



# Future Trend of MSW Incineration for Waste to Energy In ASEAN



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# Current Status of MSW Incineration Facilities

## Thailand

- 6 Incinerators with energy recovery
- 5 Incinerators with air pollution control systems
- 55 Open burning sites
- 72 Incinerators without air pollution control system

## Malaysia

- 5 Incinerators but **none** has the capacity to transform waste to energy

## Indonesia

- Incineration is not yet available in 2020
- It is expected to operate 12 incinerators by 2022

## Singapore

- 5 Incinerators with energy recovery
- 1 was decommissioned in 2009



Source: PCD, 2019; National Environment Agency, 2020; Gokkon, 2019

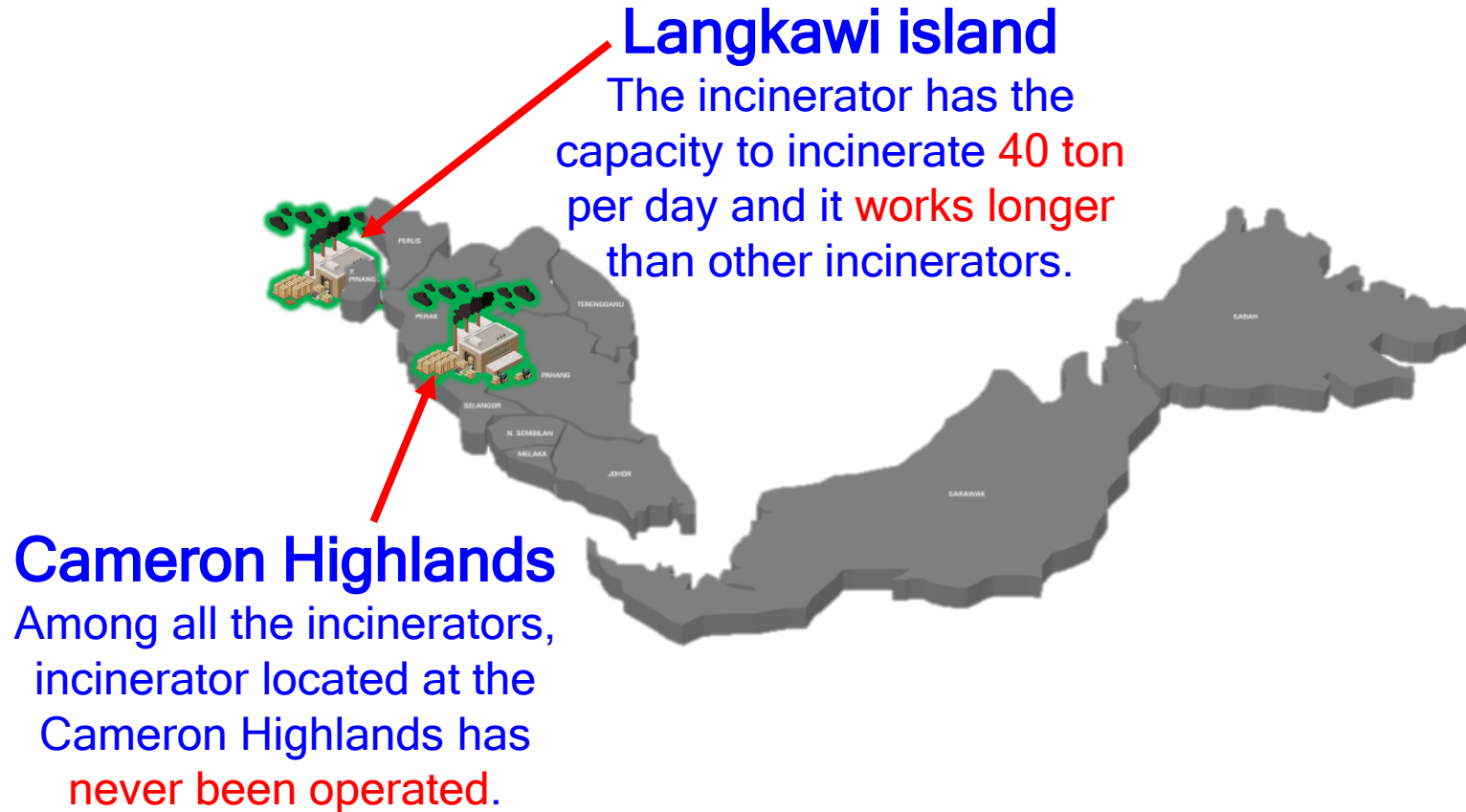
# Operation Status of Incineration Facilities

Parameter	Thailand	Malaysia	Indonesia	Singapore
Capacity (ton/day)	8-250	20-40	Nil	800-3,000
Electricity generation	Yes	No	No	Yes
Under operation	6 (Energy)	5	0	5
Number of working day	N/A	4 days a week	0	Daily
Electricity generation (MW)	2.5	0	0	80

Source: Nation Science and Technology Development Agency, 2015; National Environment Agency, 2020; Gokkon, 2019

# Incineration in Malaysia

- 5 incinerators of capacity of 20-40 tons per day
- None of the facilities have the transformation of waste to energy



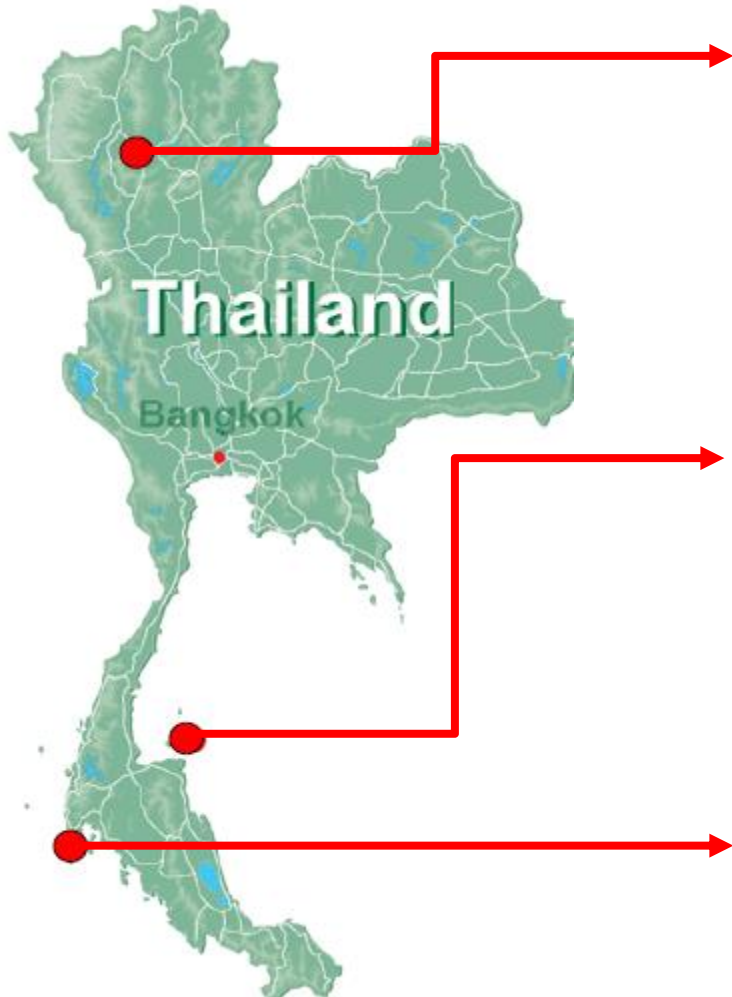
# Operation Status

- All 5 incinerators are rotary incinerator
- They do not work properly, it works 4 days/week
- Challenges faced by incinerator are
  - The **inaccuracy** in the calculation of moisture content
  - **Political** issue which has delayed the pipeline for Kuala Lumpur of 1,000 ton/day costing **RM 600,000**



Rotary incinerator

# Incineration in Thailand



## Lamphun incinerator

- 2 incinerators
- Capacity is 8 tons/day each
- Only 1 is under operation



## Samui incinerator

- Caught fire on 23<sup>rd</sup> April 2020
- Capacity is 140 tons/day
- No facility to turn waste to energy



## Phuket incinerator

- Incineration capacity is 250 tons/day
- Generate 2.5 MW of electricity.

Source: Nation Science and Technology Development Agency, 2015

# Performance of Samui's Incinerator, Thailand

Date	Dioxin (Total) Standard= 30 ng/Nm <sup>3</sup>		Dioxin and Furans-TEQ Standard= 0.5 ng TEQ/Nm <sup>3</sup>	
	Measured	Adjusted O <sub>2</sub> 7%	Measured	Adjusted O <sub>2</sub> 7%
May 7, 2003	202.1		0.9	
August 2, 2003	4,254	7,301	21.19	36.37
December 12, 2003	1,329	2,309	12.30	21.37
January 21, 2004	1,469	2,552	14.77	25.67
May 19, 2004	1,712	2,867	16.57	27.76

- In 2004, Samui incinerator has emitted **100 times** greater than the standard set by Ministry of Natural Resources and Environment, Thailand.

Source: UNEP, 2006



# Incineration in Singapore



**1979**

Ulu Pandan  
incineration plant, it  
was **decommissioned**  
in 2009



**1986**

Tuas incineration plant



**1992**

Senoko incineration  
plant



**2000**

Tuas South  
incineration plant



**2009**

Keppel Segher  
incineration plant.  
The 5<sup>th</sup> incinerator in  
Singapore



# Incineration in Singapore

	Tuas incineration plant	Tuas South incineration plant	Keppel Seghers Tuas WTE Plant	Senoko WTE Plant
Plant capacity (tons/day)	1,700	3,000	800	2,100
Power generation (MW)	30	80	22	40-50
Cost of construction (Million Singapore dollar)	200	890	160	560

Source: National Environment Agency, 2020

# Reality of MSW Incineration



## Open waste burning

Improper waste management is the source of dangerous carcinogen such as dioxin, furans, black carbon, and GHG that contributes to climate change

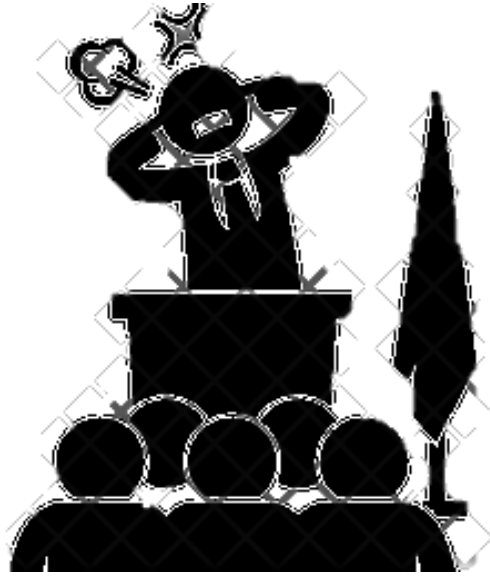


## Protest in Bandung, Indonesia against incinerators

The urge to stop the construction of multiple incinerators in 7 different cities in Indonesia on 5<sup>th</sup> March 2018

Source: Dipa, 2018

# Challenges of Implementing Waste to Energy Incineration



**Politics**

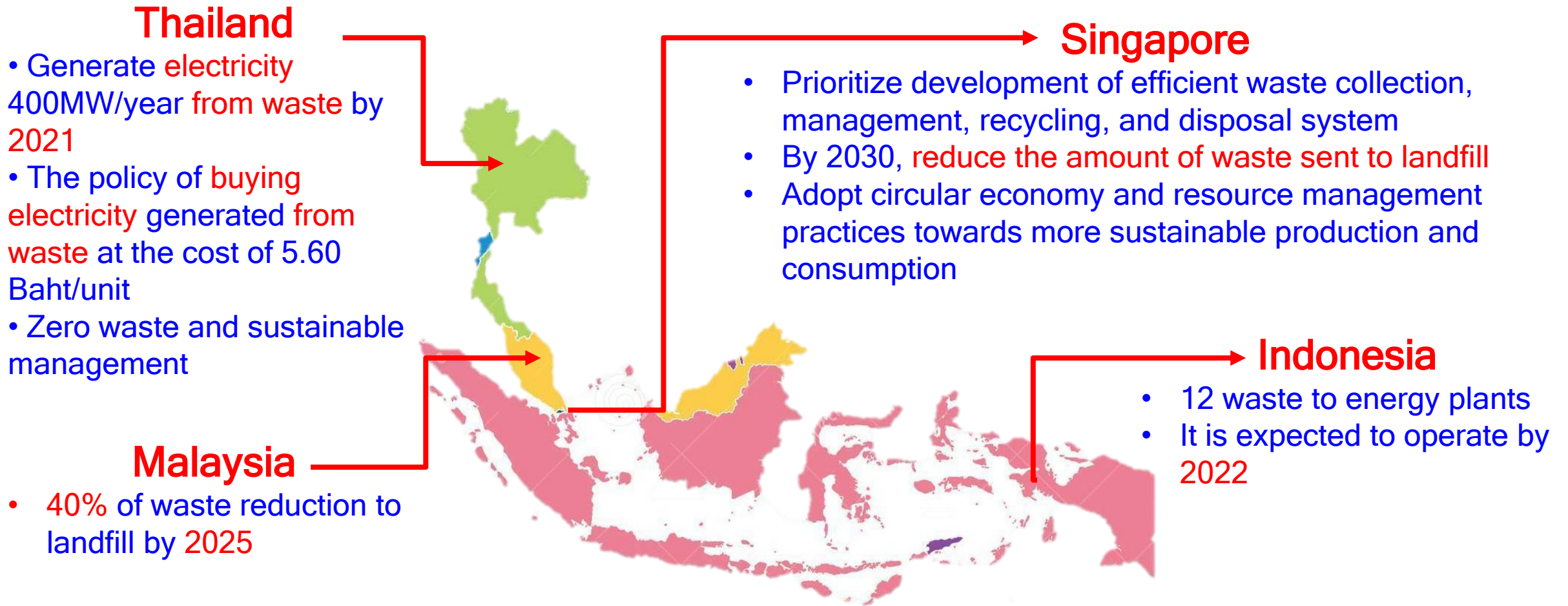


**Lack of holistic  
approach in waste  
management**



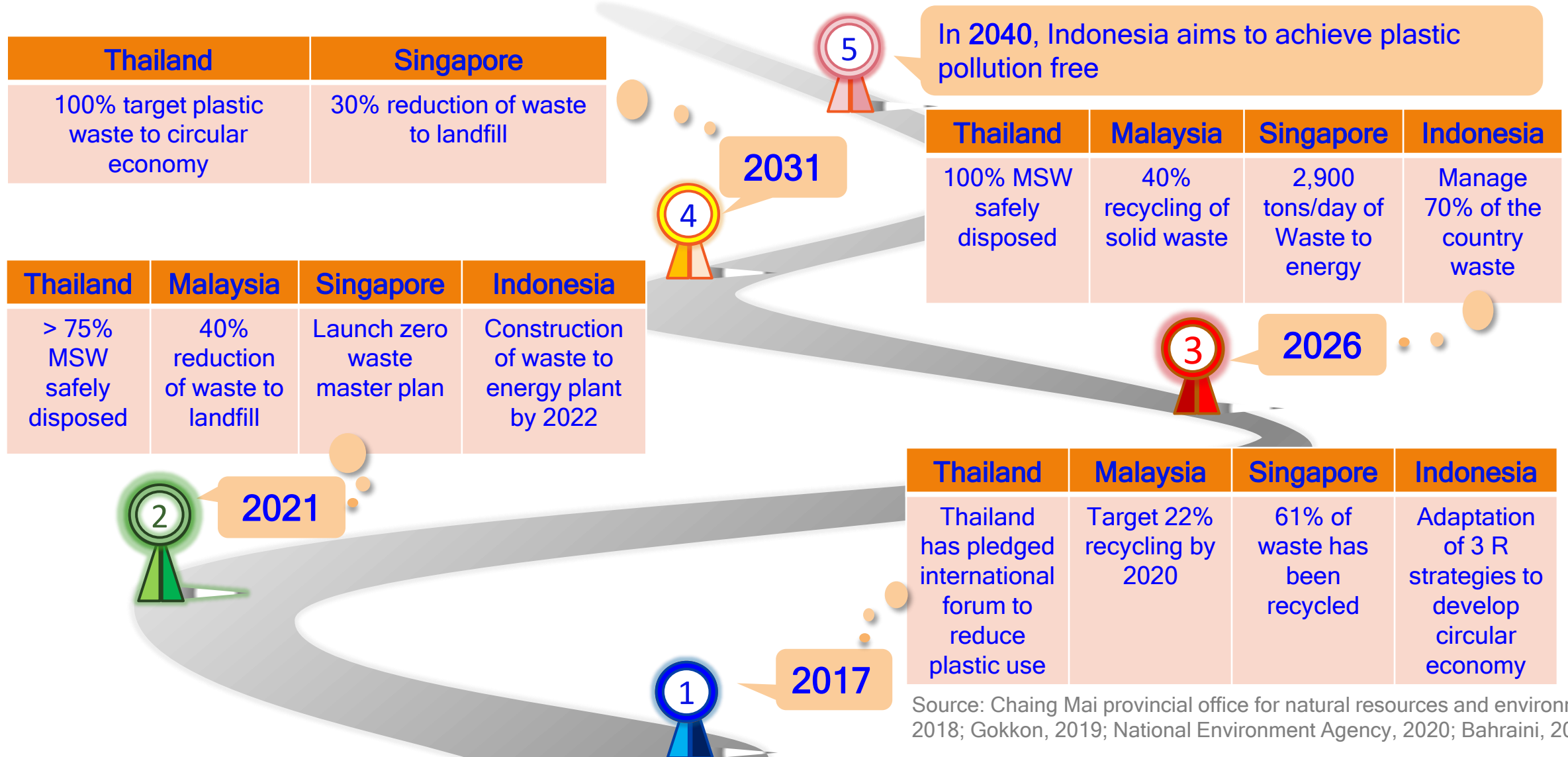
**Unknown waste  
composition**

# Future Trend of Thailand, Malaysia, Indonesia, and Singapore



Source: Kerdlap et al., 2019; National Environment Agency, 2020; Rattanakal, 2018; Chaing Mai provincial office for natural resources and environment, 2018; Gokkon, 2019; Kathiravale, n.d.

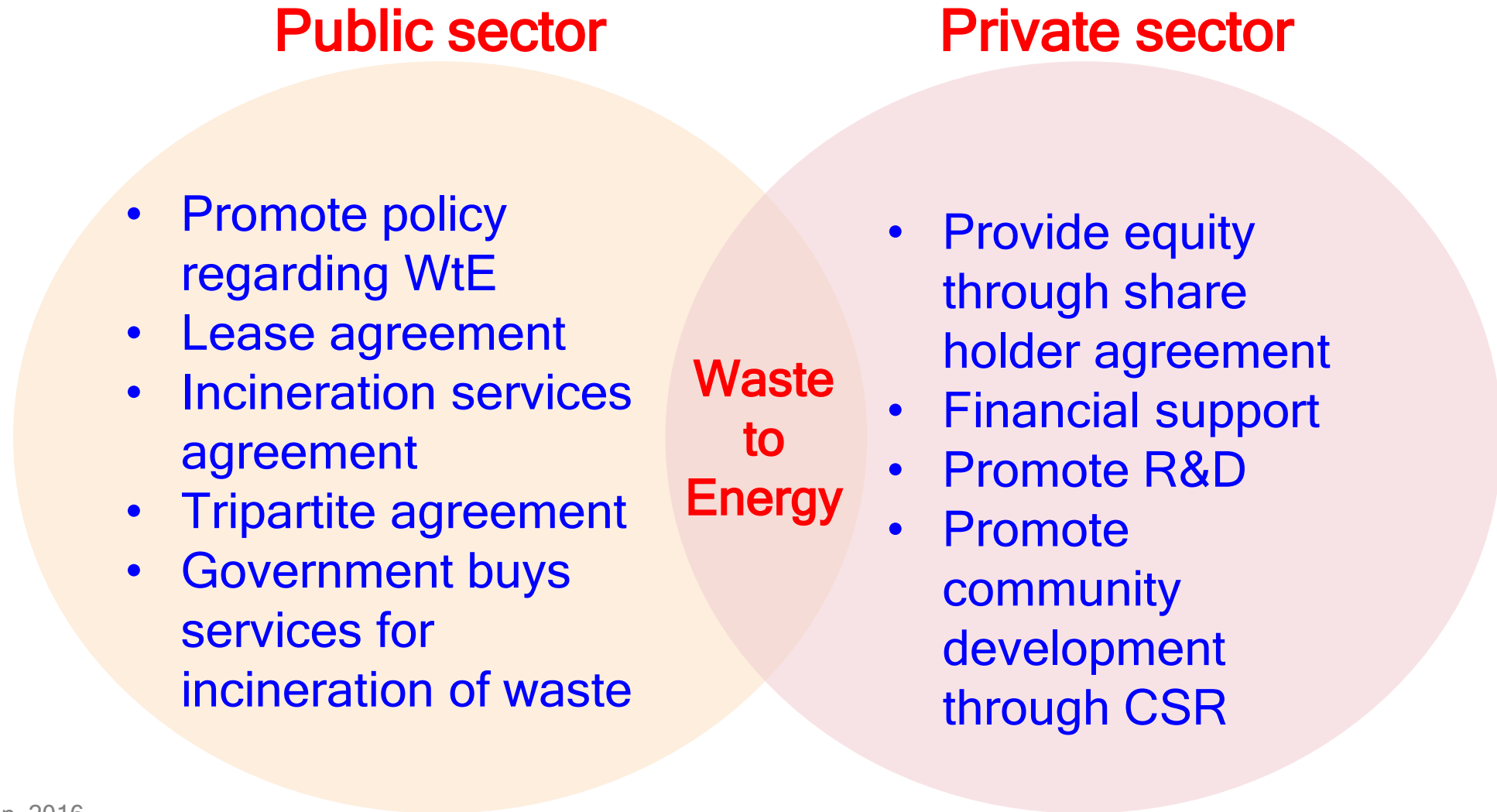
# Policy Timeline Comparison



Source: Chaing Mai provincial office for natural resources and environment, 2018; Gokkon, 2019; National Environment Agency, 2020; Bahraini, 2018



# Public Private Partnership



Source: Tuan, 2016



# Incineration is More Helpful if Properly Managed

## Case study of Tuas south incineration in Singapore

Parameter	Limit (mg/Nm <sup>3</sup> )	Plant level (mg/Nm <sup>3</sup> )
Particulate substances	50	2.77
Hydrogen chloride	200	158
Sulphur dioxide	1700	103
Carbon monoxide	250	19
Dioxin and furans (ng TEQ/Nm <sup>3</sup> )	0.1	0.0582
Mercury and its compounds	0.05	0.003

- If properly managed, incineration would not emit harmful substances
- Tuas South incineration emission data in 2017
- The emission level has met with the National standard
- The plant has incinerated 3,000 tons of waste per day producing 80 MW of electricity

Source: National Environment Agency, 2018

# Incineration and New Normal Trend



- Wuhan sterilized and incinerated medical waste generated to manage the overwhelming quantity of medical waste over a short period of time.
- What if this waste is not just a waste?
- What if we could turn it to energy?
- Incineration, a promising **positive driver** under the new normal trend to **minimize** the waste generation, **generate** energy, and promote **a better health** of the society.

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