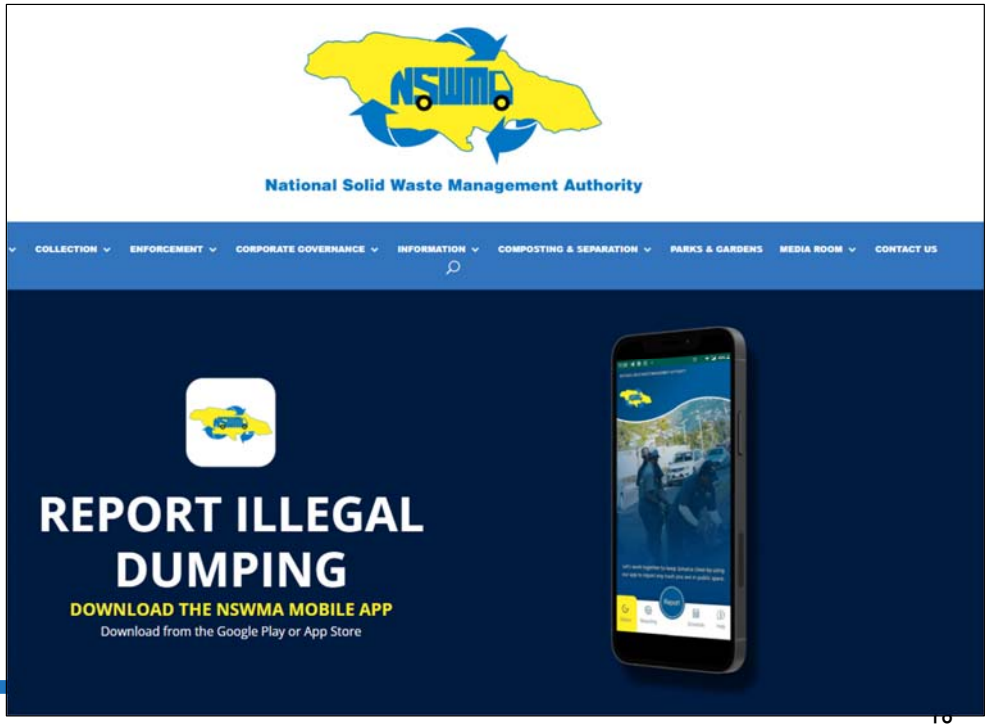
IEC Tools: Positive and negative tags to reinforce good recycling habits (USA)

- "Emoji" turns out to be understood by anyone!

Source : NEWMOA-NERC webinar "Effective Education Strategies for Proper Recycling" Jun 7, 2018 - Presentation of Cindy Jolicoeur & Anna DeMers, C+C

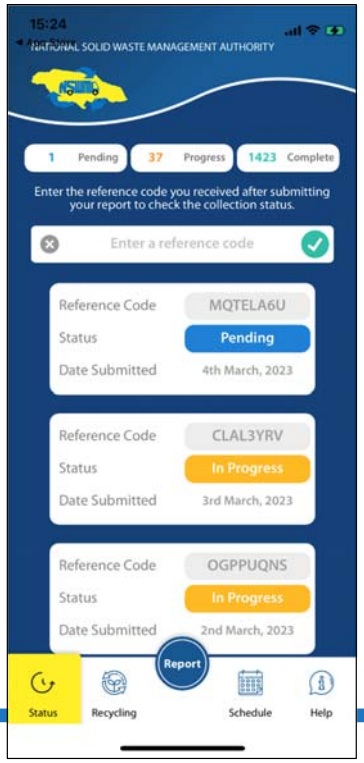
Communication Tools: Mobile Apps

- Example #1: National Solid Waste Management Authority of Jamaica

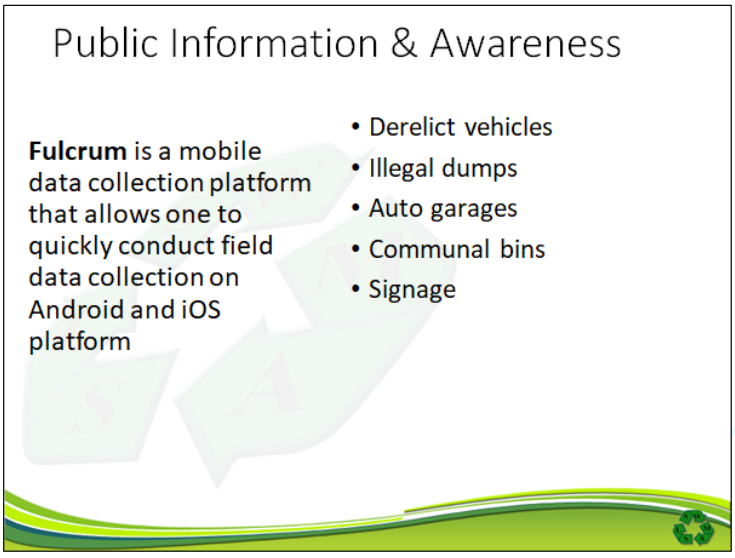


Communication Tools: Mobile Apps

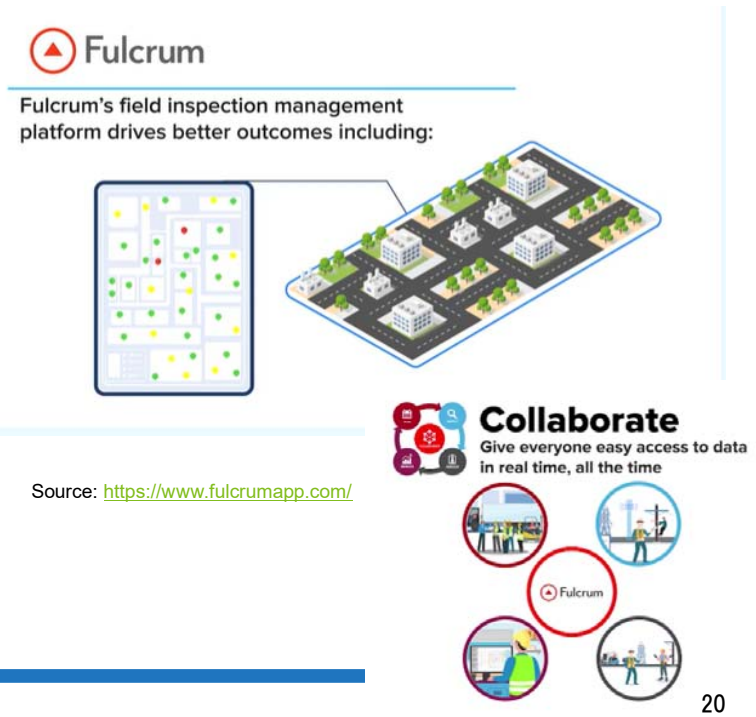
- Once the App is installed, all they need to do is
  - Take a photo , send it with your location and contact information.
  - NSWMA will go collect the garbage!



Communication Tools: Mobile Data Collection Tool: Fulcrum (SLSWMA)



Source: 1st Workshop Presentation of Saint Lucia



Source: https://www.fulcrumapp.com/

IEC Tools: School visits: Saint Lucia's case

- It is more difficult to change older people's behavior. So, start with children.

IEC Tools: Landfill Site Tours

Saint Lucia

Grenada

IEC Tools: Landfill Site Tours Japan's case

- School children in Japan visit landfills, recycling facilities, waste-to-energy (incineration) facilities.

ごみクレーンでごみを運ぶ様子を見学する児童たち＝白山市上小川町の松任石川環境クリーンセンター

京都市北部クリーンセンター見学風景

Educational activity: clean-up activities

Grenada

Jamaica

Guyana

NATIONAL ENHANCEMENT COMMITTEE

- Monthly Cleanup Exercise in the 10 Administrative Regions
- A collaborative effort between the Government, Municipalities, Private Sector, NGOs, Civil Societies and Residents
- Works include cleaning and removal of waste from public spaces, drainage network and removal of derelict vehicles.

IEC Tools: coloring garbage bins for source separation

Educational Activity: Recycling initiatives

Grenada

Antigua and Barbuda

Source: 2nd Workshop Presentation of Antigua Barbuda

Educational Activity: Recycling initiatives
RePLAST in Saint Lucia

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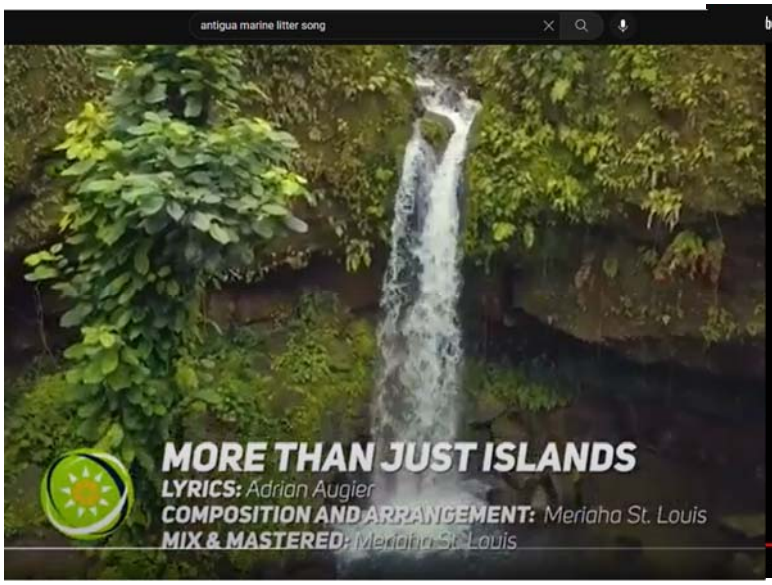
IEC Tools: Songs

https://www.youtube.com/watch?v=43LrsAgRSJA



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Only behavioral change of people will stop the marine plastic litter!

Thank you very much for your attention!

- Questions to the participants:
  - –What are your challenges with your IEC?
  - –What are your successful IEC activities, and the reason why you think they are so successful?

GRENADA SOLID WASTE MANAGEMENT AUTHORITY

GSWMA

Addressing Waste Management Challenges presented by New and Increasing waste streams.
JAT/JICA 14th Online Technical meeting. June 13th 2023

Myrna Julien
Communications Manager
Grenada Solid Waste Management Authority.

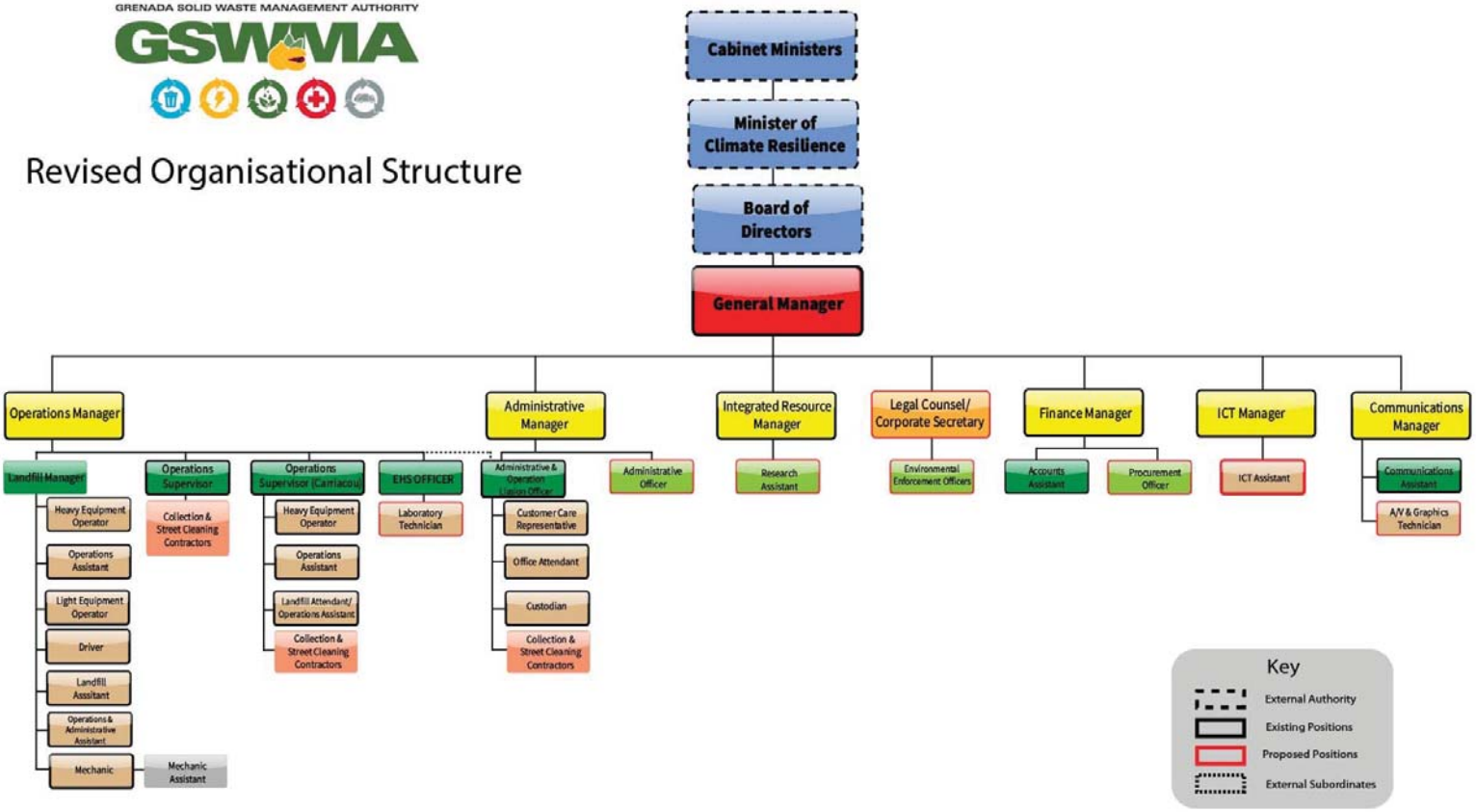
In this Presentation

- The Authority – Establishment – Structure- Supporting legislation – Services.
- Waste management challenges.
- Addressing challenges and opportunities out of waste- The waste stream
- Perseverance Landfill operation systems. Challenges re – Data collection, facilities, Landfill cell development, Landfill closure, leachate treatment. Filling plan.
- Strategic targets & policies

GRENADA SOLID WASTE MANAGEMENT AUTHORITY

GSWMA

Revised Organisational Structure



The GSWMA

Other supporting Legislation

- Grenada Solid Waste Management Authority Act 11.1995.
- The Environmental Levy Act.1997
- The Waste Management Act. 16 of 2001
- Abatement of Litter Act. #24 of 2015
- Environmental Management Act of 2005
- National Parks & Protected Areas Act 1991
- Non-Biodegradable Waste Control Act of 2018
- Procurement and Disposal of Public Property Act #1 of 2018
- Public Finance Management Act # 17 of 2015

GRENADA SOLID WASTE MANAGEMENT AUTHORITY
GSWMA

What we do

- Development and Management of landfills.
- Waste Collection
- Supervision of services
- Street Cleaning
- Integrated Resource Recovery
- Public Education

Some major waste management challenges

- Lack of enforcement capabilities within GSWMA
- Illegal disposal of solid waste, littering and mis-use of communal receptacles – Public Health and Environmental Implications.
- Financial sustainability of GSWMA and SWM projects & programs
- Limited options for future waste disposal facilities
- Huge and changing waste stream
- Ineffective Landfilling operations.

Financial sustainability

- Environmental Levy – not enough to support services with little changes in 27 years.
- More waste – dwindling financial resources to: manage waste, further develop facilities for disposal, for waste transportation, equipment maintenance and procurement, collection services, sanitation services, new facilities and technology for waste treatment. Emergency operations- frequent and severe. (increase population)

In 2023 the Government was creative in including a new environmental tax system through the water utility bill. Similar to that of the Electricity billing system of 1996 based on water consumption.

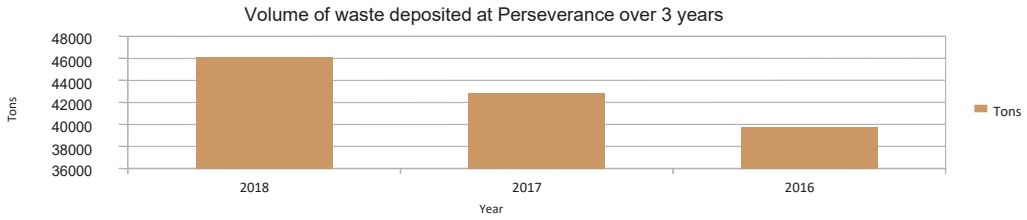
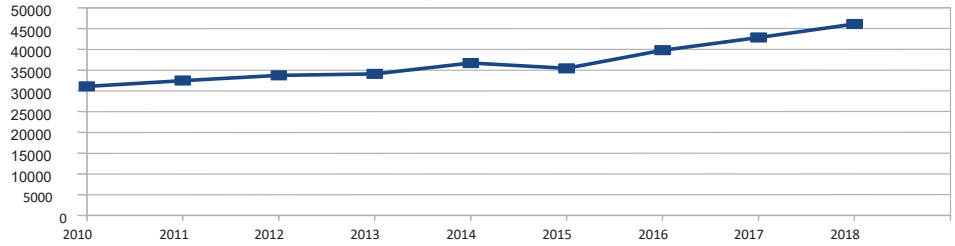


Chart shows the volume of waste in tons deposited at the Perseverance Dumpsite over a 3 year period
2018 – 46,106.72 short tons, 2017 – 42,868.06 short tons 2016- 39,789.83 short tons

The Chart below shows a record of waste arrivals at the Perseverance for 2010 to 2018



The Last waste characterization study which was commissioned by the Minister for the Environment for review of the National Waste Management Strategy was done in 2020.

- Organics (Food and green waste) 25.3%
- Hazardous waste 2.5%
- Paper, Cardboard and poly coat packaging 13.9%
- Special care waste (Pampers, tissue etc) 5.7%
- Glass 7.7%
- Refundable glass 1.9%
- C&D waste 3.8%
- Metal (non-ferrous) 2%
- Metal (Ferrous) 5.9%
- Hard plastics 10.1%
- Soft plastics 3.7%
- Textiles 6.2%
- E-waste 3.7%
- White goods 0.2%
- Non recyclable, non hazardous waste 7.2%

Our Strategic objectives

1	Reach an 80% diversion rate by 2035.
2	Limit the individual production of household and ICI waste at 1.45 kg/capita/day by 2035.
3	Send 100% of the waste to be landfilled in an engineered sanitary landfill by 2025.
4	Close in an environmentally sound manner the existing non-sanitary landfills by 2025.
5	Process 100% of the incinerable waste that is not diverted towards another option with Waste to Energy by 2030.
6	Process 100% of biomedical waste in a way that minimizes the risks for public health and the environment by 2023.

Challenges specific to Landfilling at Perseverance.

- Limited waste separation/Limited recycling options
- Huge waste stream 29,000 tonnes in 2000 to close to 50,000 tonnes in 2020
- Methane gas generation- fires
- Land, Air and water pollution
- Illegal dumping in vicinity of landfill.
- Limited space for landfill expansion at Perseverance.
- Improper management of special waste.
- Inappropriate equipment

Integrated Resource Recovery.

Establishment of a new department within the GSWMA

Basic functions being to forecast and have a clear understanding of Grenada's waste stream, offer directions for sustainable waste diversion initiatives and plan in consultation with stakeholder institutions including private partners, government ministries, institutions, projects aimed at waste reduction in conformity with the best practices and sound environmental standards.

- a. Plastic waste recycling in Carriacou. NSU/Paddies/GSWMA –Pilot – Funded by UNDP – Current Status – Expansion of project – PPP – investment in new equipment.
- b. PPP for waste oil refinery.
- c. IICA/Sandals Foundation Community Composting.
- d. Grenada Grown – Organic fertilizer from food waste.
- e. Out of the Box Production- Used tyres
- F. Re Create- Plastic waste – All grades
- G. Every bottle Back – Coca Cola International.

Addressing the Challenges of Increasing waste stream

- Waste Diversion Initiatives. Organic Waste. 25% of waste stream
- - Composting Promotion.- Community, Institutions, Schools, Hotels. Partnetships so far with Sandals Foundation and IICA

Derelict Vehicle Project

- Challenges and Opportunities.
- Approximately 10,000 vehicles located in Public and private spaces.
- Public Health and Environmental challenges.

Contribute to:

Obstructions, Accidents, fires, pollution due to leaching, bulky at landfills, difficulty to process, criminal activity, unsightliness.

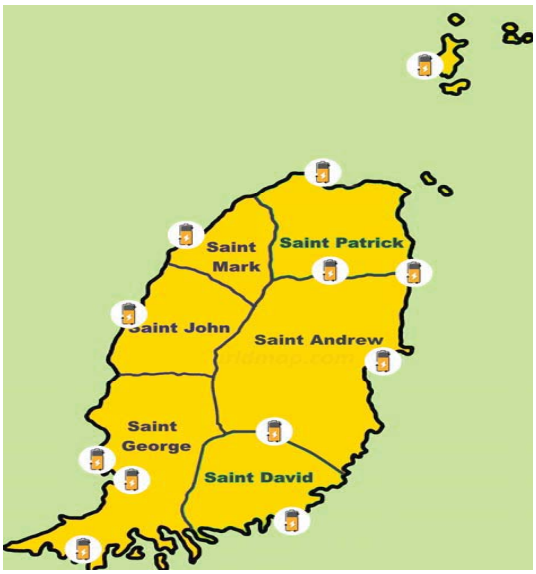
National derelict Vehicle project..ctd

- Establishment of stakeholder body. GSWMA, MIT, Police, MOH, PPA
- Communications- PR.
- Establishment of Hotline to report/surrender derelicts.
- Legal Tagging of vehicles
- Removal of derelicts.
- Processing –offer for sale
- Export

Electronic waste and special waste

- Light bulbs – Mercury discharge among waste. Potential for public health problems.
- E-waste – Cell phones, computers, TV, batteries etc. result in contamination of water systems, frequent landfill fires, damage to property etc.

Other challenging waste streams. E-waste & Chemicals



Commencement of Community waste separation.

Procurement and implementation of Colour Coded bins- June 5th 2023

Extension of project. Recycle OECS. Commenced June 7th 2023

- Aimed at reducing plastic pollution.
- Design and implement model for sustainable waste separation, collection and recycling of plastics.
- Encourage self-financing
- Business sustainability & Business viability.

Plastic waste. 13.8% of waste stream.

Household Hazardous waste facility

Refrigerants.

Extraction & storage of CFC's HCFC's rather than release into the environment

Bulb Crushing/Mercury storage. Rather than discharging into mixed waste.

Challenges Ctd. Illegal Dumping

Inability to enforce

- Waste Management Act gives Authority only to Police and MOH.
- We could have only done monitoring and no enforcement.

Resulting in Littering, Illegal waste disposal, improper waste transportation, untimely waste disposal, poor management by commercial and construction sectors

GSWMA can now enforce

- As of March 2023 Zonal Supervisors working with the GSWMA now have the powers for enforcement under the Waste Management Act 2002 of Grenada.

Challenges ctd. Improper management of Bio Medical waste

Current challenges with Bio-medical waste.

- Burial not the safest option. Disturbed occasionally.
- Not properly disposed by private users.
- Disposed with regular household waste.-Infection of handlers, scavenging, ingested by animals etc.
-

Bio medical waste incinerator now being installed at main landfill.

Hazardous waste ctd.

Chemical neutralization facility

Hazardous waste burial site and system for tracking arrival, treatment and disposal of special waste.

Landfilling challenges

Space, Equipment, Trained personnel, proper filling plan, waste treatment

- Final cell for landfill development – 5 years left.
- No other locations identified for landfill development.
- Still no answers for other challenging waste types – Paper, glass, textiles, C&D waste, Non-recyclable hazardous waste, Hard plastics

Waste Picking and its security and public health concerns.

- Formation of RRT body.
- Establishment of protocols for engaging RRT's.
- Plans for formation of cooperative.
- Use them in 3 of the derelict vehicle teams.

Integrated Solid Waste Management Project (ISWMP)

1.CDB/GoGr funded

- Loan of 10.7Million USD.-
- Landfill component which involves:
- - Closure of the old dumpsite
- - Construction of the final cell for waste disposal
- - Waste water/leachate treatment facilities
- -Equipment upgrade
- Rehabilitation of existing disposal site.

Project description/ Consultancies

- Land Acquisition
- Civil works
- Equipment
- Institutional Strengthening and Capacity building
- Public Awareness and Education Program
- Engineering services
- Monitoring and Evaluation
- Project Management
- Composting Feasibility study

Where are we now?

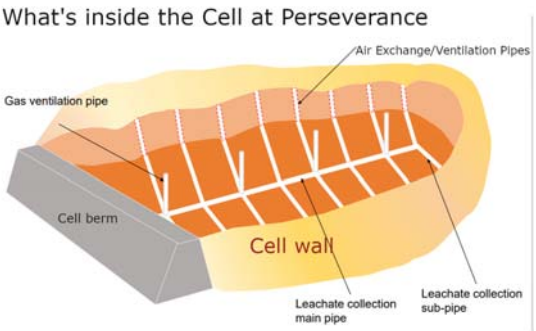
Perseverance Birdseye view

- Old dumpsite- 50+years old
- Collapsed Landfill Cell.
- Active Landfill Cell
- Final Landfill Cell- under construction.
- Disaster Derived Debris Site
- Wastewater Treatment facilities.

Landfilling

Filling plan. Semi Aerobic Landfill.
Fukuoka landfill method. July 1st 2023

What is underneath the cell



Fukuoka method (Semi aerobic)

Advantages.

- Drain away leachate as quickly as possible.
- Accelerates decomposition of waste material.
- Purifies leachate as much as possible (self purifying)
- Natural airflow to aid decomposition.
- Reduces the creation of methane gas. –playing a great role in preventing global warming.

Challenge. Pollution of nearby Marine eco-system

Leachate Treatment system

Wetland Treatment system

How.

- Wetland treatment system.
- Leachate and storm water treatment systems.
- Five ponds to naturally treat leachate and bring it to its purest form.
- Water to be used for irrigation and cooling of old covered dumpsite.

Data collection system

Critical to any planning in waste management.

Why the need for data

- Understanding waste generation trends and how to address them.
- Understanding the efficiency or non effectiveness of planned interventions to address challenges identified in characterization studies.
- Planning to address effective waste collection services.
- Budgeting for waste management
- Understanding growth in waste streams and forecasting disposal requirements.
- Modification of or legislative review to address changing trends in waste management. e.g. NBDWC Act
- Disclosure of waste type- to direct to appropriate site/facility.
- Issue of certificates of waste arrivals, destruction and disposal. Implementing of waste tracking system

Policy Focus

- Addresses the need for designing, importing, and managing products and processes in ways that reduce and eventually eliminate the volume and toxicity of waste.
- Builds on earlier policies and legislation enacted by the Government of Grenada to address waste management and resource recovery.
- Focuses on waste prevention, improved material recovery and addressing the challenges of plastic pollution.
- Introduces mechanisms to ensure that the public receives an efficient service.

Thank You.

Technical Cooperation Project on
Advisor for Marine Plastic Litter Management in the Caribbean Region

- Recycling System in Japan with Focus on Plastics–

Online Tech Meeting

July 11, 2023

Taisuke Watanabe
JICA Advisory Team

NIPPON KOEI

1

Contents

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2

1. Background

- As Japan is an island country, securing land for landfill is very difficult and costly. Governments keep trying efforts to minimize the volume of waste to be landfilled. Institutions and facilities are developed with this strategy.
- Municipal solid waste is managed by local governments in Japan, while national government support them with legal setting and financial support.
- To involve all stakeholders (commerce & industries, consumers and governments), the role of stakeholders is prescribed in the law and much dissemination work including education has bee conducted.

3

3

2. Plastic waste

【In recent years, there has been a growing global concern about plastic waste and its impact on the environment. What measures has Japan taken to address this issue?】

1. Promotion of 3R (Reduce, Reuse and Recycle)

   Example:

   ✓ Use my bag (not use single-use plastic bag at retail)

2. Introduction of producer responsibility on bottles and containers by setting the Act in 1995 (explained later)

   ✓ Collection from households is by local governments

   ✓ Recycling of collected bottles and containers is by producers organization

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2. Plastic waste

【In recent years, there has been a growing global concern about plastic waste and its impact on the environment. What measures has Japan taken to address this issue?】

3. Introduction of Plastic Resource Circulation Act in 2022
   - ✓ Reflecting the growing concern on plastics and needs on circularity
   - ✓ Covering design/manufacturing, sales and discharge/collection/recycling

(Reference on Plastic Resource Circulation Act)
https://www.iges.or.jp/sites/default/files/inline-files/01_MOEJ_Shintaro%20Murai-min.pdf

5

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3-1 Recycling - Principle

- ➢ Recycling needs extra cost for segregation, collection, processing and sales, compared with municipal solid waste, even for valuables.
  - ✓ Responsibility of producer is introduced (so called" Extended Producer Responsibility" (EPR)) by establishing law – intending the cost sharing by producers
- ➢ Recycling method differs from products
  - ✓ Product-type based recycling laws are developed in Japan
- ➢ Involving stakeholders is critical to make the system work (explain later)
  - ✓ Dissemination and education is critical

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3-2 Recycling- Bottles and Containers

【In recent years, there has been a growing global concern about plastic waste and its impact on the environment. What measures has Japan taken to address this issue?- on plastic bottles and containers】

Outline of Bottles and Containers Act (1995)

- Target waste (products): metal can, plastic bottle &container, paper containers and glass bottles
- Responsibility (including cost) of stakeholders
  - ✓ Consumers: Discharge waste bottle &containers in separated way and reduce the discharge volume
  - ✓ Local governments: Collect bottles & containers from houses to collection points
  - ✓ Producer (as producer organization): Recycle collected bottles & containers (commission to recyclers) and reduce the volume of bottles & containers

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3-2 Recycling- Bottles and Containers

【How can other countries learn from their experiences?】

This is the background when preparation of Bottles and Containers Act (1995)

- There was high nationwide concern on throwing away of bottles & containers along roadside, parks and tourist destinations.
- Act was drafted based on the existing practices/opinions by stakeholders. This worked for building consensus among stakeholders to accept burdens.
  - ✓ Drink companies has voluntary recycling programme through sales-point collection
  - ✓ Many local governments has collection system specific for bottles & containers.
  - ✓ Consumers wanted to introduce the system to promote recycling for cleaner environment.

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3-3 Recycling- E-waste

【Electronic waste (e-waste) is a significant challenge in today's world. How does Japan handle e-waste?】

E-waste is managed by the Home Appliance Recycling Act (1998) and Recycling of Small Waste Electrical and Electronic Equipment Act (2012)

- Target waste (product):
  1) AC, TV, Fridge and washing machine (as home appliance)
  2) PC, mobile phone, camera, gaming machine, etc (as small E & E)

See next slides for the responsibility of stakeholders

(Reference)

Home appliance

https://panasonic.net/eco/petec/recycle/

Small e-waste

http://www.city.kodaira.tokyo.jp.e.fj.hp.transer.com/kurashi/039/039329.html

9

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3-3 Recycling- E-waste

【Electronic waste (e-waste) is a significant challenge in today's world. How does Japan handle e-waste?】

- Role of stakeholder (home appliance)
  - ✓ Consumers: Pay for collection and recycling by purchasing the recycling ticket (fee depends on the type (TV, AC--))
  - ✓ Retailers: Collect the replacing appliance when sales of appliance (also selling the recycling ticket)
  - ✓ Manufacturer association: Recycle the collected appliances

(The recycling ticket is used for the track record of each appliance.)

- ◆ Involving retailers is important to improve the collection rate, because they are the contact point with consumers.
- ◆ Much dissemination/warning/detection work was needed to prevent illegal dumping.

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3-3 Recycling- E-waste

【Electronic waste (e-waste) is a significant challenge in today's world. How does Japan handle e-waste?】

- Role of stakeholder (Small Electric & Electronics Equipment)
  - ✓ Manufacturers: Try to use recycled materials
  - ✓ Consumers: Discharge E-waste in separated way
  - ✓ Retailers: Setting collection box to receive small e-waste
  - ✓ Local governments: Collect e-waste from houses or at collection points
  - ✓ Approved recyclers: recycle collected waste
- ◆ This system works as the resource recovery system.
- ◆ Involving communication (mobile) companies/retailers is effective to improve the collection rate.

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3-4 Recycling- Involvement of citizens

【Japan is known for its diligent recycling practices. What role do citizens play in Japan's waste management system?】

【How is public awareness and participation encouraged?】

- ◆ Involving public is the basic and critical to promote the recycling system.
- Role of citizens (consumers)
  - ✓ Responsibility of citizens is proscribed in each waste management law and recycling laws
  - ✓ Responsibility of citizens is manly on reduce, reuse and separation of waste

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3-4 Recycling- Involvement of citizens

【Japan is known for its diligent recycling practices. What role do citizens play in Japan's waste management system?】

【How is public awareness and participation encouraged?】

- Raising awareness and participation
  - ✓ Environmental education including waste issue has been incorporated in school curriculum from 1990s. This resulted in the effect that learned kids educate their parents on needed practices. This found to be very effective awareness raising method.
  - ✓ Local governments have many kind of dissemination programmes together with residential association. Nowadays mobile APP is used to tell how to separate waste.

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3-4 Recycling- Involvement of citizens

【Japan is known for its diligent recycling practices. What role do citizens play in Japan's waste management system?】

【How is public awareness and participation encouraged?】

- Raising awareness and participation
  - ✓ NGOs are also very active raising awareness and participation, especially on plastic issues
  - ✓ Manufactures/retailers cooperate to promote the recycling programmes.

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3-4 Recycling- Involvement of citizens

【How can other countries learn from their experiences?】

- Cooperation program by Japan
  - ✓ JICA provides technical cooperation such as development of container-deposit legislation in the Pacific islands and E-waste institutionalization in Malaysia
  - ✓ JICA provides training courses on waste management and recycling
  - ✓ JICA developed several educational materials

See and search “Environmental Management”

https://www.youtube.com/@JICANetLibrary/videos

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Thank you!

Contact: Taisuke Watanabe (Mr.)

t-watanabe@exri.co.jp

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National Environment and Planning Agency

Plastic Pollution: Jamaica's Response

Presentation

16th Online Technical Meeting on solid waste management in the Caribbean

Anthony McKenzie
NEPA

Overview of Presentation

- Plastic Policy Framework
- The Ban on Single Use Plastics
- Plastic Action and next steps

Policy and Legislative Framework

Jamaica is Party to a number of multilateral environmental agreements that address the environmentally sound management of waste, inclusive of plastic waste:

- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their disposal
- The Cartagena Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region, and more specifically its Protocol on Land-based Sources of Pollution to the Marine Environment (RAPMaLi)
- The United Nations Convention on the Law of the Sea
- The International Convention for the Prevention of Pollution from Ships (MARPOL)

Policy and Legislative Framework

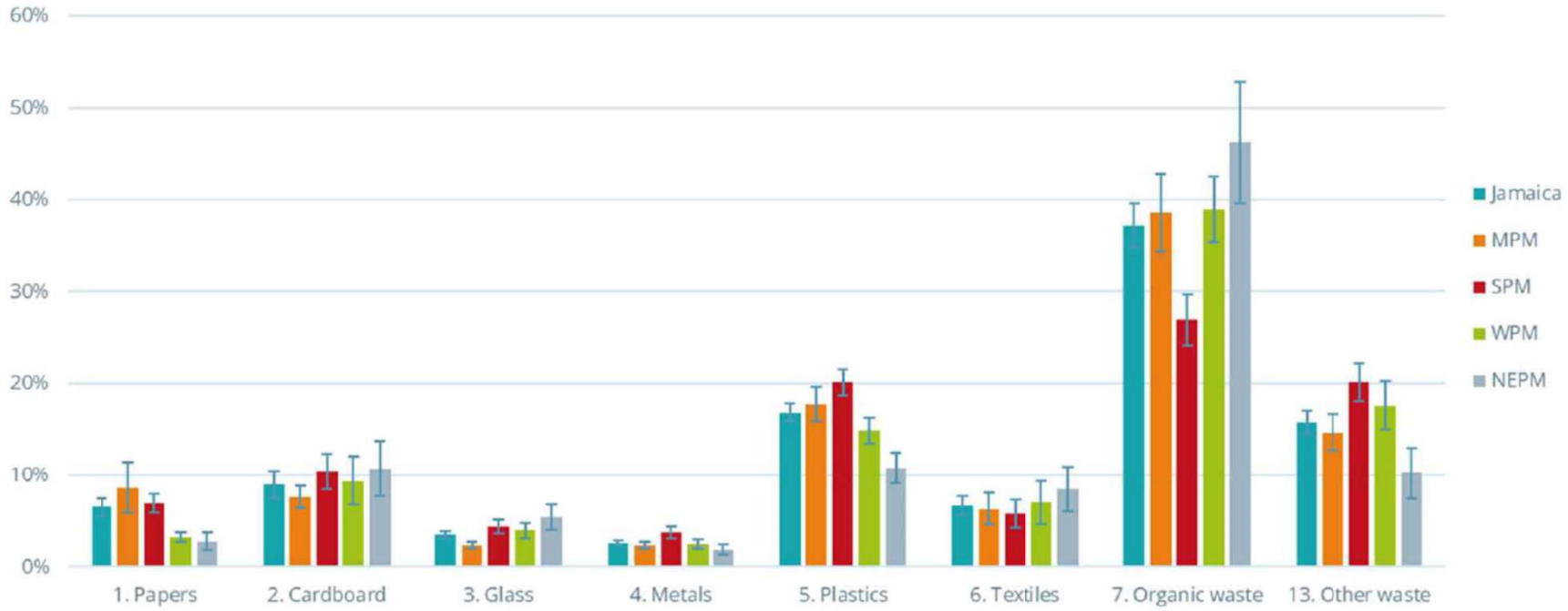
- National Policy - Environmental Management Systems (EMA), *In Pursuit of a Green Economy - March 2019*
- Integrated Waste Management Strategy & Action Plan
- Regulatory Impact Assessment on Plastics including Polystyrene
- The National Green Economy Investment Strategy and Action Plan

Policy and Legislative Framework

Jamaica introduced legislation to ban the importation, distribution, manufacture and commercial use of certain types of single use plastics beginning 1 January 2019:

- The Trade (Plastic Packaging Materials Prohibition) Order, 2018.
- The Natural Resources Conservation Authority (Plastic Packaging Materials Prohibition) Order, 2018

Plastic Pollution Problem



Waste Characterization Study 2022: Plastics 16.8%

Plastic Pollution Problem

Top 10 Items collected in Jamaica 2019 - International Coastal Cleanup Day (Source: JET 2019)

Plastic Pollution Problem

Relative abundance of debris with/without biotic interaction collected by zones at Half Moon Bay - Hellshire - Marine Debris Assessment: Jamaica 2017

GoJ Policy Position On Plastics – Overview of the Process

- Senator Samuda's Motion in the Senate
- Cabinet deliberation and Decision
- Establishment of Multi-Stakeholder Task Force
- Consideration of the Task Force recommendations
- Communication of GoJ policy position
- NEPA tasked with oversight of implementation
- Planning and implementation - Technical Working Group
  - Legislation
  - Public awareness

Ban on Single Use Plastic

National Environment and Planning Agency

Single-Use Plastic Bags

Banned

Image credit:

As of January 1, 2019 single-use plastic shopping bags ('scandal bags/'T-Shirt') at and below 24"x 24" will be banned.

Exempt

Limited exemption allowed until January 2021 for branded single-use shopping bags made of Polyethylene on a case-by-case basis on application to NEPA.

For additional information please contact; email: policyonplasticban@nepa.gov.jm or hotline 876-285-8531

National Environment and Planning Agency

Ban on Single Use Plastic

National Environment and Planning Agency

Polystyrene Foam (Styrofoam)

No Importation as of January 1, 2019

- **No importation of Styrofoam food and beverage containers as of January 1, 2019**
- **Locally manufactured food and beverage containers will be banned as of January 1, 2020**

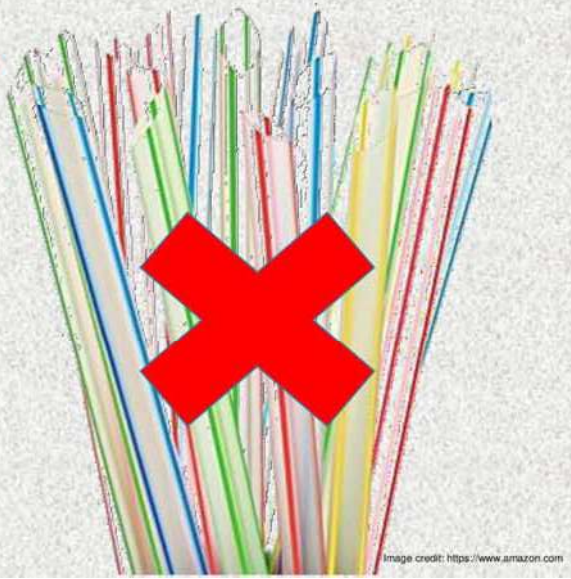
National Environment and Planning Agency

Ban on Single Use Plastic

National Environment and Planning Agency

Single-Use Plastic Straws

Banned as of January 1, 2019

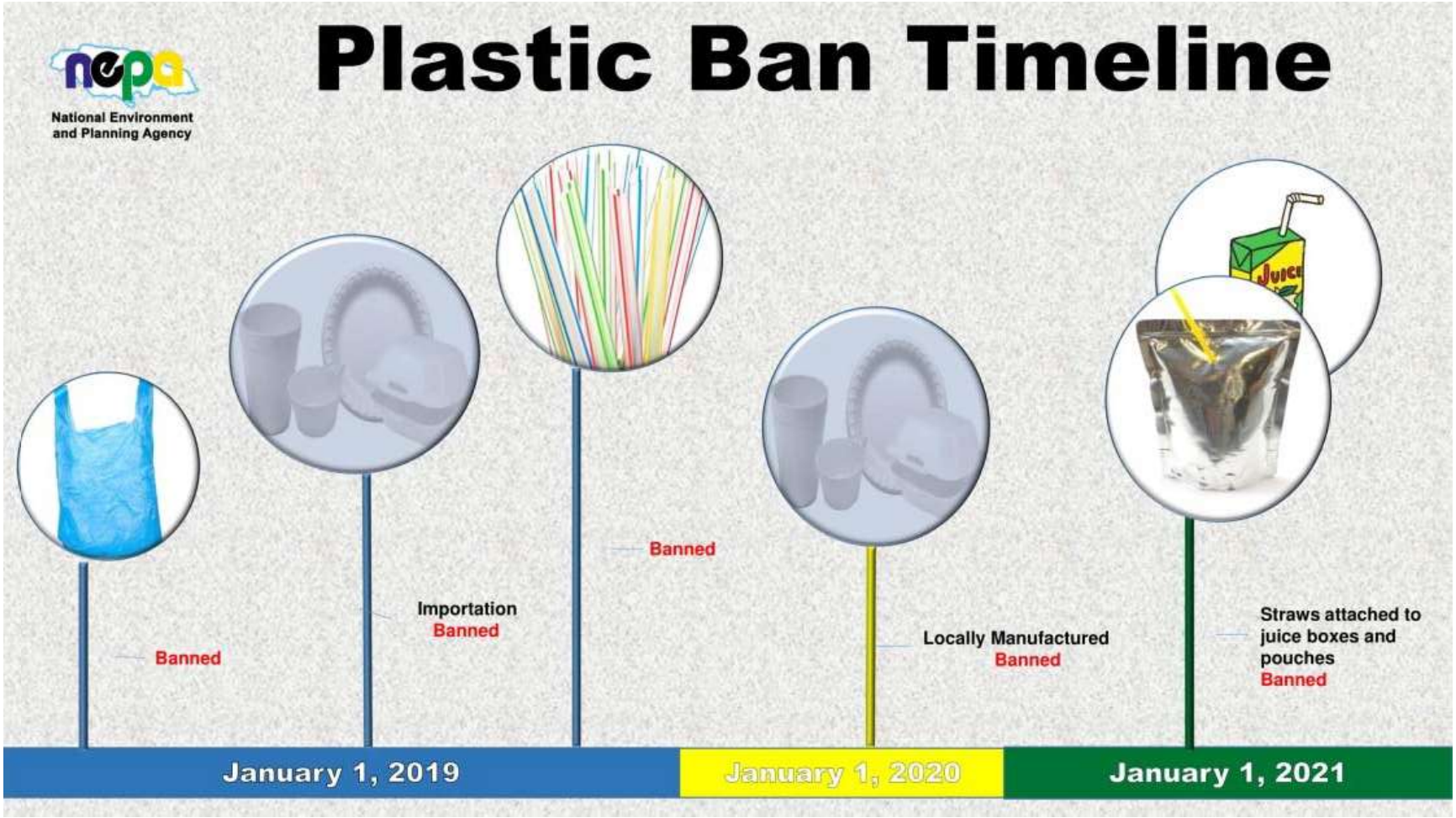


Single use-plastic straws will be banned.

- **Exemptions** will be considered for the medical sector as well as persons with disabilities. **Applications for exemptions should be sent to NEPA**
- **Not banned** - wax-lined or other non-plastic straws.

National Environment and Planning Agency

Ban on Single Use Plastic



National Environment and Planning Agency

Impact of the Plastic Ban

- The ban has generally been accepted by manufacturers, retailers and consumers.

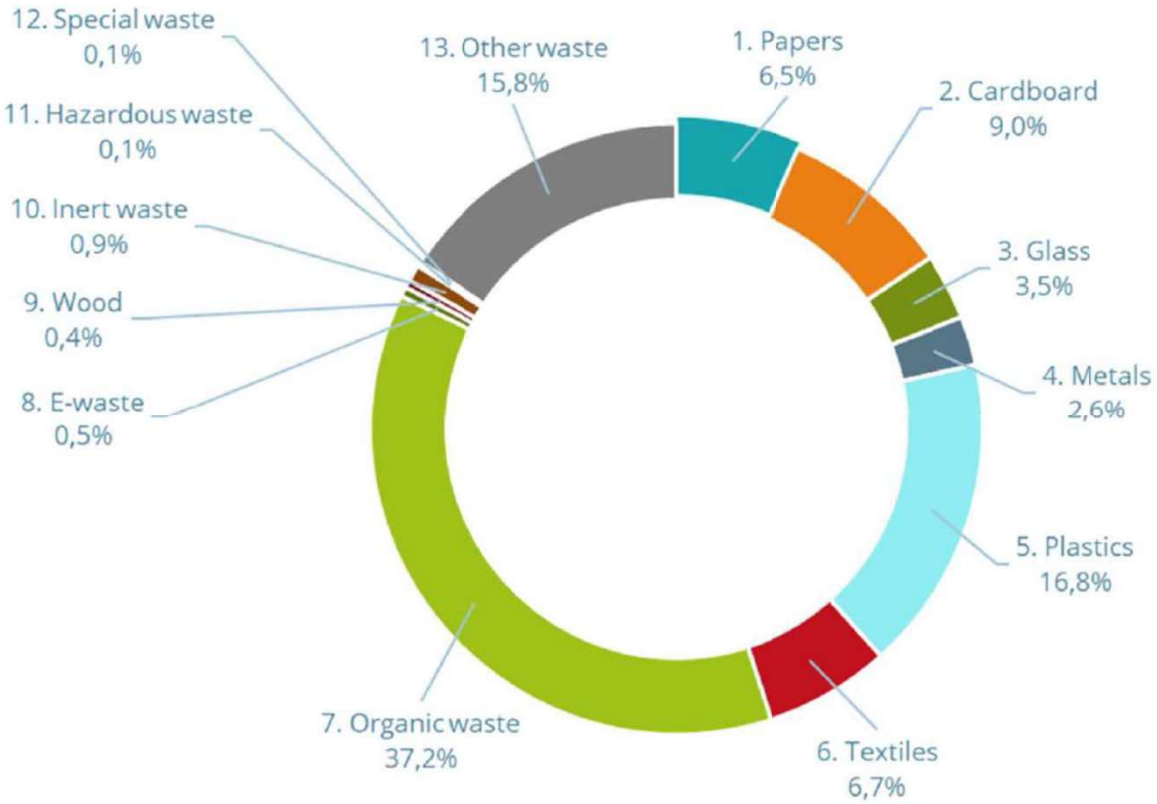
- Acknowledgement of the positive environmental impacts from the ban of these single use plastics products

- Ban on polystyrene foam food containers has led to an increase in the use of polypropylene food containers on the market primarily for use for take-away meals

Impact of the Plastic Ban

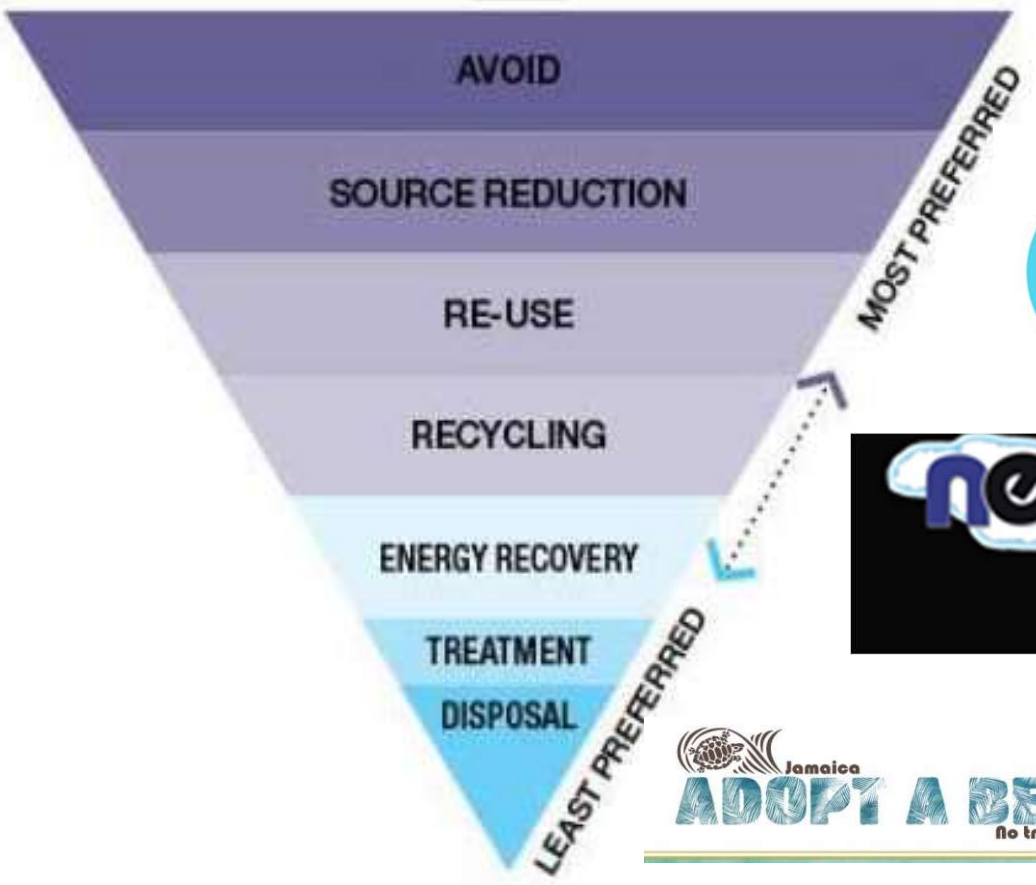
- Most shoppers now carry their own reusable bags to the supermarkets and stores,
- International Coastal Cleanup Day (ICCD) - 2019
  - plastic bags collected in 2019 increased by 8.2% when compared to 2018,
  - plastic straws collected in 2019 decrease by 33.4% when compared to 2018 and
  - styrofoam collected in 2019 decreased by 1.6% when compared to 2018.

Impact of the Plastic Ban



Plastics (16,8%) in which are found very few banned plastics (0,03%), a notable quantity of plastic bottles (5,9%) and other plastics (11,8%) – mostly plastic packaging.

NEPA Supported Initiatives related to Plastic Waste Management



Waste Management Hierarchy

PLASTIC WASTE MINIMIZATION PROJECT

Green Business JAMAICA

DON'T FEED THE PLASTIC MONSTER
BRING YOUR OWN BAG
SAVE OUR PLANET
A MESSAGE FROM nepa GO GREEN

Say NO to single use Plastic Bags!!

nepa GO GREEN

Jamaica ADOPT A BEACH
No trash left behind

UNEP
Peace Corps

Trash Free Waters

nepa

National Environment and Planning Agency

NEPA Supported Initiatives related to Plastic Waste Management

- Ministry of Economic Growth and Job Creation
- Office of the Prime Minister
- Ministry of Finance and the Public Service
- Passport Immigration and Citizenship Agency
- Development Bank of Jamaica

Green Business JAMAICA

Half Moon

Lee's Food Fair

Juici Patties

Total

Island Grill

Shortwood Teachers' College

University of Technology, Jamaica

National Environment and Planning Agency

Opportunities: Value of Recycling

	YEAR					
Type of waste	2020			2021		
	Quantity exported (KG)	Revenue		Quantity exported (KG)	Revenue	
		USD	JMD		USD	JMD
Paper	4,698,470	306,850	43,626,858	4,266,830	424,974	64,678,855
Assorted Scrap Metal	21,032,955	3,992,255	568,515,395	30,638,948	5,686,618	857,877,172
Aluminium waste and Scrap	1,115,900	790,576	112,303,940	1,206,960	770,480	115,833,881
Plastic waste	1,589,523	470,742	66,587,427	2,696,612	751,892	114,513,712

Revenue generation from recycling of plastic, paper and metals 2020-2022, (Jamaica STATIN 2021)

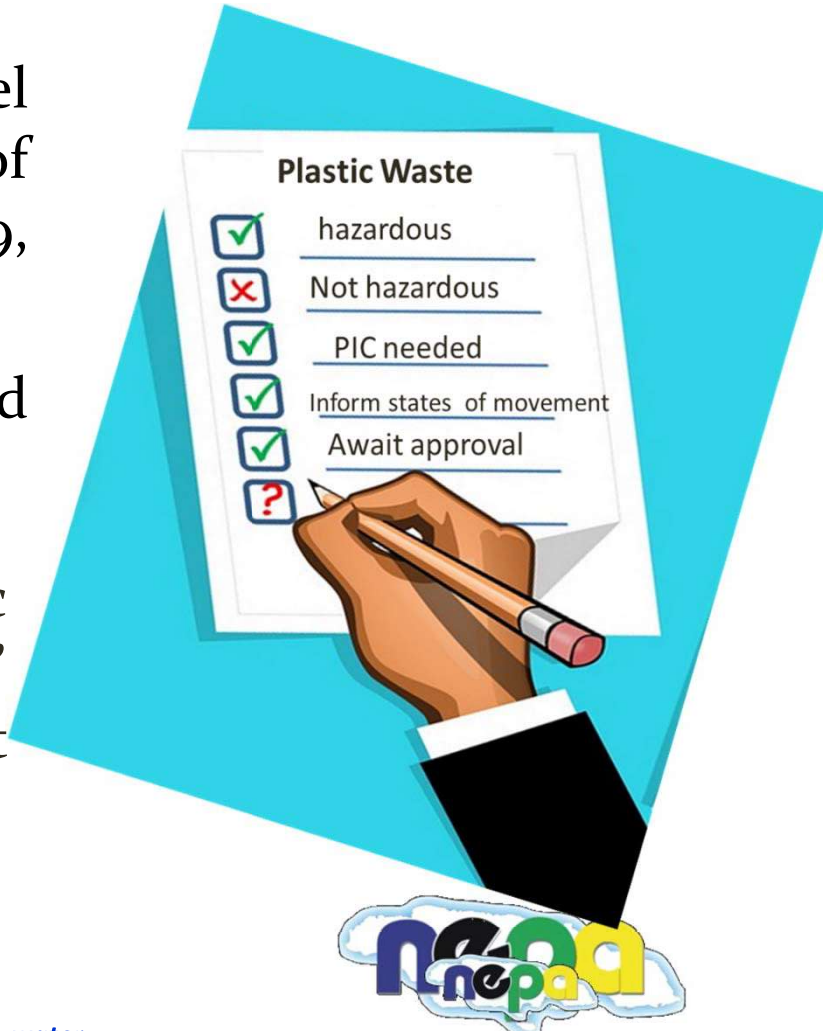
Opportunities: Value of Recycling

Type of Waste	Export Countries
Plastic waste	Brazil, Canada, Spain, Honduras, Indonesia, India Korea, Republic of South Korea, Malaysia, Netherlands, Singapore, Turkey, United States of America, Vietnam
Ferrous Waste and Scrap	United Arab Emerates, Canada, Spain, Korea, Republic of South Korea, Panama, Thailand, Taiwan, United States of America, Vietnam
Aluminium waste and Scrap	United Arab Emerates, Panama, Thailand Taiwan United States of America
Paper	Canada, Chile, Colombia, Ecuador, Spain, Guatemala, India, Italy, Korea, Republic of South Korea, Mexico, Singapore, El Salvador, Thailand, Turkey, Taiwan, Vietnam

Markets for Jamaica's plastics, metals and paper recyclables (Jamaica STATIN 2021)

Basel Convention Plastic Waste Amendments – Decision Bc-14/12

- Plastic Waste Amendments to the Basel Convention were adopted at the 14th meeting of the Conference of the Parties (COP) in May 2019, coming into effect on January 1, 2021.
- Amendments were done to Annexes II, VIII and IX to the Basel Convention.
- The entries specify the criteria for plastic wastes that require the 'prior informed consent' (aka PIC procedure) of the import and transit states for transboundary movement.



Basel Convention Plastic Waste Amendments – Decision Bc-14/12

Sensitization sessions have been conducted with stakeholders that are critical to the implementation of the Plastic Waste Amendments to the Basel Convention.

Private Sector stakeholders in the plastic waste export market included:

- Recycling Partners of Jamaica
- Jamaiaca Recyles aka International Recycling & Reclamation Ltd
- Gravita

Public sector stakeholders included:

- MEGJC
- Jamaica Customs Agency (JCA)
- National Solid Waste Management Authority (NSWMA)

Basel Convention Plastic Waste Amendments – Decision Bc-14/12

Drafting instructions and proposed legislative amendments to Transboundary Regulations

- Review of the Natural Resources (Hazardous Wastes) (Control of Transboundary Movement) Regulations were conducted and Drafting Instructions prepared to facilitate the Plastic Waste Amendment to the Basel Convention.

Provisional Measures To Guide Plastic Waste Exporters Pending Regulatory Amendment Of The Transboundary Regulations

- In anticipation of the local promulgation of the regulatory requirements for the export of specific plastic wastes in accordance with the 'prior informed consent' (PIC) procedures of the Basel Convention, provisional measures to guide plastic waste exporters were prepared

Enforcement of the Plastic Ban

- Forty-two businesses/individuals have been prosecuted for breaches under the Natural Resources Conservation Authority (Plastic Packaging Materials Prohibition) Order, 2018, Twenty-seven businesses/individuals have been convicted and fined. Ten matters are currently before the courts for a decision.
- The number of breaches by parish are:
  - St James: 16
  - Kingston and St Andrew: 9
  - Trelawny: 7
  - Manchester: 4
  - St Elizabeth: 3
  - Portland: 2
  - St Thomas: 1
- The penalty for breaches of the ban under the Trade (Plastic Packaging Materials Prohibition) Order, 2018 is $2 million, while breaches under the Natural Resources Conservation Authority (Plastic Packaging Materials Prohibition) Order, 2018 attract a fine of $50,000.

Preserve our Land....Support the Plastic Ban

Rethink **R**efuse **R**educe

Managing and protecting Jamaica's land, wood, air and water

Single Use Plastics – Next Phase

- National Policy on Single Use Plastics

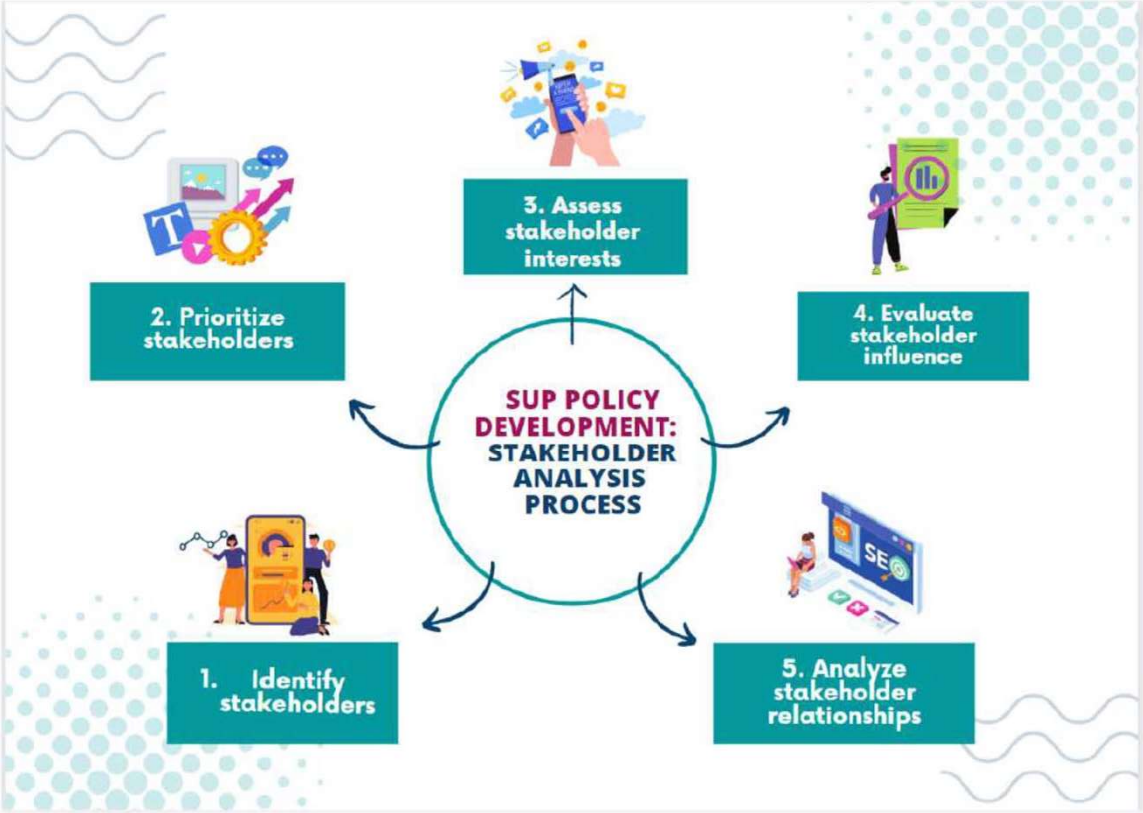
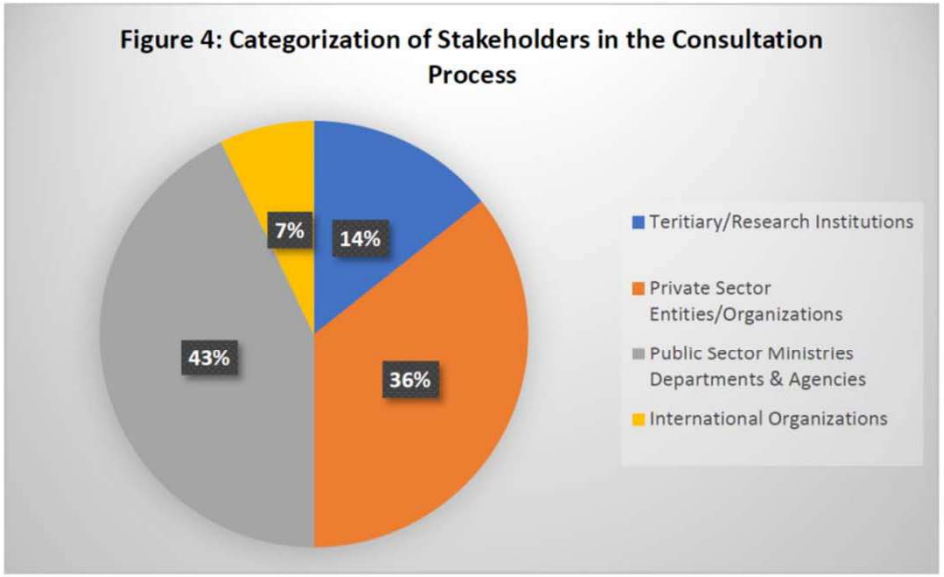
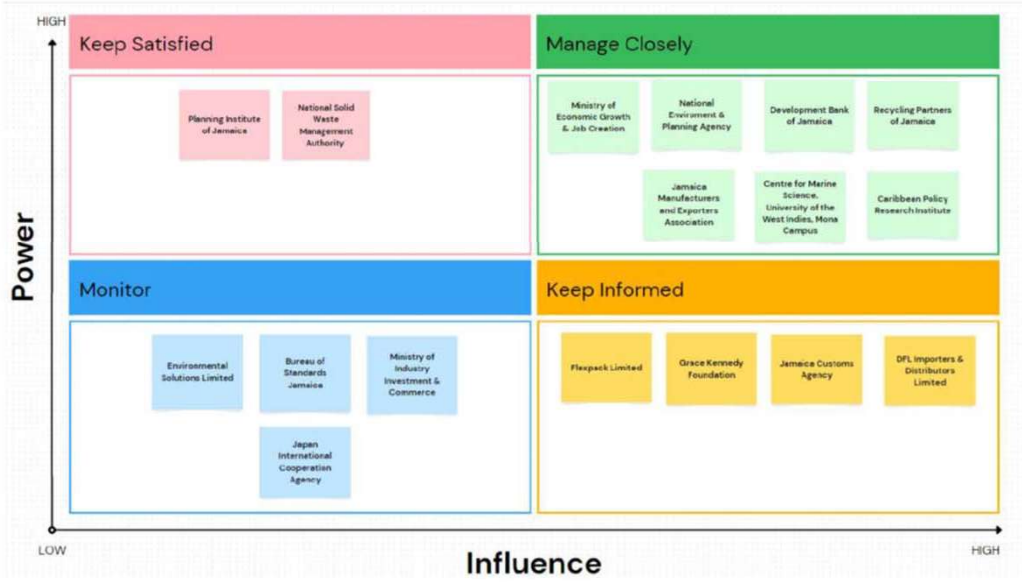


Figure 1: Stakeholder Analysis Process

Single Use Plastics – Next Phase

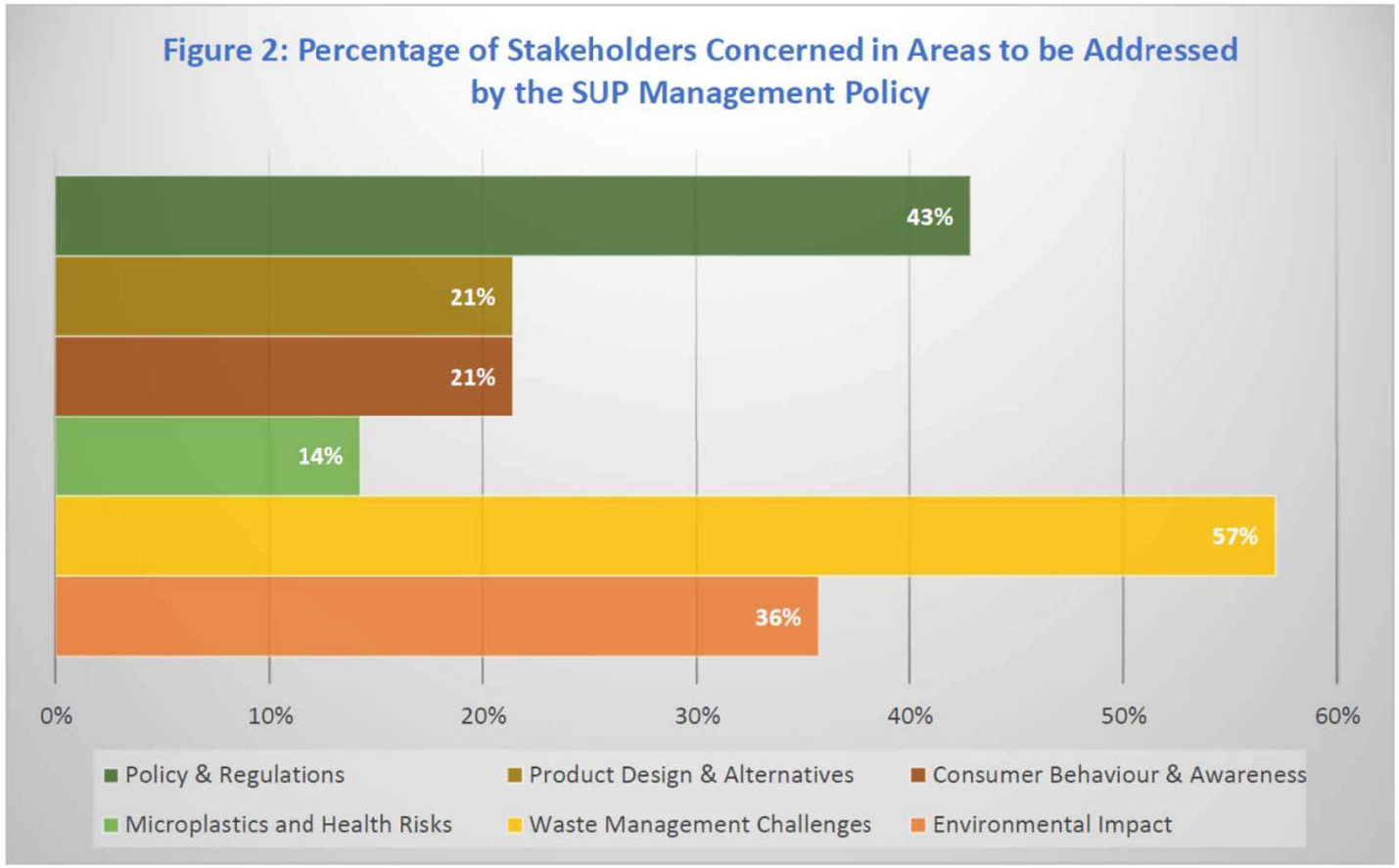
- National Policy on Single Use Plastics





Single Use Plastics – Next Phase

- National Policy on Single Use Plastics



Single Use Plastics – Next Phase

- UN Environment Assembly (UNEA 5.2) - Intergovernmental Negotiating Committee (INC) :legally binding agreement by 2024
- National Policy on Single Use Plastics
- Strengthened surveillance and enforcement – NEPA, National Compliance and Regulatory Authority, Jamaica Customs Agency
- Further phase – out of other categories of single use plastic.

Many Thanks for Your Attention

Questions?

National Environment and Planning Agency

Marine Plastic Free

Edson Z. Carr

National Solid Waste Management Authority

Projects and Planning Manager

Overview of Presentation

- NSWMA
  - Separation at Source
    - Overview of Projects
      - Updates Since St. Lucia

National Solid Waste Management Authority

- Effect April 1, 2002
- Creation of the National Solid Waste Management Authority
- Primary Focus – Solid Waste Management at the National Level via its Regions

National Solid Waste Management Authority

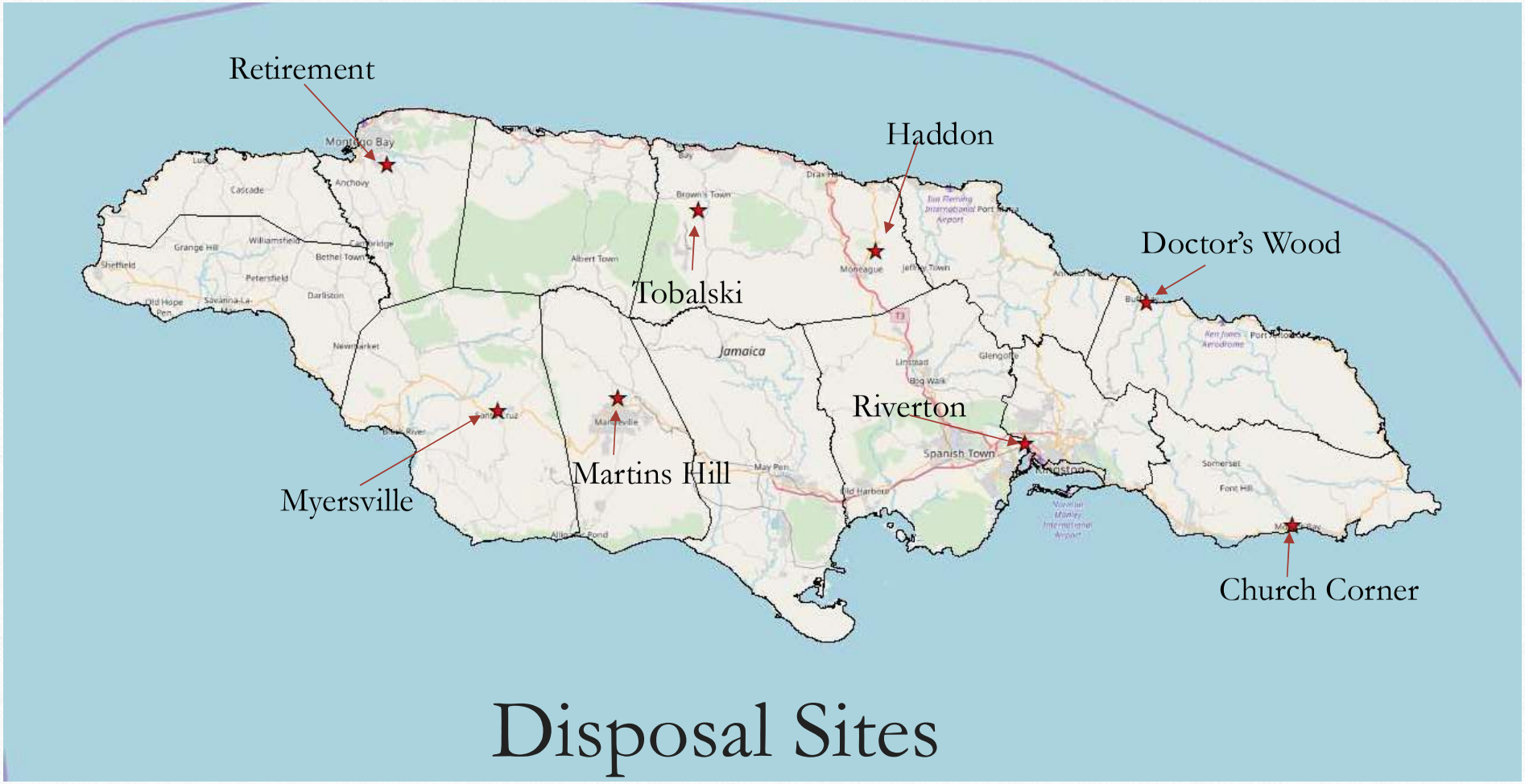
- Functions of the Authority

Regulatory

Grant, Refusal, Renewal, Modification. Suspension and Revocation of Licences

Operational

Public Cleansing: Street Sweeping, Collection, Transportation and Final Disposal of Municipal Waste, Operation of Disposal Sites



Disposal Sites

National Solid Waste Management Authority

- Riverton City Disposal Facility
- Kingston, St. Andrew & St. Catherine
- Population of 1,183,295

Separation at Source

- What is the current collection regime
- What is Separation at Source
- Benefits of Separation at Source

Projects

- Integrated Community Development Project (ICDP)
- Rae Town Recycling Pilot Project
- Northern Belt Plastic Recycling Initiative
- Leakage: Plastics in Kingston Harbour

ICDP

- Skip Enclosures

- Recycling Enclosures

- Composting Enclosures

Rae Town Recycling Pilot Project

- Reduction of Marine litter along the Rae Town Fishing Village Coastline
- Reduction of the volume of garbage within the gully.
- Creation of a culture of separation at source.

Rae Town's Project Scope

- Clean-up

- Separation at Source

- Garbage Collection

- Environmental Wardens

Northern Belt

- Hope Pastures
- Barbican
- Liguanea
- Mona Heights
- Havendale

- Cherry Gardens
- Millsborough
- Lower Shortwood
- Beverly Hills
- Belgrade
- Smokey Vale

- Jack's Hill
- Long Mountain
- Norbrook
- Waterworks
- Dillsbury

Northern Belt's Project Scope

- Sensitization

- Separation at Source

Leakage: Plastic Waste in Kingston Harbour

Aim of Project

- The principal goal involved the characterisation of the potential for solid waste generation across the KMA Region

- This involved the preparation of geospatial data for the Kingston Metropolitan Area (KMA).

RESULT: RECYCLING PARTNERS OF JAMAICA (RPJ) DEPOSIT LOCATIONS

Figure 1: Location of RPJ Jamaica Deposit Cage Locations

RESULT: POTENTIAL WASTE GENERATION BY ENUMERATION DISTRICT WITHIN THE KINGSTON METROPOLITAN AREA

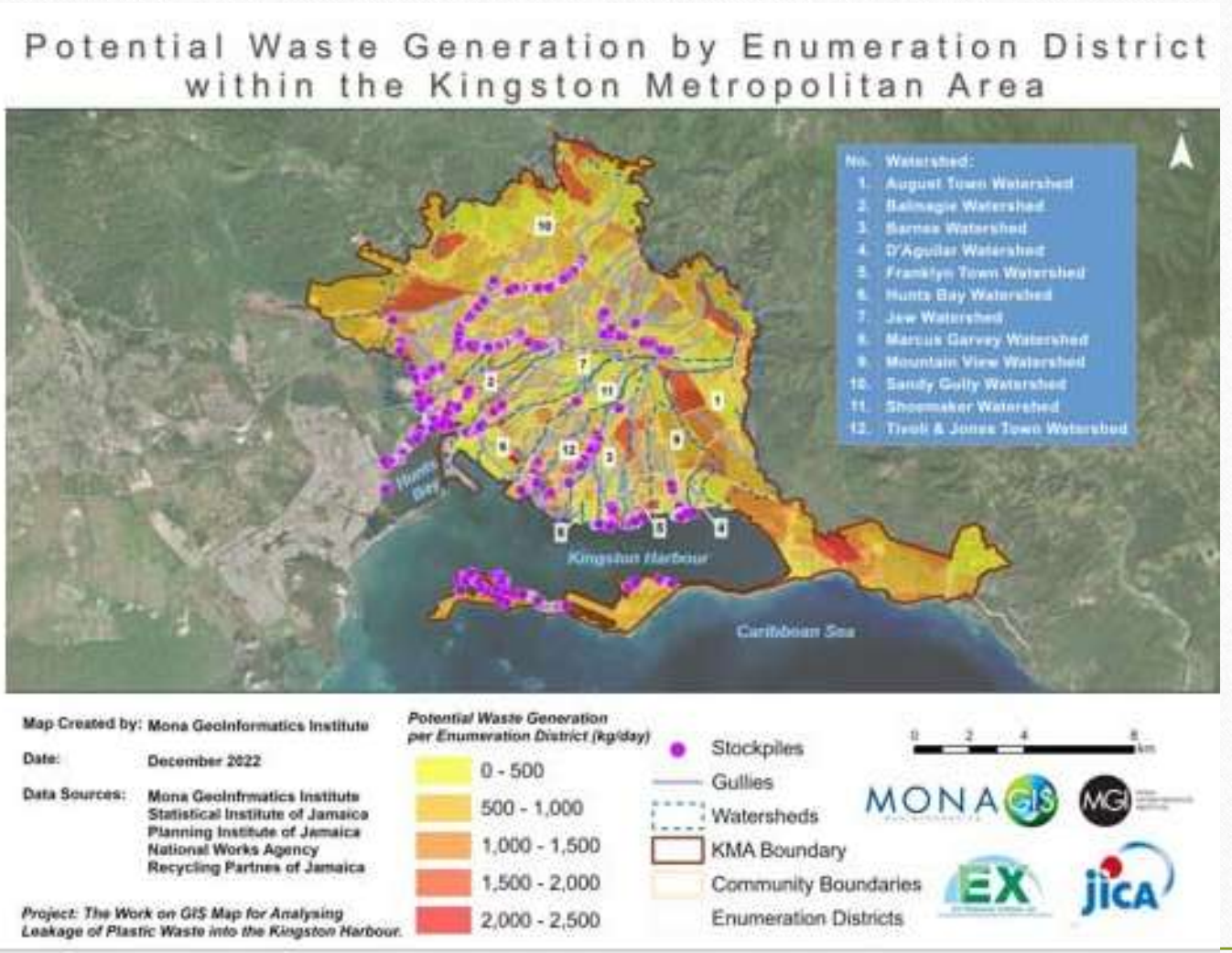


Figure 2: Potential Waste Generation By Enumeration District Within The Kingston Metropolitan Area

Updates: Since St Lucia

- Northern Belt Project
  - Since January 27, 2020 over

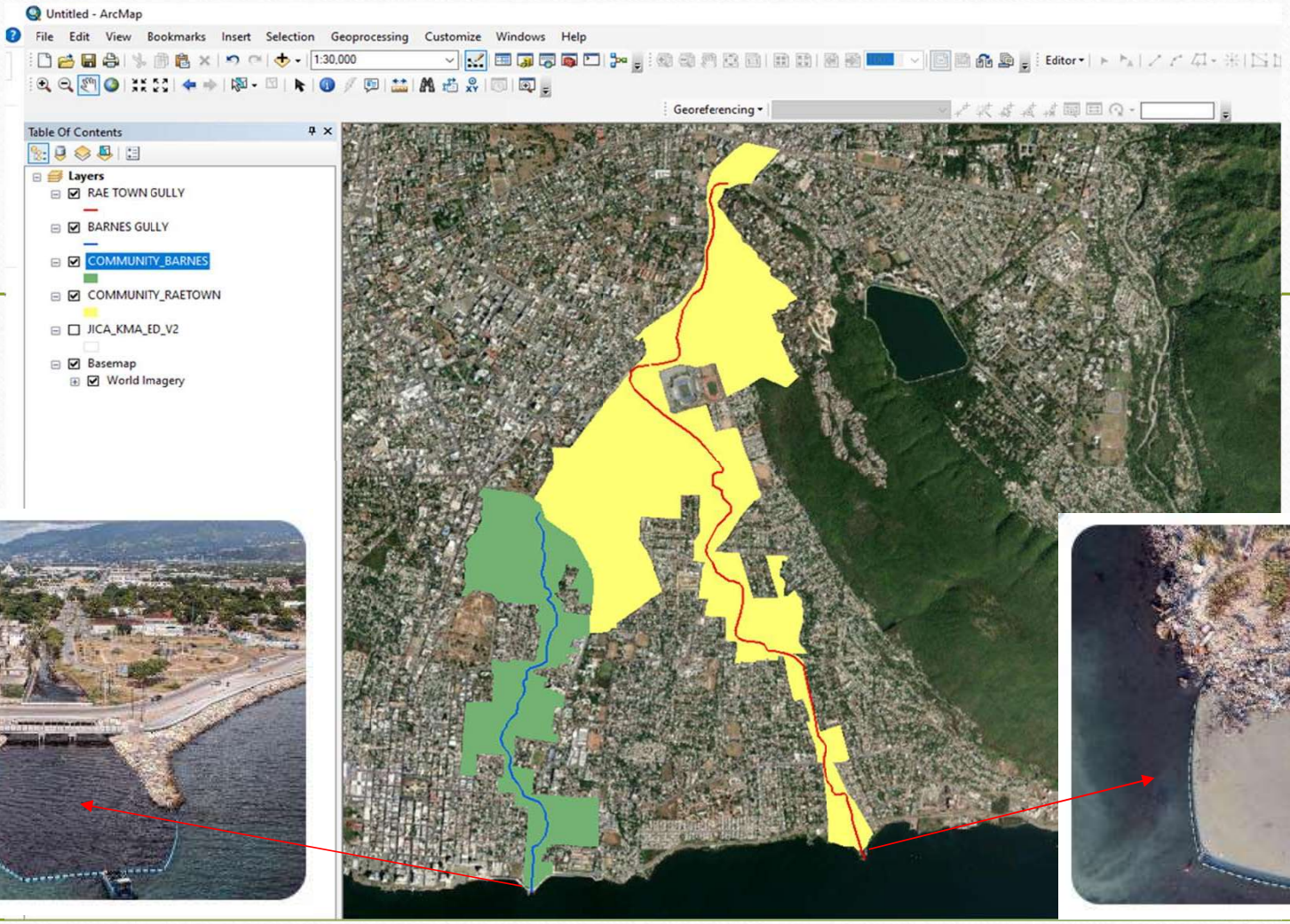
    253,600 lb (May)


Plastic Collection Weight
7000
6000
5000
4000
3000
2000
1000
0
4366
3101
6567
4427
February
March
April
May

Sensitization and Public Education

- Continued sensitization via face to face meetings/workshops, zoom and other online platforms

- Public Education via social media, live outside broadcast and mobile app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File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
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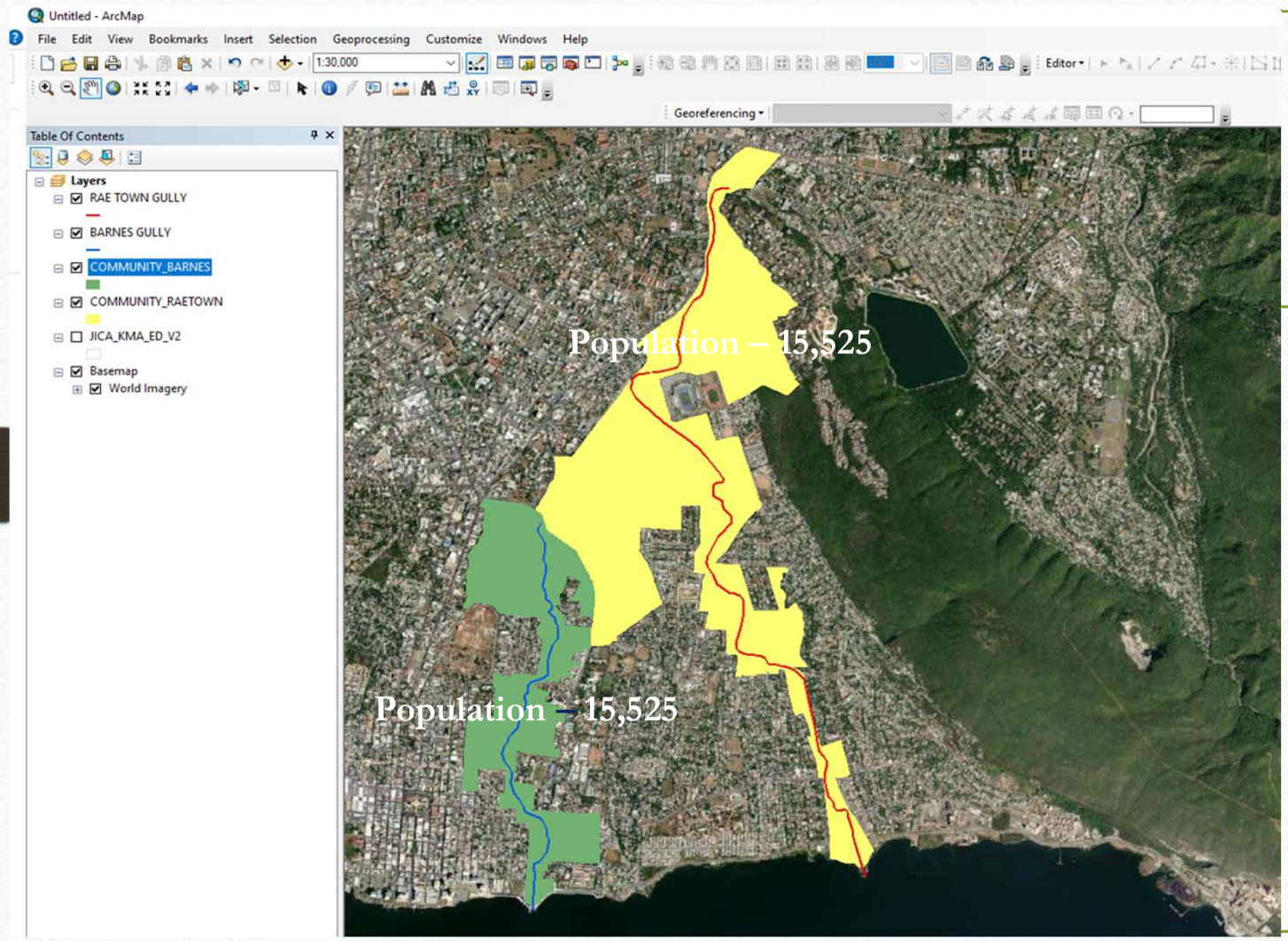
Editor
Georeferencing
Table Of Contents
Layers
RAE TOWN GULLY
BARNES GULLY
COMMUNITY_BARNES
COMMUNITY_RAETOWN
JICA_KMA_ED_V2
Basemap
World Imagery

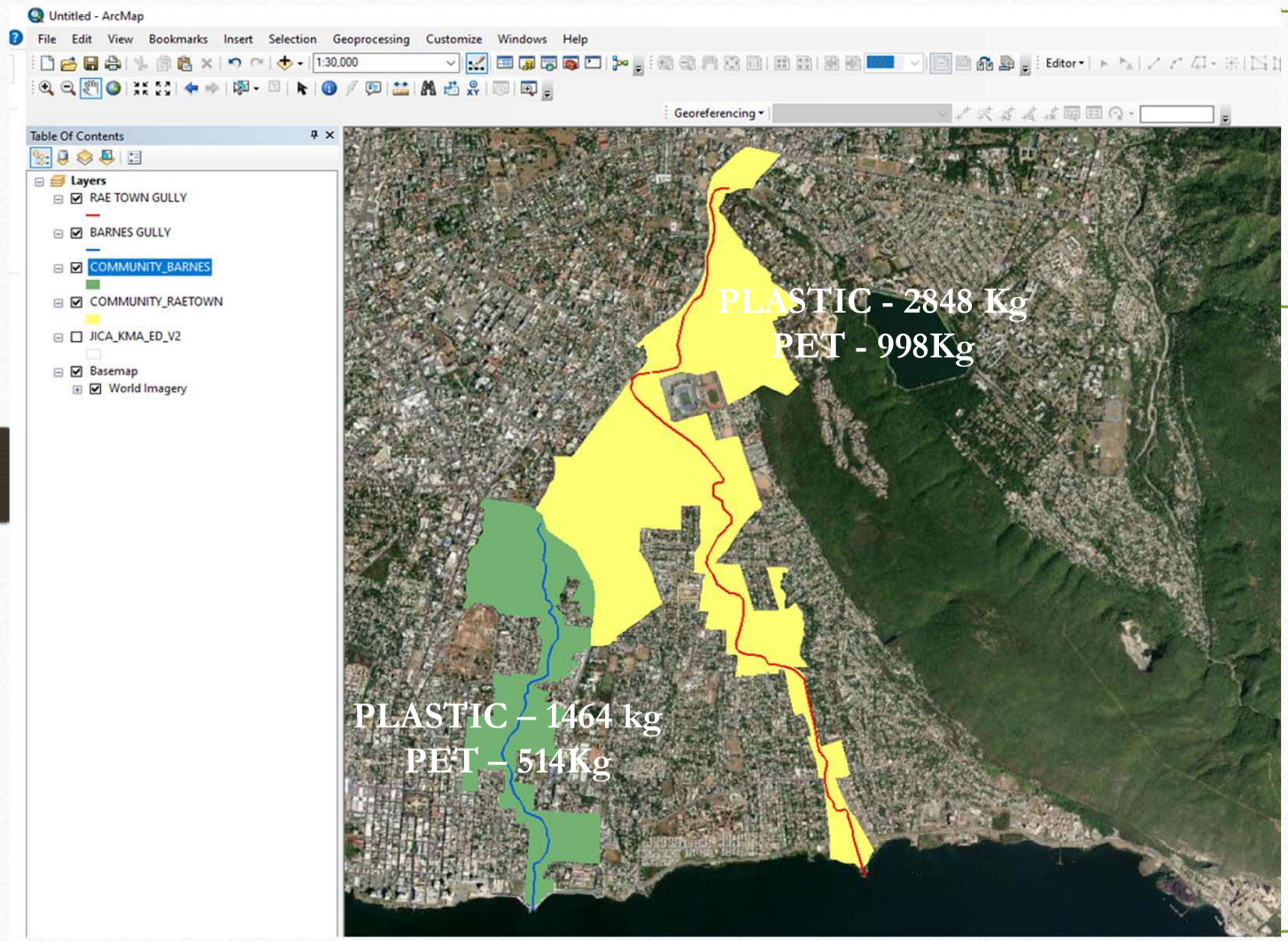


GIS

MAPPING

&

LEAKAGES



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Thank you