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Waste to Energy in Urbanized Cities in Thailand

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Hong Kong Special Administrative Region of the People's Republic of China

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Overview

General information

Policies of Waste management and WTE in Thailand

FIT

Government incentives to promote waste to energy development

Example of Waste to energy in urbanized cities

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Kingdom of Thailand

Capital and largest city: Bangkok

Official languages: Thai

Population: 68,863,514

Area: 513,120 km^2

GDP: $7,084 per capita

Currency: Baht (THB)

Time zone: UTC+7 (ICT)

Source: https://www.roughguides.com/maps/asia/thailand/

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MSW management in Thailand

Past

Landfill

Open dump

Burn out

Problem

- environment
- disease vector
- people's health
- Greenhouse gas
- etc.

Present

Landfill gas to energy

Incineration

Electricity

Gasification

Heat

Anaerobic digestion

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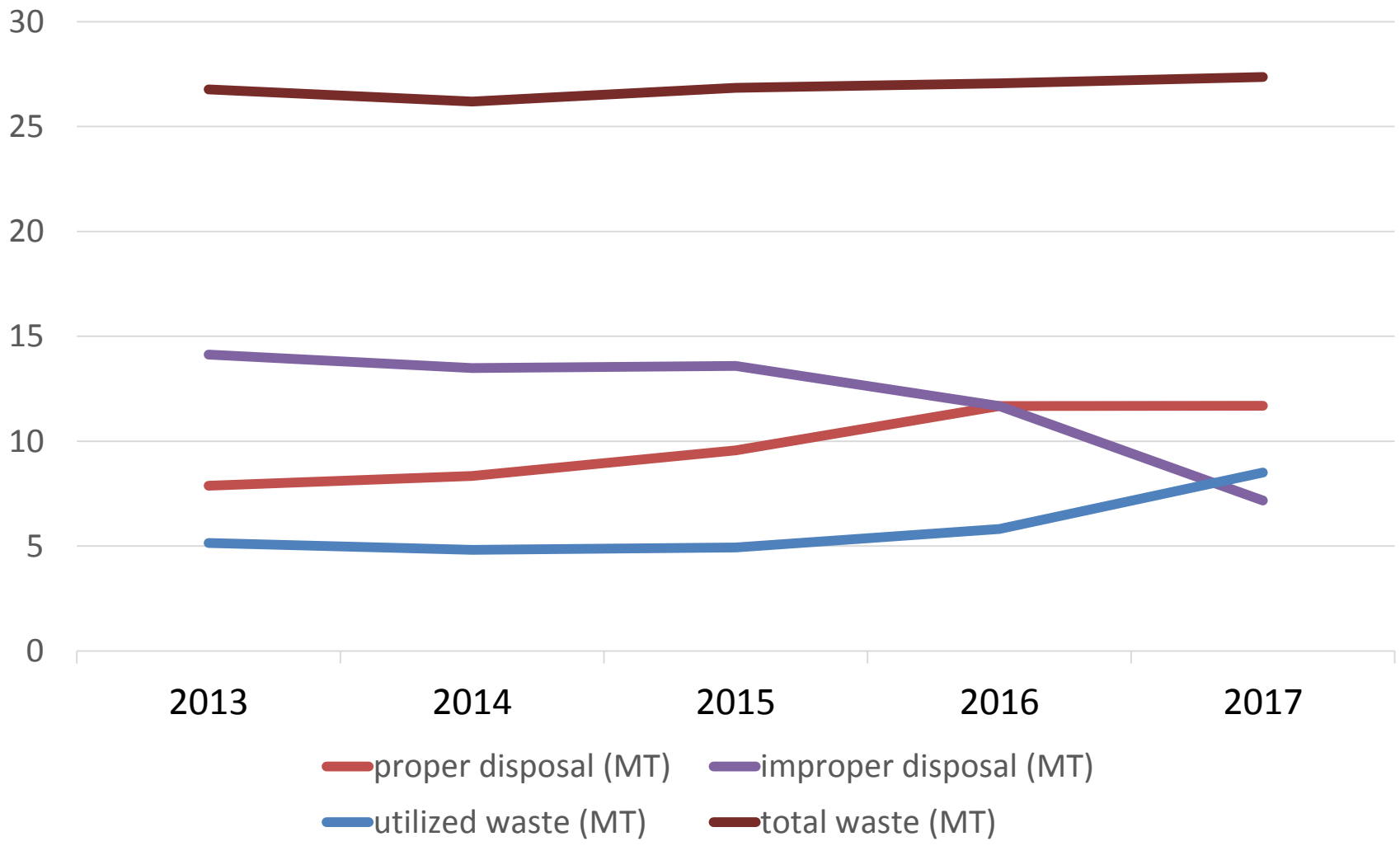
Waste situation in Thailand



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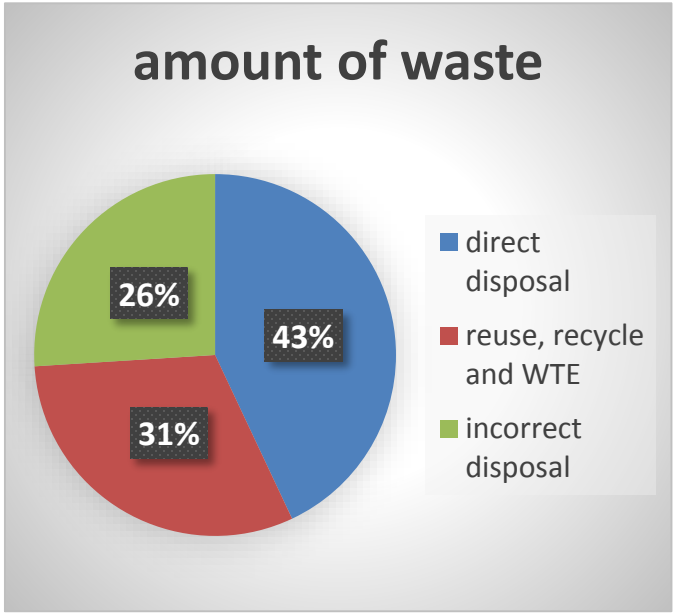
Waste quantity in Thailand

27.40 MT or 75,046 tons/day (average 1.13

- Direct disposal 11.70 MT
- Reuse , Recycle and Waste to energy 8.52 MT
- Incorrect disposal 7.18 MT



Reference : Pollution Control Dep

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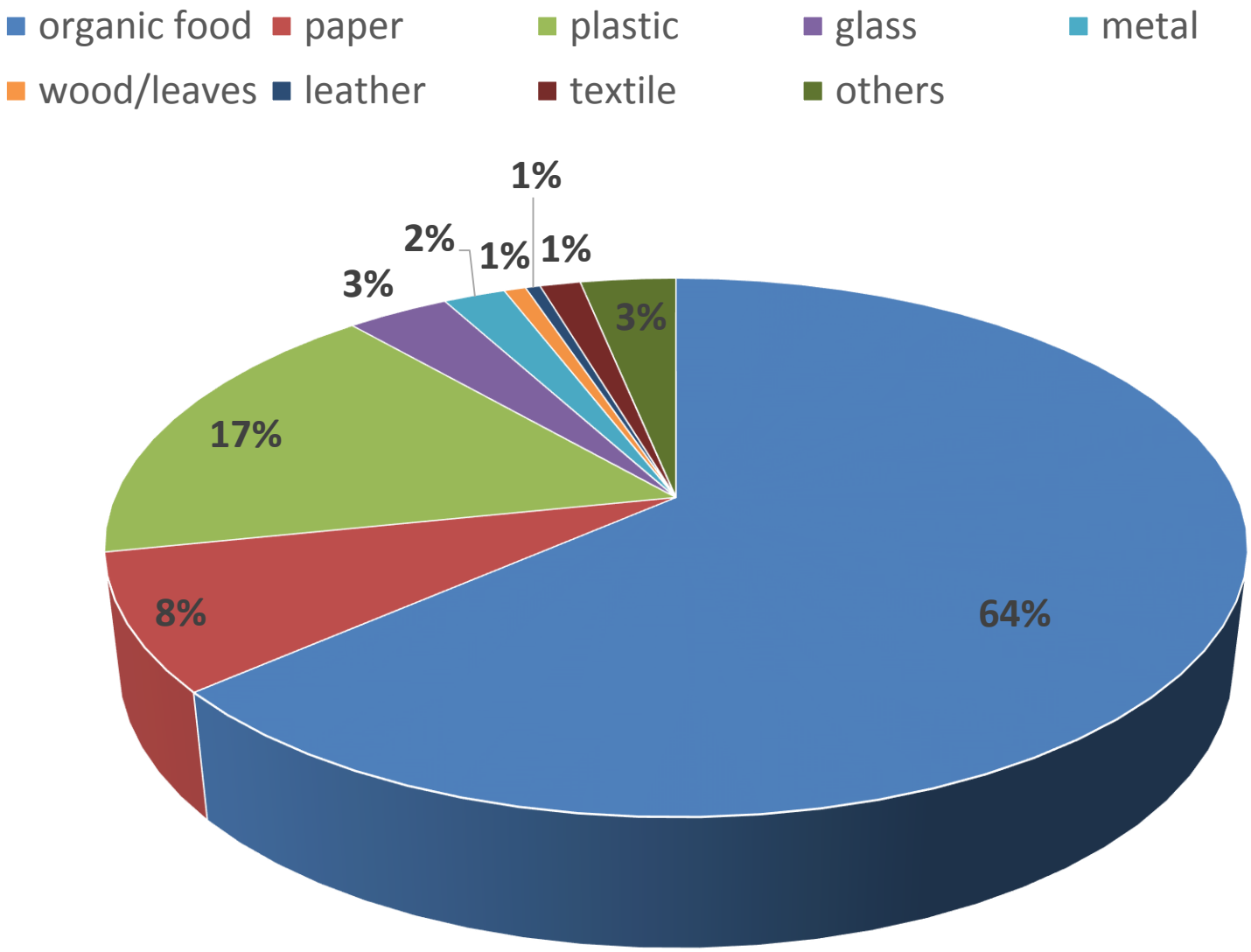
Composition of Waste in Thailand



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National Agenda on Waste Management

2014

- **Road Map on Waste and Hazardous Waste Management**
- ***Approved by the National Council for Peace and Order on the 26th August 2014***

2016

- **National Solid Waste Management Master Plan (2016- 2021)**
- ***Approved by the cabinet on the 3rd May 2016***

Source: PCD

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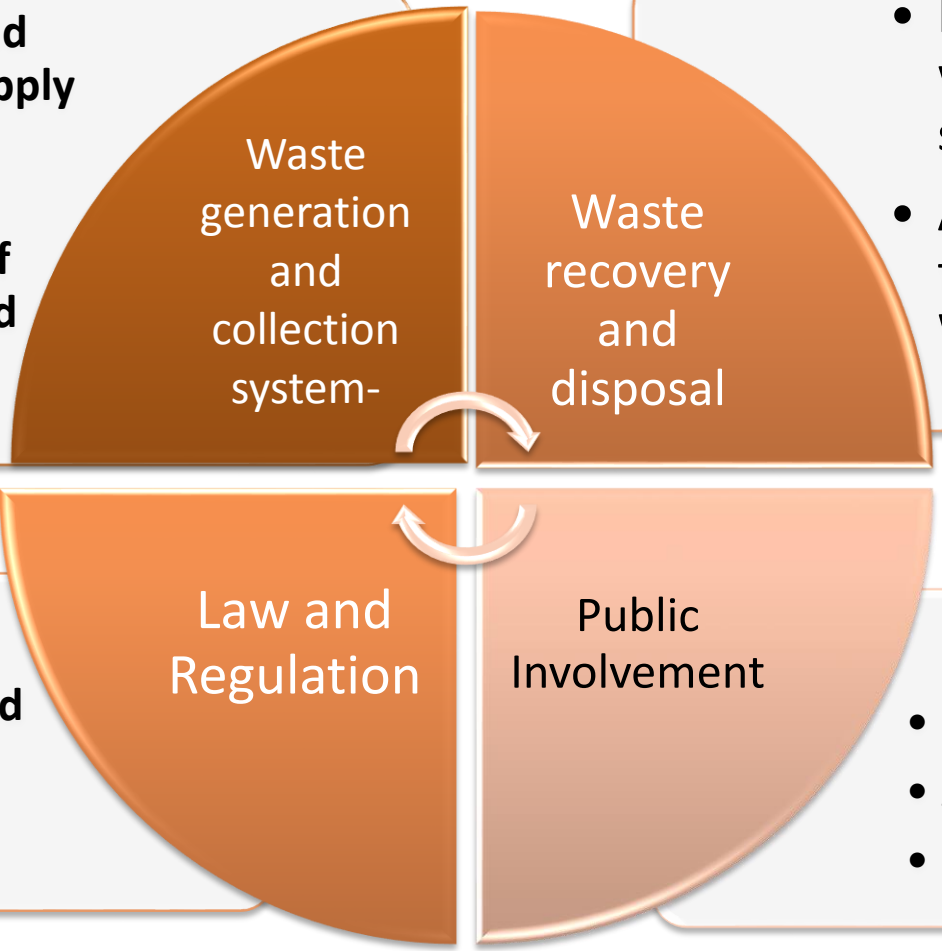
Principle of SWM Roadmap

Residual waste	• No more open dumping + improve illegal landfills. • Covert waste to refuse derived fuel (RDF) and promote private sector in waste treatment technologies.
Emerging waste	• Reduce and separate waste at household sources. • Using combination technologies with the emphasis on WTE and maximizing waste recovery.
Waste management measures and policy	• Governors are the provincial regulatory waste management administrators. • Legislation to introduce and standardize procedures.
Encouraging civil discipline	• People illegally dumping waste should be punished. • Public relations, education, and awareness-raising are necessary.

National Waste Management Master Plan (2016- 2021)

- **Waste generation and collection system- Apply 3R into waste management**
- **Increase efficiency of waste separation and collection**



- Improve improper waste disposal sites.
- Apply integrated technologies i.e WTE, Biogas, RDF.

- **Law amendment and development (MSW/WEEE, Environmental law)**

- **Education Program**
- **Awareness rising**
- **Capacity building**

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Alternative Energy Development plan (AEDP) 2015

Overall targets: 30% Renewable Energy in total energy consumption by 2036

Electricity (4.27%)

19,684.4 MW

1. Municipal Solid Waste	500
2. Industrial waste	50
3. Biomass	5,570
4. Biogas (Wastewater/sewage)	600
5. Small hydro	376
6. Biogas (Energy crop)	680
7. Wind	3,002
8. Solar	6,000
9. Large hydro	2,906.40

Heat (19.15%)

25,088 ktoe

1. Municipal Solid Waste	495
2. Biomass	22,100
3. Biogas	1,283
4. Solar	1,200
5. Alternatives Heat Source*	10

* Geothermal, pyrolysis oil, etc.

Fuel (6.65%)

8,712.43 ktoe

1. Biodiesel (million l/d)	14.0
2. Ethanol (million l/d)	11.3
3. Pyrolysis oil (million l/d)	0.53
4. CBG (ton/d)	4,800
4. Alternative fuels* (ktoe)	10

* Bio-oil, Hydrogen and others

RE share 15.27% (Aug 2018)

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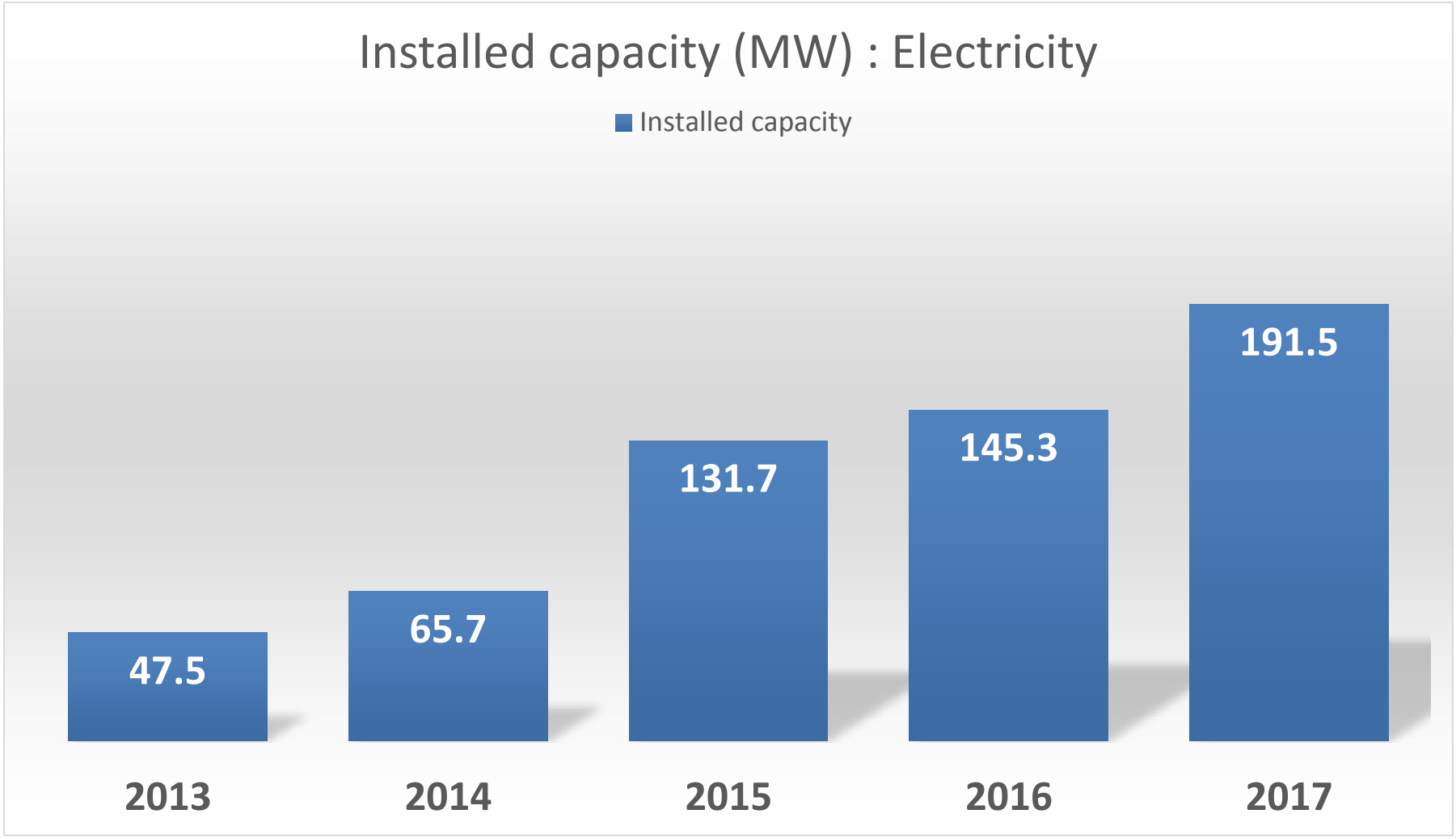
Current capacity for Electricity generation by waste



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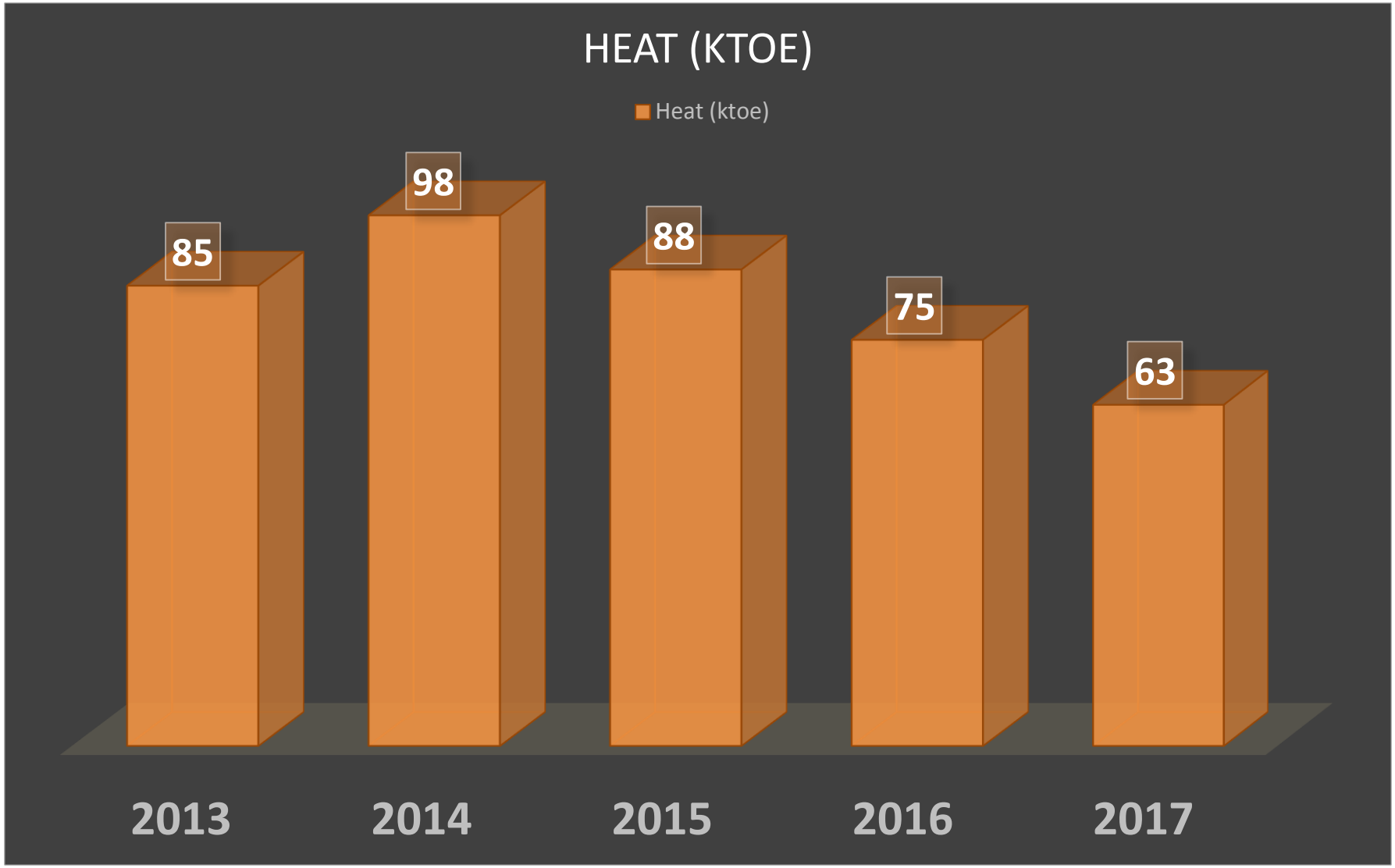
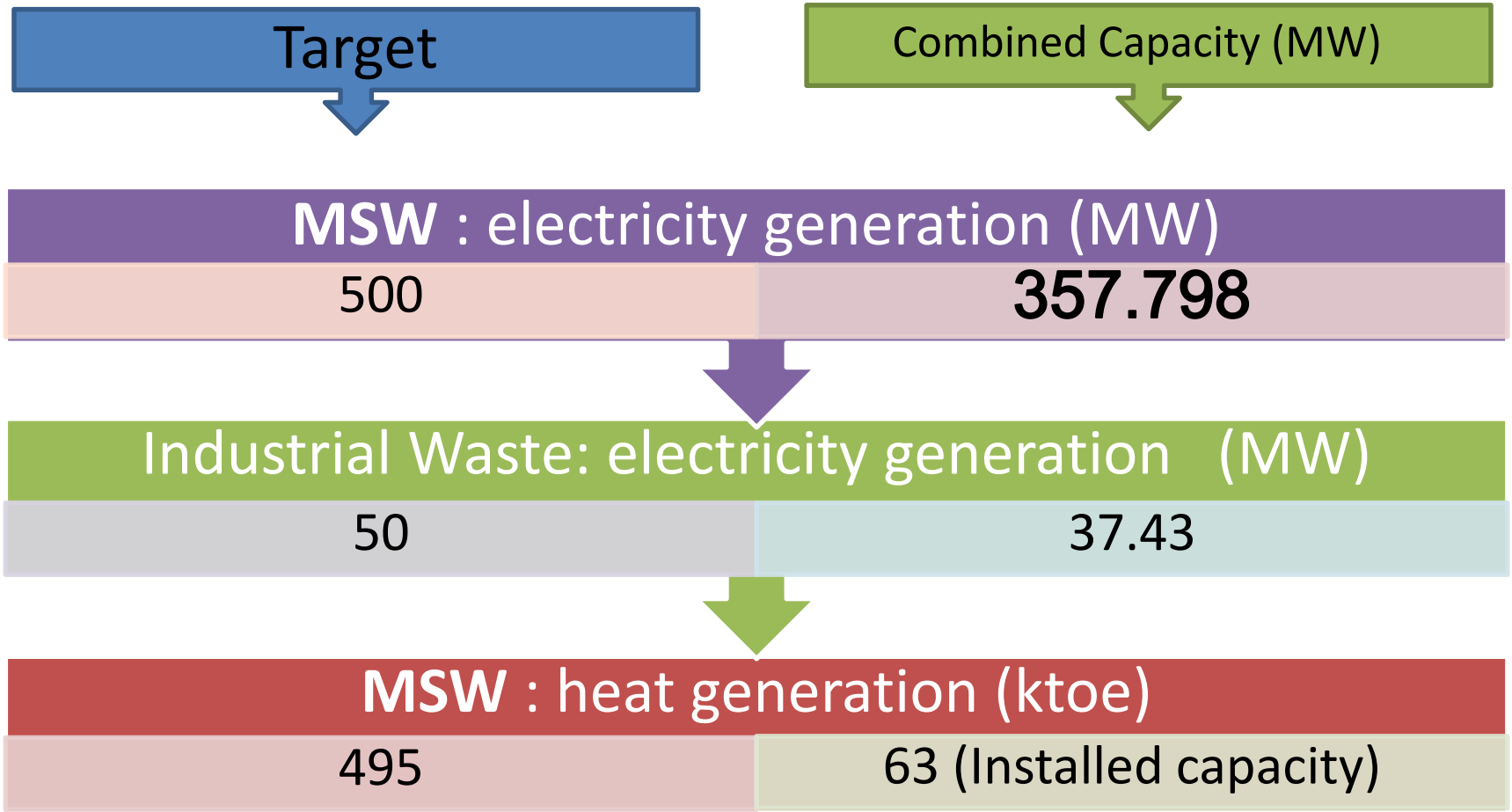
Current capacity for Heat generation by waste



Target & Current capacity from Waste under AEDP 2015



Data : DEDE,2017

Government incentives to promote waste to energy development

BOI

- **Exemption of**
  - **import duty on equipment or machines**
  - **income-corporate taxes resulting from selling RE or saving energy for periods up to 8 years**

FiT

Feed-in Tariff for Solid Waste

FiT for VSPP project						
Capacity (MW)	FiT (Baht/kWh)			Period (year)	FiT Premium (Baht/kWh)	
	FiT_F	$FiT_{V,2560}$	$FiT^{(1)}$		For year 1-8	For 3 provinces in the south[2] (Whole period)
1) Integrated process						
≤ 1 MW	3.13	3.21	6.34	20	0.70	0.50
> 1-3 MW	2.61	3.21	5.82	20	0.70	0.50
> 3-10 MW	2.39	2.69	5.08	20	0.70	0.50
2) Landfill Gas to Energy						
All sizes of project	5.60	-	5.60	10	-	0.50

Note: (1) FiT rates will be used for projects that COD by 2017. After 2017, FiTv rates will continuously increase by core inflation.
(2) Projects in Yala, Pattani Naratiwat and 4 districts in Songkla; Chana, Tepa, Sabayoi, and Natawee

SPP: Waste to Energy

FiT for waste to energy SPP project: 3.66 Baht/kWh

Project capacity: 10 – 50 MW

Project must be approved by cabinet or Ministry of Interior.

Have contract of waste disposal with the municipalities

Non-firm contract

No competitive bidding

Locate on municipality land area

SCOD by 2020

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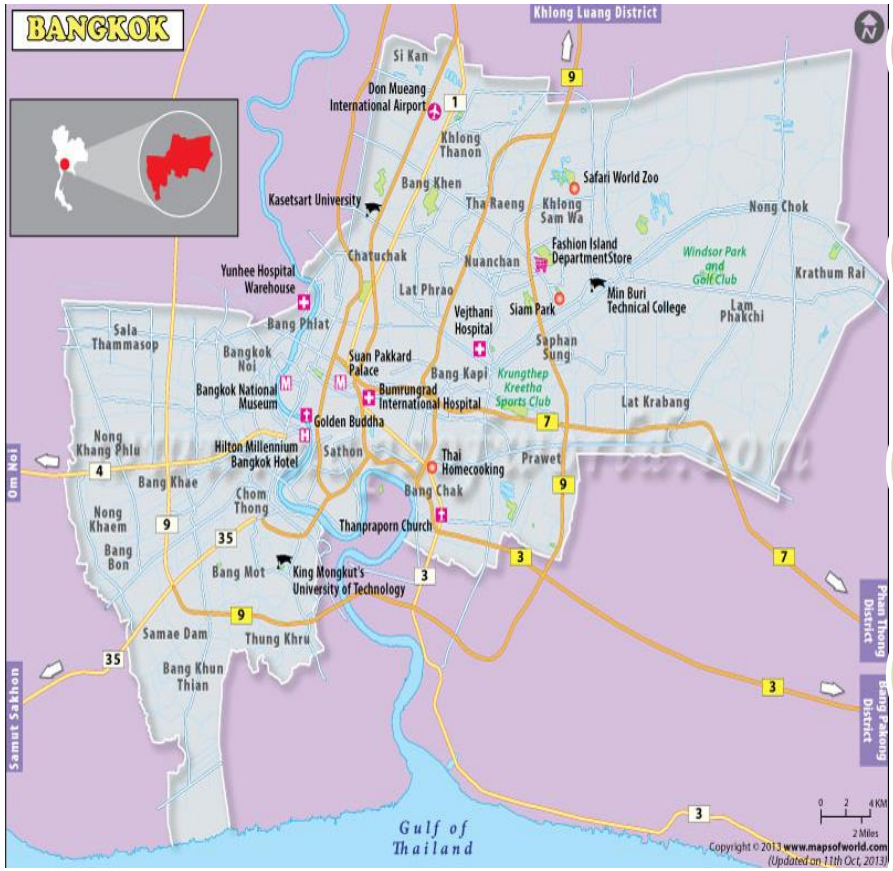
Bangkok



Area: 1,568.74 km2

Temperature 17.6 – 39.3 C

Population: 9.456 million

Density Population: 5,300 persons/km2

District: 50 districts

https://www.mapsofworld.com/thailand/bangkok-city-map.html

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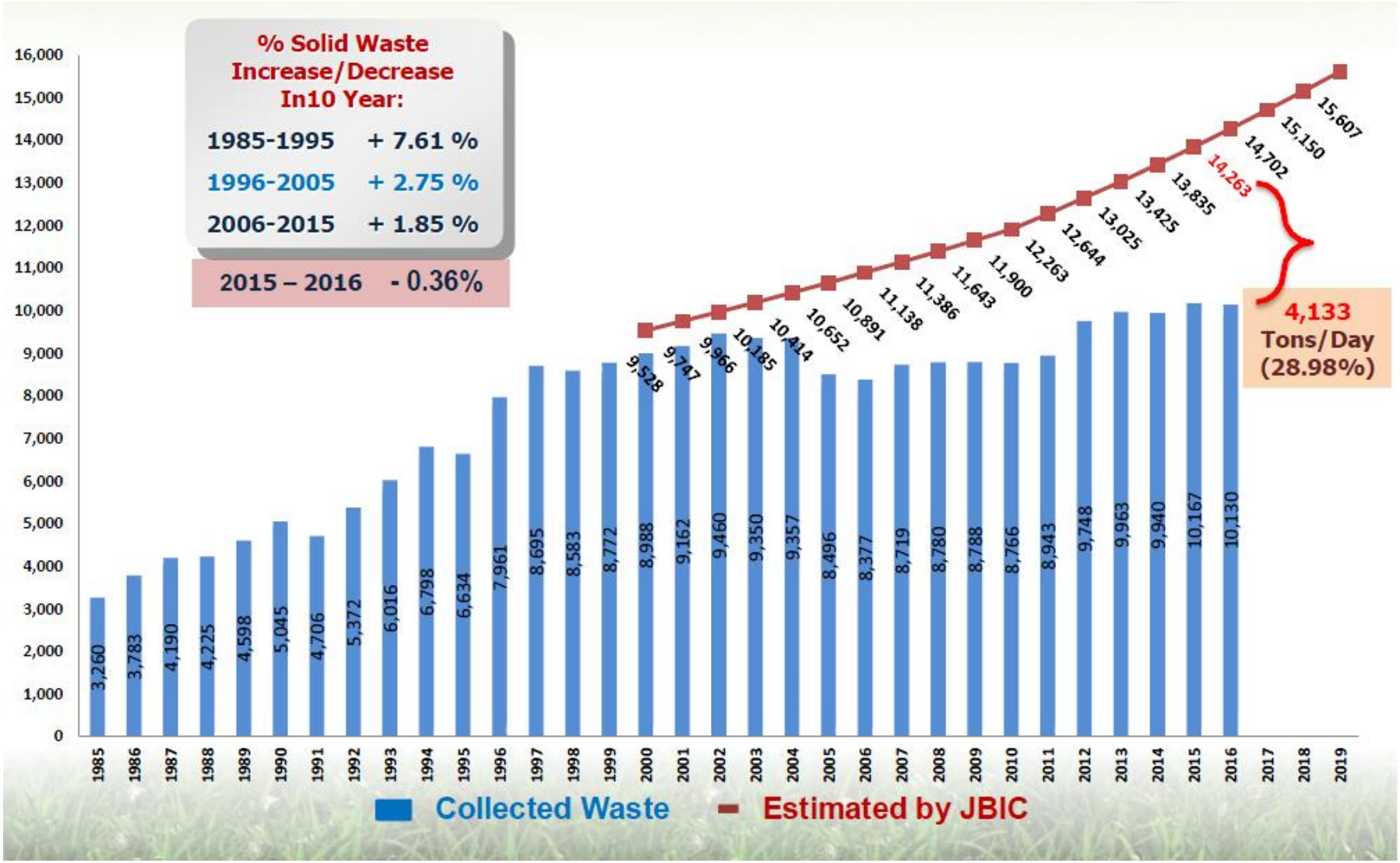
Solid Waste Situation in Bangkok



Source: BMA

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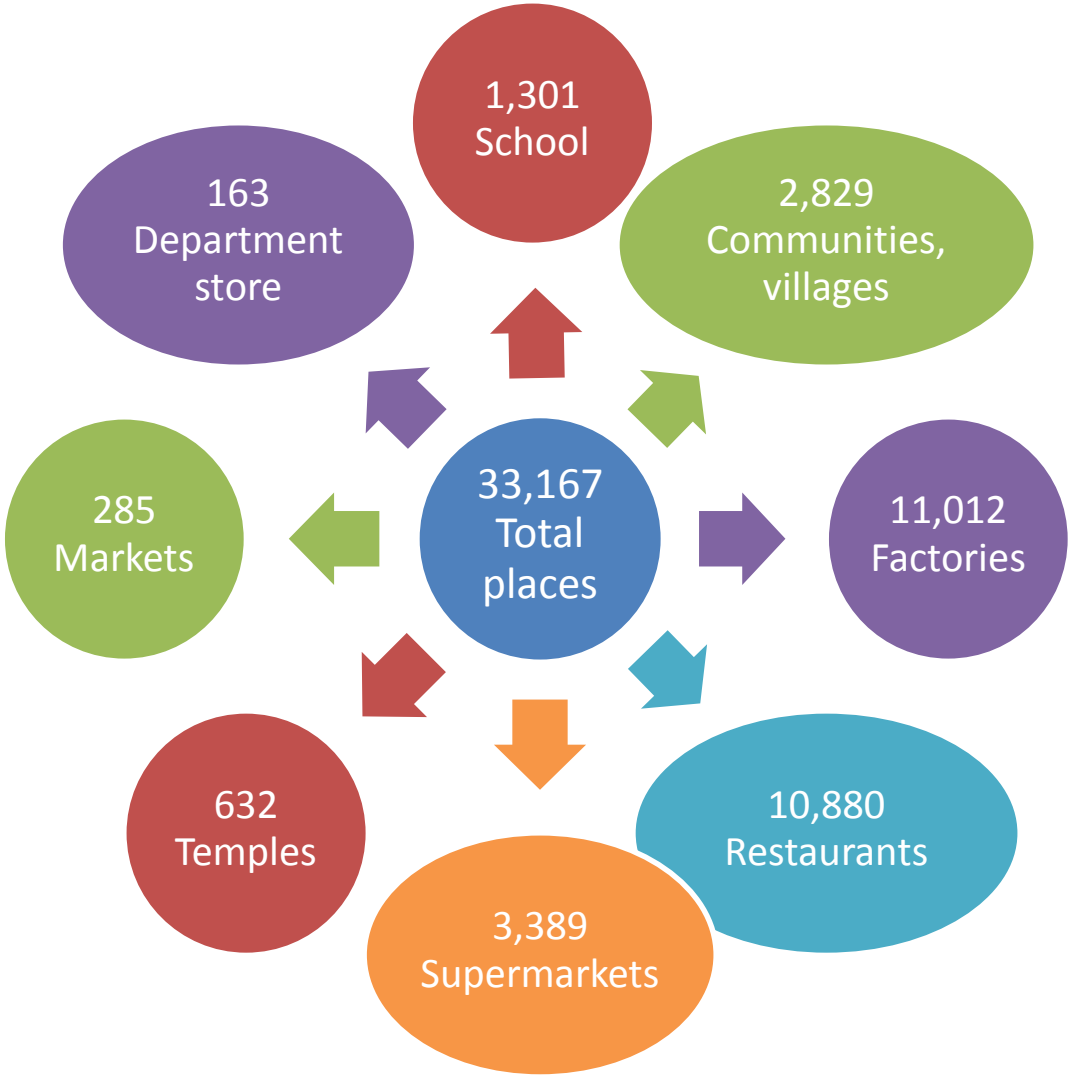
Waste in Bangkok comes from:



Source: BLTbangkok.com

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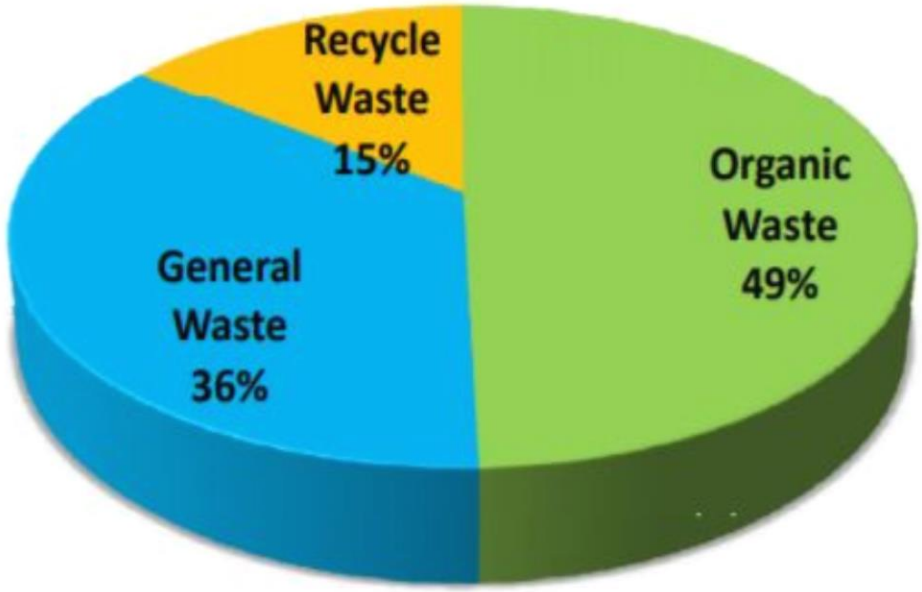
Composition of waste in Bangkok



Organic Wastes	**49.51 %**
- Food waste	42.48 %
- Woods and leaf	7.03 %
General Waste	**35.73 %**
- Paper	8.95 %
- Plastic	17.93 %
- Feather and rubber	1.98 %
- Rag and textile	4.58 %
- Rock and ceramic	0.58 %
- Bone and shell	1.71%
Recycle Waste	**14.76 %**
- Recyclable paper	2.99 %
- Recyclable Plastic	4.94 %
- Foam	1.45 %
- Glasses	3.78 %
- Metal	1.60 %

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Solid Waste in Bangkok

Volume of Waste : 13,374 t /d (2017)
Proper management : 10,635.7 t/d

3R : 2,738.3 t/d

Waste collection :

Service area (50 districts)

Collection trucks (1,894 vehicles)

Waste disposal:

Incineration (500 tons/day)

Composting Plant (1,700 tons/day)

Landfill (8,830 tons/day)

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Strategies for SWM Plan of Bangkok

Strategy 1 : Increase the efficiency of solid waste and hazardous waste management

- Promote 3Rs concept
- Encourage hazardous and e-waste separation
- Develop efficiency of waste collection
- Use Eco friendly technology

Strategy 2: set up the discipline by public participation on SWM

- Enforce law and registration
- Encourage economic measure
- Promote public participation

Strategy 3: Integrate SWM system

- Set up SWM plan by public participation
- Apply IT for SWM

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Strategies for SWM Plan of Bangkok

Strategy 4 : Increase the capacity building of SWM of BMA

- Develop knowledge and skill among BMA's staff
- Encourage SWM attitude
- Seeking cooperation

Strategy 5: research and develop knowledge and technology for SWM

- Promote R&D
- Develop SWM innovation

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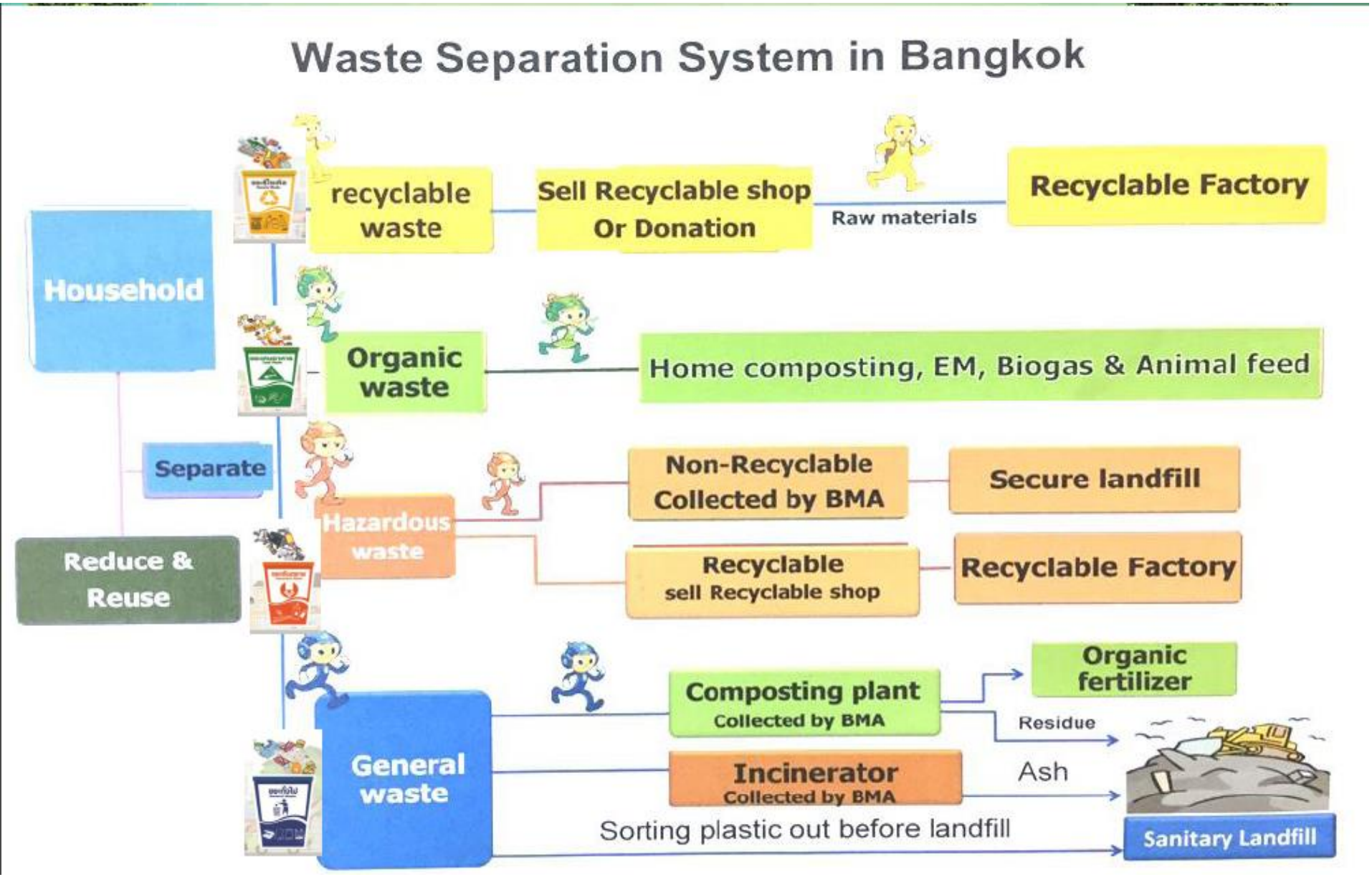
Waste separation in Bangkok



BMA

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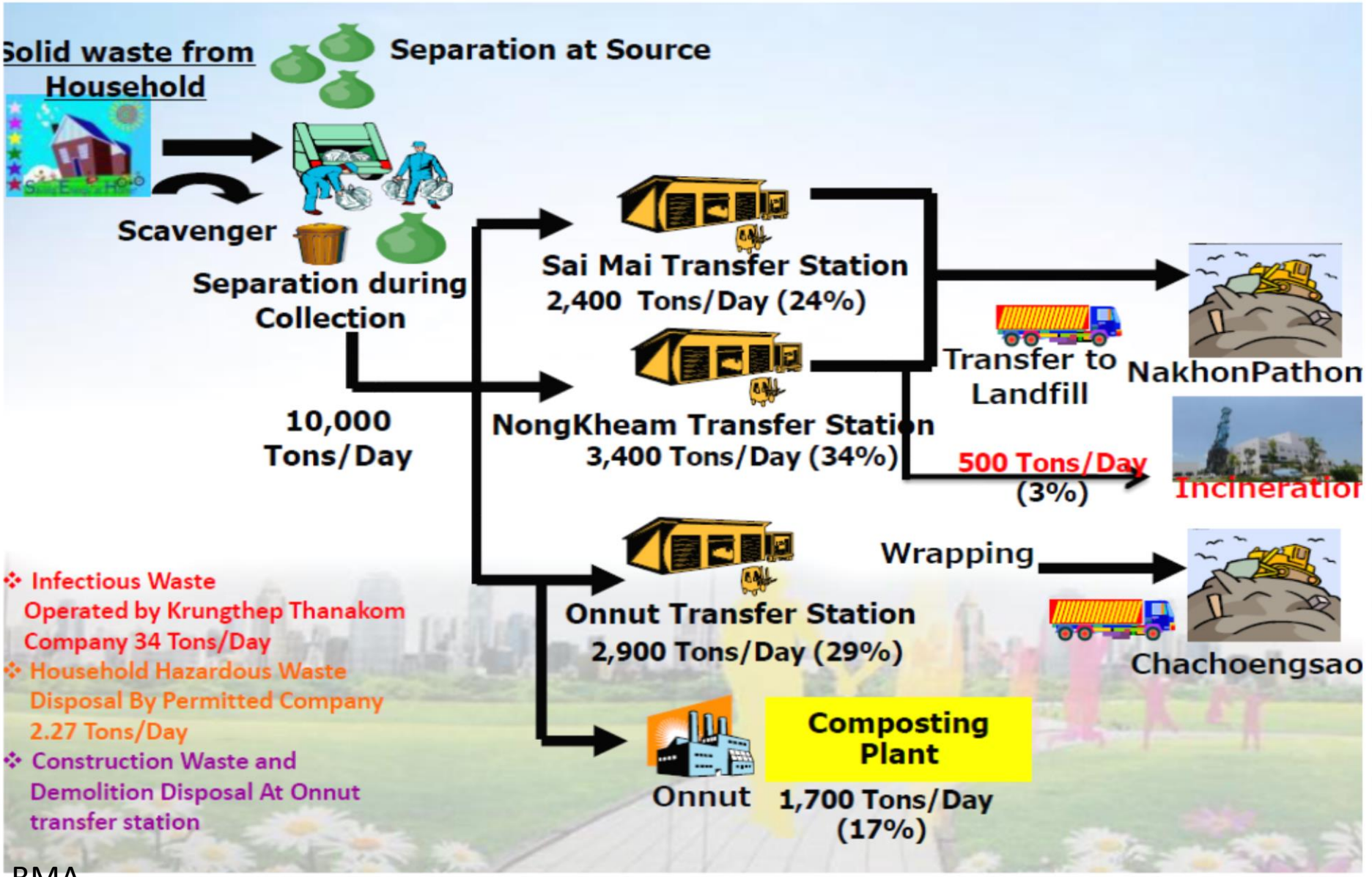
Flow of Waste



BMA

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Incineration plant

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Chiang Mai Province

Location: 700 km from Bangkok

- Area (city municipality): 20,107 km^2

Population (city municipality): : 1,746,840

- Density 86.87 persons/km^2

GDP per capita 86,211

- Administration: 25 districts

https://th.wikipedia.org
http://www.chiangmai.bangkok.com

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Waste generation in Chiang Mai

No. of Local administration	• 210
Amount of MSW	• 605,351.16 tons/year
Amount of MSW properly disposed	• 253,001.41 tons/year • 41.8 %
Amount of waste utilized or recycled	• 191,911.28 tons/year • 31.7%
Amount of old MSW	• 42,978.96 tons
No. of disposal sites	• 128

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Waste management in Chiang Mai

Measures

- 3Rs
- Appropriate waste processing

Actions

- 3Rs promotion at city and sub-district organization level
- Study for introduction of appropriate waste processing facilities e.g. WtE, biogas collection facility

WtE Projects in Chiangmai

Landfill gas to Energy

Bantan, Chiang Mai
1 MW

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THANK YOU for attention