



Solid Waste Management Towards Green Movement

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Solid Waste Mngmt. (Act No. 32/2009, Art. 1)



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Legal Basis



"Being and Knowing"

How about it in Ind.?

Implication

Introduction

Municipal solid wastes (MSW) generation

- □ Idea to solve ? \rightarrow Many !
- □ Talking ? \rightarrow Easy !
- □ Theory ? \rightarrow Expert !
- □ Implemented ?
 □ "Not yet" → NATO.

To solve the problem





Introduction: Basic Question



Introduction: Primitive way to manage MSW

Reducing solid waste at home: Just throw it away



Ciliwung - Bukit Duri

www.republika.co.id

Introduction

Cheerful: No feeling guilty?

Pabuaran, Bojong Gede



sangkarang.wordpress.com



poskotanews.com

"Throwing waste away in river: Penalty Rp. 50 M"





http://bogor.net/2015/09/buang-sampah-ke-sungai-didenda-50-juta-rupiah.html

Different way to manage

Ordinary people

ASY Family





Aesthetics ...

Society



Waste generation:

- Not treated at source
- Transported to transfer sta.
- \rightarrow Classical problem.

ASY: Do it and teach it !



The funny one

Not smart untill adult

To be smart: The right way



surabayaecoschool.tunashijau.org



hijihawu.wordpress.com

Waste Separation Hierarchy





TPA Galuga, Bogor (Final Disposal Site)



TPA Galuga, Bogor

Close to heavy equip.	
Danger	
Must	
Why ?	

Solid waste (Antwerpen) - Energy

4 milion Watt









Municipal Solid Waste → Electricity (Bekasi + Bantar Gebang)

MSW

Convert: Methane (CH_4) \rightarrow Electricity







Volume reduction: Incineration



https://www.ivago.be/over-ivago/verbranding/werking

Chemical oxidation at high T, where organic material is converted into energy (heat), flue gas and slag.

Volume reduction: Incineration

Incineration Plant (Ivago)

Control room



How about incinerator of DKI Jkt ?



Combustion chamber monitor

Simple illustration: Bonn

Yard waste collection

Furniture: Clean only within some hours (!)



Weighing \rightarrow record \rightarrow proof



Packaging \rightarrow put out \rightarrow transported

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Separation

Separation at:

- Source (household, industry, ...)
- Transfer station
- Final destination (TPA).

Separation at source

 Eliminates the need for expensive & difficult manual and/or mechanical sorting.

Separation

Waste that are desirably separated at source:

- Food waste
- Paper and cardboard
- Plastic
- Metal ferrous and non-ferrous

🗆 Glass.

Waste that can be delivered to drop-off centres:

- Bulky waste (furniture, tyres, etc)
- Yard waste
- Hazardous household waste.

Source separation

Drop-off Centre

- Community drop-off centres for glass and non-ferrous metals
- Skip type containers: clearly labelled
- Advertising program: public education.



Example in Gent, Belgium



Enter the gate:→ Choose the appropriate container

Civic amenity drop off site

- People come at this amenity site.
- Choose the right container
- Drop-off !



Storage and Transport

Wheeled bin (120 – 390 liter)

Wheeled bin (~1500 liter)





Sortation and storage \rightarrow Make 3R easier



de.academic.ru

Transport \rightarrow Recycle

Collection FUNICAR vetroswiss Transport Glas bleibt Glas FUNICAR Reprocess

Returnable bottles \rightarrow Proof of deposit

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https://ethariesta.wordpress.com/2015/02/02/pfandflasche-jangan-dibuang-botolnya/

Transport → Energy Recovery



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MSW Sources and Classification

MSW sources



http://mytutorial.srtcube.com/solid-waste-management-in-india/environment-science/826-454#7490

MSW classification

3. German case



BDE

Indonesia (2013): Organic 60%

MSW Classification (UNEP & ISWA 2015)



http://www.grida.no/resources/5034

MSW composition



Wood

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Solid Waste Generation (1998)

C:+	Solid waste production					
City	m ³ /day	kg/capita/day				
Jakarta	24.025	0.66				
Bandung	6.862	0.70				
Semarang	3.215	0.69				
Yogyakarta	1.240	0.78				
Padang	1.922	0.90				
Makasar	2.424	0.86				

Source Separation

Source separation: kitchen

How about your kitchen?



Trash, plastic, organic, glass, metals, paper



Storage and Transport

Type of storage

- Doorstep collection
- Regular kerb collection
- Civic amenity drop-off
- Haulier for skip collection of bulky items

Doorstep collection



- Community recycle bins
- Vacuum trucks.





MSW Minimisation

Waste Minimization

Means: reducing the amount that is generated at source. Some sources:

- Production units
 - Food
 - Household products
 - Commercial products.
- Shopping outlets
- Households
- Offices, commercial properties, institutions.



Waste Minimization

Examples:

- 1. In households:
 - Food waste: minimized
- 2. Home, office:
 - Both sides printing.
- 3. Goods with least packaging.



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Reuse, recycle dan recovery

□ EU (1992) in 10

- years:
- 90% packaging must be recovered
- 60% recycled
- Denmark (currently):
 - Not to allow any organic/combustible waste to its urban landfills.



Some Popular Recycle Streams

- 1. Aluminum cans
- 2. Paper and cardboard
- 3. Glass
- 4. Plastics
- 5. Yard waste
- 6. Organic food fraction
- 7. Miscellaneous items.



Materials Recovery Facility (MRF)

- Recover as much reusable waste materials as possible
- Including paper, cardboard, glass, metals, aluminum cans, plastics, etc.
- 2 formal design of MRF:
 - MRF for source separated materials
 - MRF for unseparated (commingled) MSW.



Materials Recovery Facility (MRF)

MRF for electronic wastes

Storage of recovery process







Materials Recovery Facility (MRF)

Electronic wastes

Recycle & Recovery





Waste to Energy (Antwerpen)

Electricity generator

Developer





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Utilizes:

A variety of technologies to treat and dispose waste.

Waste to Energy Plant (Jakarta)

- Capacity 2200 tons/day
- 250 million US\$
- Babcock & Wilcock
 Volund Tech. (Denmark)
- Time frame:
 - Ground breaking: 20 Dec. 2018
 - **Ready: 2022.**
- Incinerator 1000°C
- Electrical energy 35 MW per hour.
- □ Flue Gas Treatment (FGT) ≅ Euro 5.



Sunter Waste to Energy Plant (Jakarta)

ITF Sunter, Jakarta

ITF Sunter, Jakarta





https://megapolitan.kompas.com/read/2019/07/04/10540471/5-kecanggihan-itf-sunter-tempat-pengolahan-sampah-yang-akan-dimiliki?page=alliteration and the second statement of t

Household Scale 51

Case study: **The Yuwono Family**

We are not only talking about, Instead, we are active to implement the governmental regulation.

Kompos



Sesuai dengan SNI 19-7030-2004 .

- Diproduksi dengan teknologi baru .
- Menyuburkan semua jenis tanaman.

Kualitas Kompos

	Satuan	SNI 19-7		
Parameter		Min.	Maks.	Nilai
Nitrogen	%	0,40	-	0,45
Phosfor (P ₂ O ₅)	%	0,10	•	0,72
C/N ratio	•	10	20	14,7
Kalium (K ₂ O)	%	0,20	•	0,67
Cobalt (Co)	mg/kg	•	34	2,4
Besi (Fe)	%	•	2,00	0,40
Mangan (Mn)	%	2	0,10	0,04

Ket.: * Nilainya lebih besar dari minimum atau lebih kecil dari maksimum.

Diproduksi oleh:

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Household MSW separation: Easy and simple to implement at home !

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composting: Decomposition agents

Larva BSF

Decomposition agents

Earth worms

Treatment of Solid Organic Waste by Using Maggot (Larvae) of Black Soldier Fly (BSF)

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Maggot BSF

Black Soldier Fly (BSF)



[Priscilia & Yuwono, 2018]



[Youtube]

Composting of household solid wastes

Household solid wastes: Daily input [4 persons]

2-3 months later (depends on prod. rate): Compost ready to use





Cacing kompos



Lumbricus rubellus



Eisenia fetida (Red Wiggler)



Eisenia hortensis



Perionyx excavatus (Indian Blue)



Eudrilus eugeniae (African Nightcrawler)

Compost from household organic wastes



Compost from household organic wastes





Household scale composting process: Benefit

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No	Aspect	Qty.	Unit	Remark
1	Inhabitants		capita	-
2	Volume of solid waste generation		kg/day	Standard 0.765 kg/cap./day
3	Organic fraction		%	-
4	Composting time		Month	Process of stabile compost
5	5 Volume of composting bin		Litre	L=70cm; W=60cm; H=65cm
6	Volume of raw material	218	Litre	80% bin volume
7 Volume volume)	Volume of coarse compost (40% of initial	87	Litre	ρ = 0.25 kg/litre
	volume)	22	Kg/month	ρ = 0.5 kg/litre
8	Ready compost (uniform; ready to use)	13	Kg/month	60% mass of coarse compost
9	Benefit	19,500	Rp./month	Price = Rp.1500/kg

Household Solid Waste Recycle



Compost for these plants originated from our organic solid waste !

Household Solid Waste Recycle



Compost for these plants originated from our organic solid waste !

'Go Green' ala ARIEF SABDO YUWONO

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Our latest product (Agst.-Sep. 2019)

From solid waste

Plastic treatment: Pyrolisis



Product from our solid waste:

- Compost
- Larva BSF
- Fish pellet.



The End – Thank You

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Warmest greetings from our family, We have been separating our solid wastes since 1999, How about you ?



