



# **Solid Waste Management in Bangkok**



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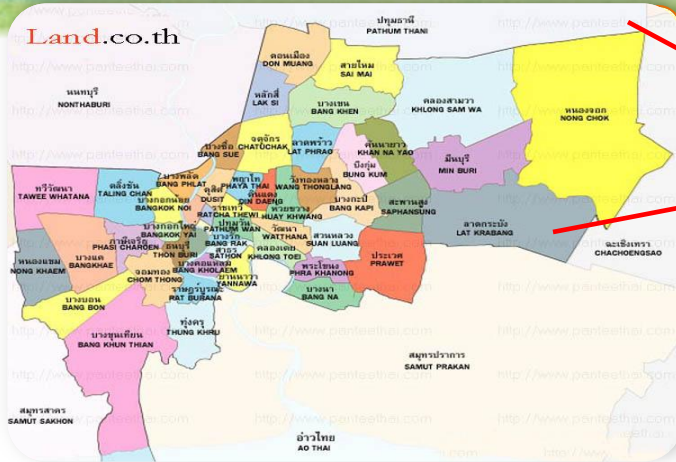


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# 1. Introduction of Bangkok



- ❖ **Total Area** 1,568.737 km<sup>2</sup>
- ❖ **Average Ground Level** +0.50 to +1.50 m MSL
- ❖ **Temperature** 17.6 - 39.3°C
- ❖ **30-year Average Annual Rainfall** 1,648 mm
- ❖ **Population** Registered 5,692,284 persons (2014)  
Non Registered ~ 4 million persons
- ❖ **Density Population** 3,629 persons/km<sup>2</sup> (2014)
- ❖ **District** 50 districts
- ❖ **House** 2,753,972 households (2015)
- ❖ **Community** 2,067 Communities (2017)
- ❖ **Length of the Chao Phraya river in Bangkok** 35 km



## 2. Concept of Solid Waste Management

### 1. Holistic Waste Management System

Minimization at Source > Collection > Transportation > Disposal

### 2. Control the amount of Solid Waste

Most Minimization > Most Utilization

### 3. Effectiveness and Completed Waste collection

### 4. Appropriate Solid Waste Management

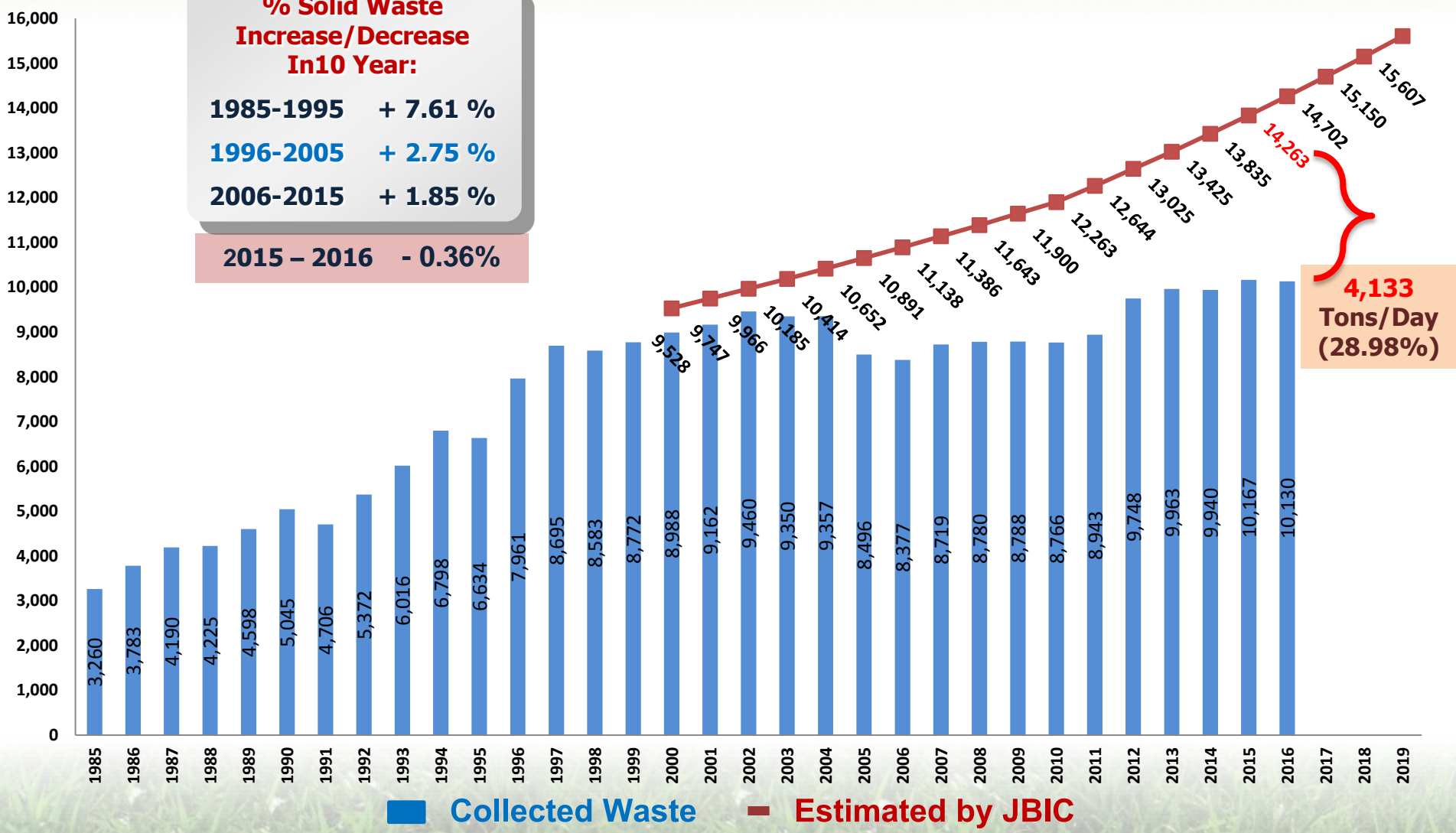
Reduce Environmental Impact, Save Cost, Less Landfill, and Receive Energy Recovery



# 3. Solid Waste Situation in Bangkok

**% Solid Waste Increase/Decrease In10 Year:**

<b>1985-1995</b>	<b>+ 7.61 %</b>
<b>1996-2005</b>	<b>+ 2.75 %</b>
<b>2006-2015</b>	<b>+ 1.85 %</b>
<b>2015 - 2016</b>	<b>- 0.36%</b>





# Solid Waste Situation in 2016



## Volume of Waste

**10,130 Tons**



## Waste Collection

- Service Area **50 Districts**
- Collection Trucks **1,894 Vehicles**
- Staffs **20,958 Persons**



## Waste Disposal

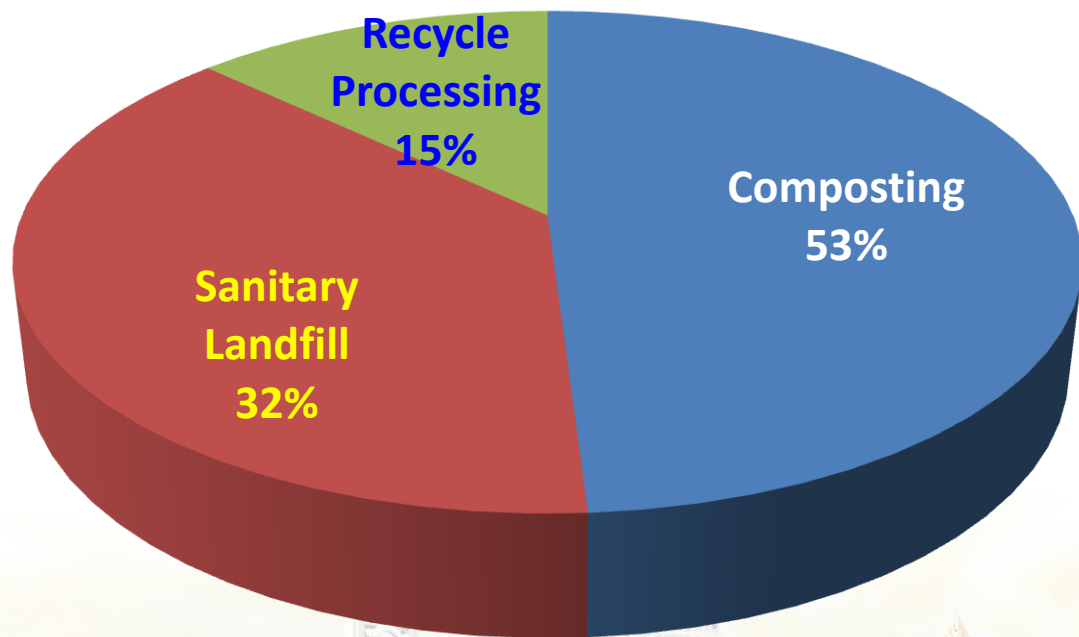
- Incineration **500 Tons/Day**
- Composting Plant **1,700 Tons/Day**
- Landfill **8,830 Tons/Day**



# Waste Composition at Transfer Stations (2016)



## Waste Composition in Bangkok



### Composting **53.55 %**

- Food Waste 47.62 %
- Woods and Leaves 5.93 %

### Recycle Processing **14.57 %**

- Recyclable paper 3.71 %
- Recyclable Plastic 4.99 %
- Foam 1.60 %
- Glasses 2.76 %
- Metal 1.51 %

### Landfill **31.88 %**

- Non-recyclable Paper 8.58 %
- Non-recyclable Plastic 18.54 %
- Leather and Rubber 0.76 %
- Textile 2.33 %
- Stones and Ceramics 0.51 %
- Bones and Shells 1.16 %





# National Roadmap

## Solid Waste and Hazardous Waste Management

1

Dispose  
Accumulated  
Solid Waste



2

Create an  
Appropriated  
pattern of Solid  
waste and  
Hazardous  
Waste  
Management



3

Set up the  
measure for  
Solid waste  
and Hazardous  
Waste  
Management



4

Discipline  
people to the  
sustainable  
management

**BMA's Solid Waste Management Plan (2015 - 2019)**

**Follow the National Roadmap**

**Solid Waste and Hazardous Waste Management**





# 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

## 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

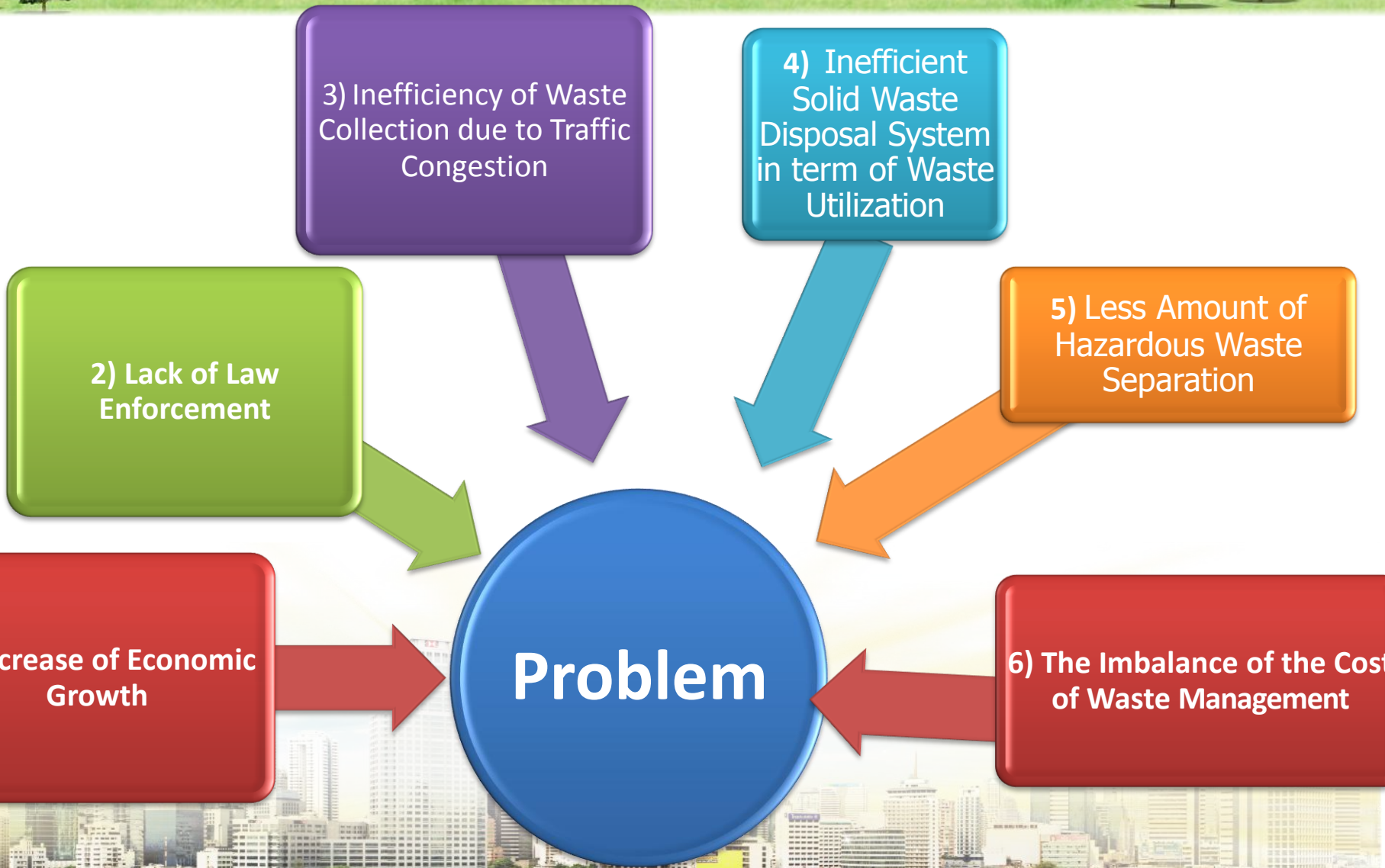
Research and develop knowledge and technology for SWM

Promote R&D

Develop SWM innovation



# Solid Waste management Problem





# 4. Solid Waste Management in Bangkok

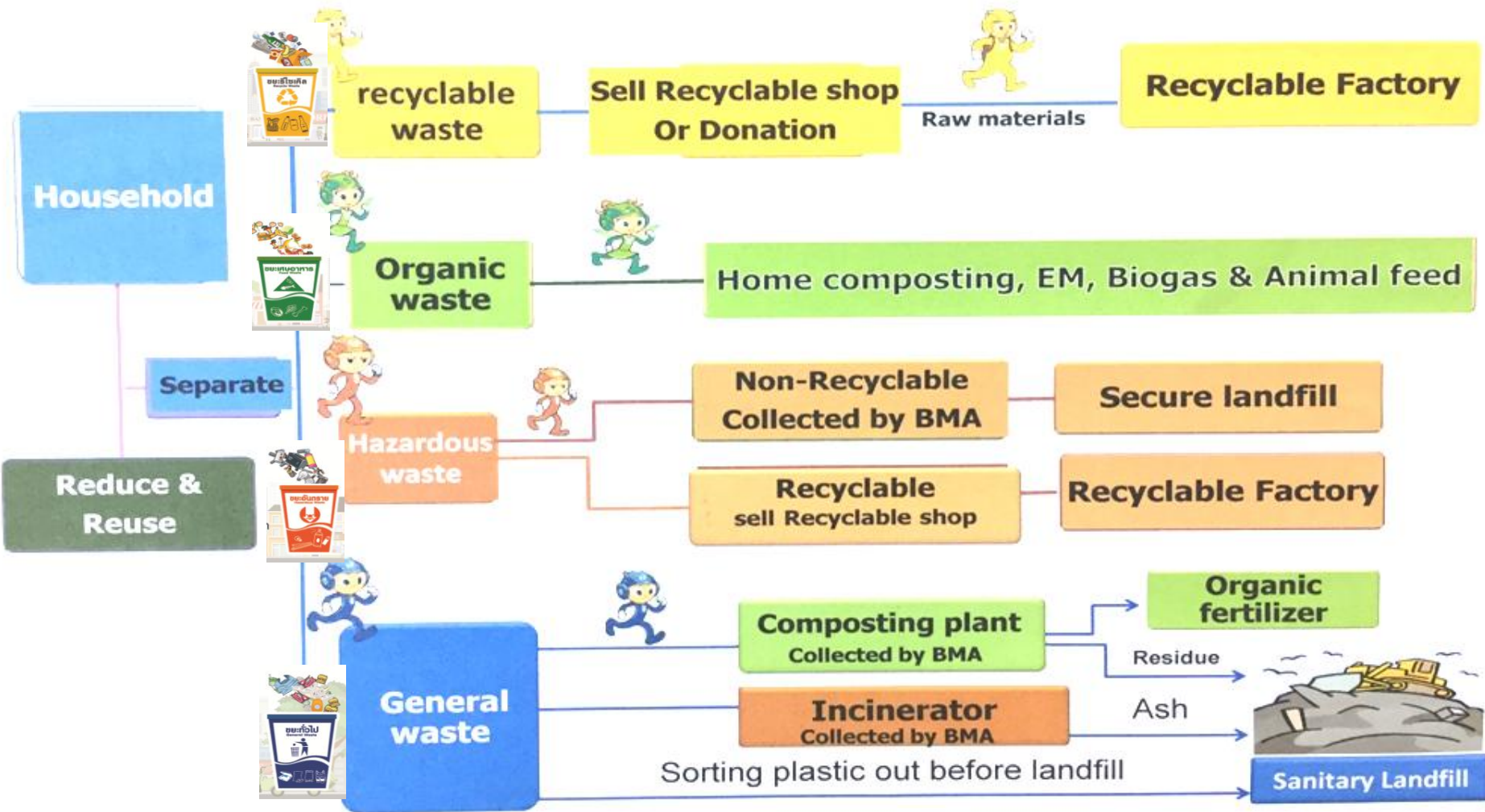




# 4. Solid Waste Management in Bangkok

## Waste Minimization at Source

### Waste Separation System in Bangkok





# 4. Solid Waste Management in Bangkok

## Waste Minimization at Source





# 4. Solid Waste Management in Bangkok

## The waste utilization 4,133 Tons/Day



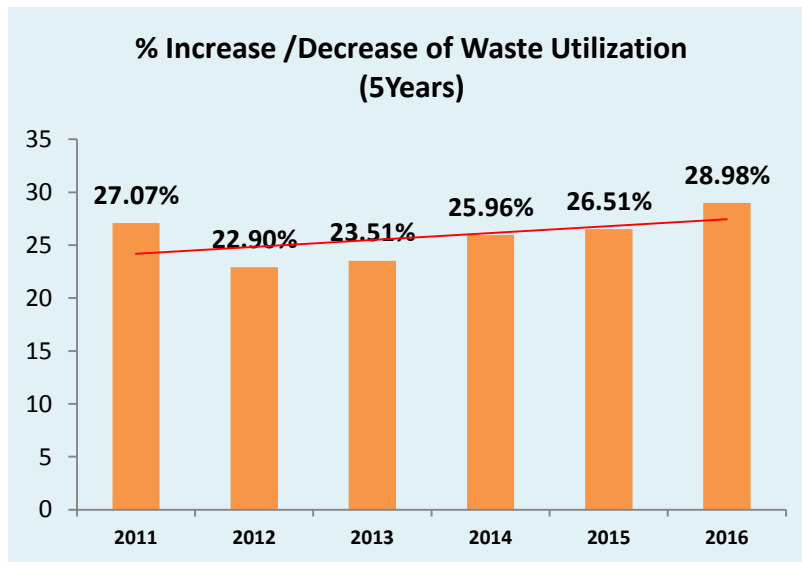
**Food Waste 393 Tons/Day(3%)**



**Yard Waste 305 Tons/Day(2%)**



**Recycle 3,435 Tons/Day(24%)**



**Waste Utilization**  
(Food Waste /Yard

Waste/Recycle)

**29%**



**Waste Disposal**  
**71%**

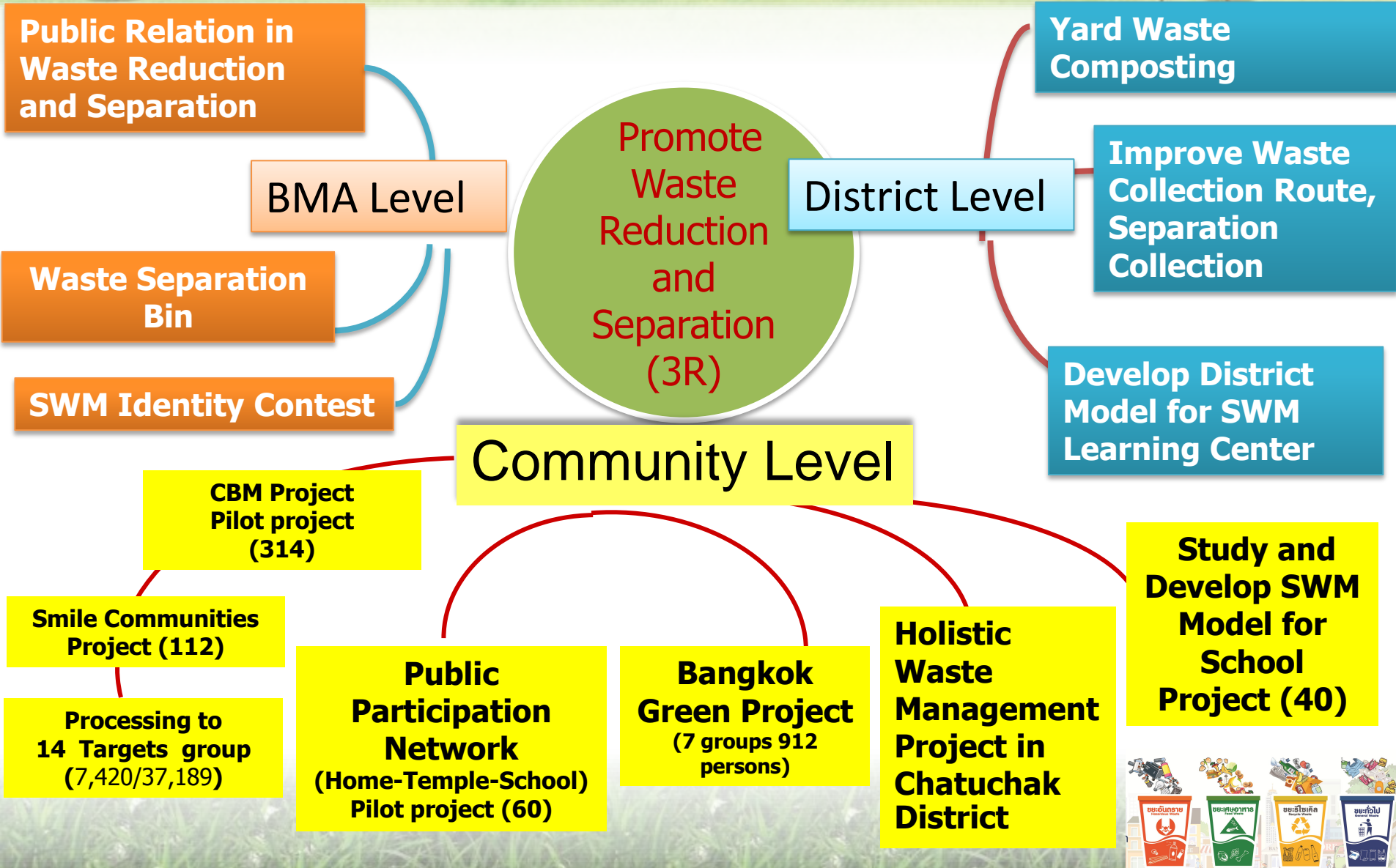
**In 2016**

- **Total Solid Waste (JBIC's Estimation) 14,263 Tons/day**
- **Solid Waste Utilization 4,133 Tons/day**
- **Collected Solid Waste 10,130 Tons/day**



# 4. Solid Waste Management in Bangkok

## Waste Minimization at Source



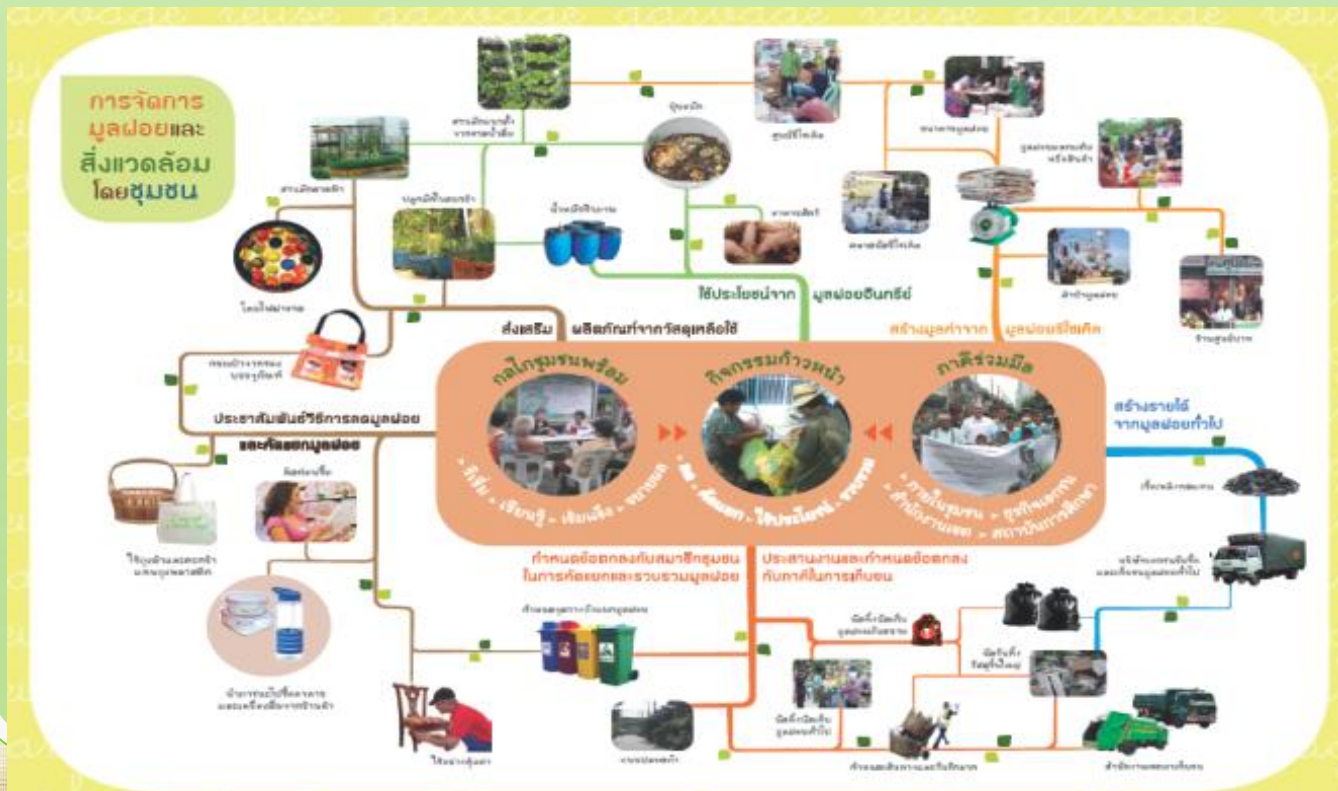


# Promote Waste Reduction and Separation with 3R concept (Community Level)

## Community Level

### 1. Community Based Solid Waste Management : CBM

- 12 Pilot Projects in 2009, 1 Extended Result in Each District, 52 Communities in 2010
- 5 Extended Results in Each District (Total 475 Communities, 422 Government and Private Organizations)
- Key Success Community Can Reduce Solid Waste 38 – 90 %







# Promote Waste Reduction and Separation with 3R concept (Community Level)

## Community Level

### 2. The Auspicious Occasion of Her Royal Highness Princess Maha Chakri Sirindhorn's Project (Home-Temple-School)

- **Public Participation in Solid Waste Management**
- **Consist of Community, Religious Place, Education Institute (Home-Temple-School) 60 Home-Temple-Schools**
- **Transfer Knowledge by Temple, Center of Participation by School, and Participate by Community**





# Promote Waste Reduction and Separation with 3R concept (Community Level) Community Level

## 4. "360° Recycle Project" in Chatuchak District

- ❑ Promote Waste Reduction and Separation at Source
- ❑ BMA, Department of Environment, Chatuchak District
- ❑ *Thailand Institute of Packaging and Recycling Management for Sustainable Environment (TIPMSE)*
- ❑ *Coca-Cola Foundation (Thailand)*

Reduce Solid Waste 41.2 % Reduce CO<sub>2</sub> 17,898 Tons

Reduce SWM Cost in BMA 11.4 Million Baht (30 %)

Increase Income 6.6 Million baht

Increase Public Satisfaction from 81% to 88%

Increase Public Participation from 86% to 98 %

Develop to SuanLuang SWM District Model

- ❖ Indirect Stakeholder
- ❖ Direct Stakeholder
  - Office Building
  - Community/ Household
  - Education Institute
  - Public Park/ Market
  - Department Store
  - Mo Chit Bus Terminal
  - Sweeper





# Promote Waste Reduction and Separation with 3R concept (Community Level)



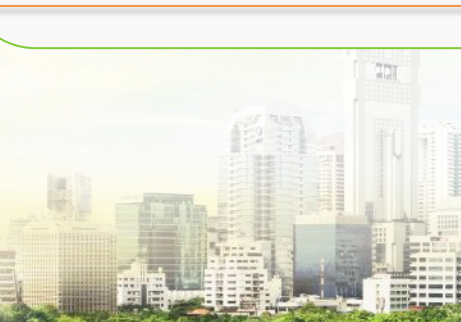
## 5. District Model of Waste as a Resource in SuanLuang District

- ❑ BMA, Department of Environment, SuanLuang District, KU
- ❑ Increase Perception in Stakeholder
- ❖ Target : Reduce the amount of waste generation by Eco-Friendly
- ❖ Concept : Solid Waste Reduction and Separation at Source
- ❖ Separate Waste Separate Collection: Appointed Time for Collection

- Reduce Solid Waste in 4 Pilot Routes, 20% Average
- Collect Yard Waste for Utilization in 4 Pilot Routes
- : Average 3.4 Tons/Day
- Solid Waste Separation at source, Reduce Amount of Waste in BMA
- Food Waste from Restaurant for Animal Feeding:
- : Average 2 Tons/Day

### Stakeholders

- ❖ Government Officers in SuanLuang District
- ❖ Department of Environment in SuanLuang District - Community
- School
- Office Building
- Market
- Department Store
- Restaurant
- Government Authority
- Peddler
- Religious Place





# Promote Waste Reduction and Separation with 3R concept District Level

## Separation Bin (3R concept)



## Up cycling



## Reuse Shop





# Promote Waste Reduction and Separation with 3R concept District Level

## Yard Waste Collection Appointment (Compost)



## Waste Separation Bin



## Solid Waste Management Learning Center





# Promote Waste Reduction and Separation with 3R concept

## Bangkok Level

### Public Relations By Media



### Separation Bin



### SWM Mascot Identity





# Waste Collection and Transportation



- **Main&Minor Road** Collect General Waste & Food Waste: 08.00p.m. – 03.00a.m.
- **Completed** before 05.30 a.m.
- **Small Road and in Community** depending on frequency

**Household Waste**  
**Bulky Waste**  
**Hazardous Waste**

- **Every Day**
- **Every Month**
- **Every 2 weeks**



**Waste Collection Truck**  
Capacity 2 tons and 5 tons



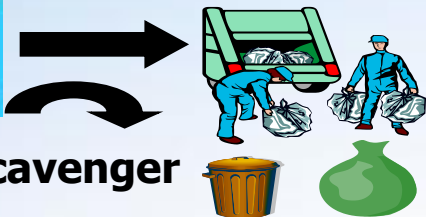
**Lifting Container Truck**  
Capacity 8 m<sup>3</sup>

# Solid Waste Disposal in Bangkok

**Solid waste from Household**



**Separation at Source**

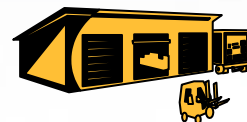


**Scavenger**

**Separation during Collection**

**10,000 Tons/Day**

**Sai Mai Transfer Station**  
2,400 Tons/Day (24%)



**NongKheam Transfer Station**  
3,400 Tons/Day (34%)



**Onnut Transfer Station**  
2,900 Tons/Day (29%)



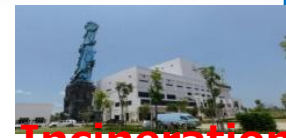
**Onnut Composting Plant**  
1,700 Tons/Day (17%)

**Transfer to Landfill**



**NakhonPathom**

**500 Tons/Day (3%)**



**Incineration**

**Wrapping**



**Chachoengsao**

- ❖ **Infectious Waste**  
Operated by Krungthep Thanakom Company 34 Tons/Day
- ❖ **Household Hazardous Waste**  
Disposal By Permitted Company 2.27 Tons/Day
- ❖ **Construction Waste and Demolition Disposal** At Onnut transfer station





# 4. Solid Waste Treatment and Disposal

## Transfer Stations and Sanitary Landfill Sites





# Composting Plant

## Composting from Organic Waste

- 1,000 tons/day
- Fertilizer ~ 300 tons/day



# Incineration Plant

By Public Private Partnership (PPP)

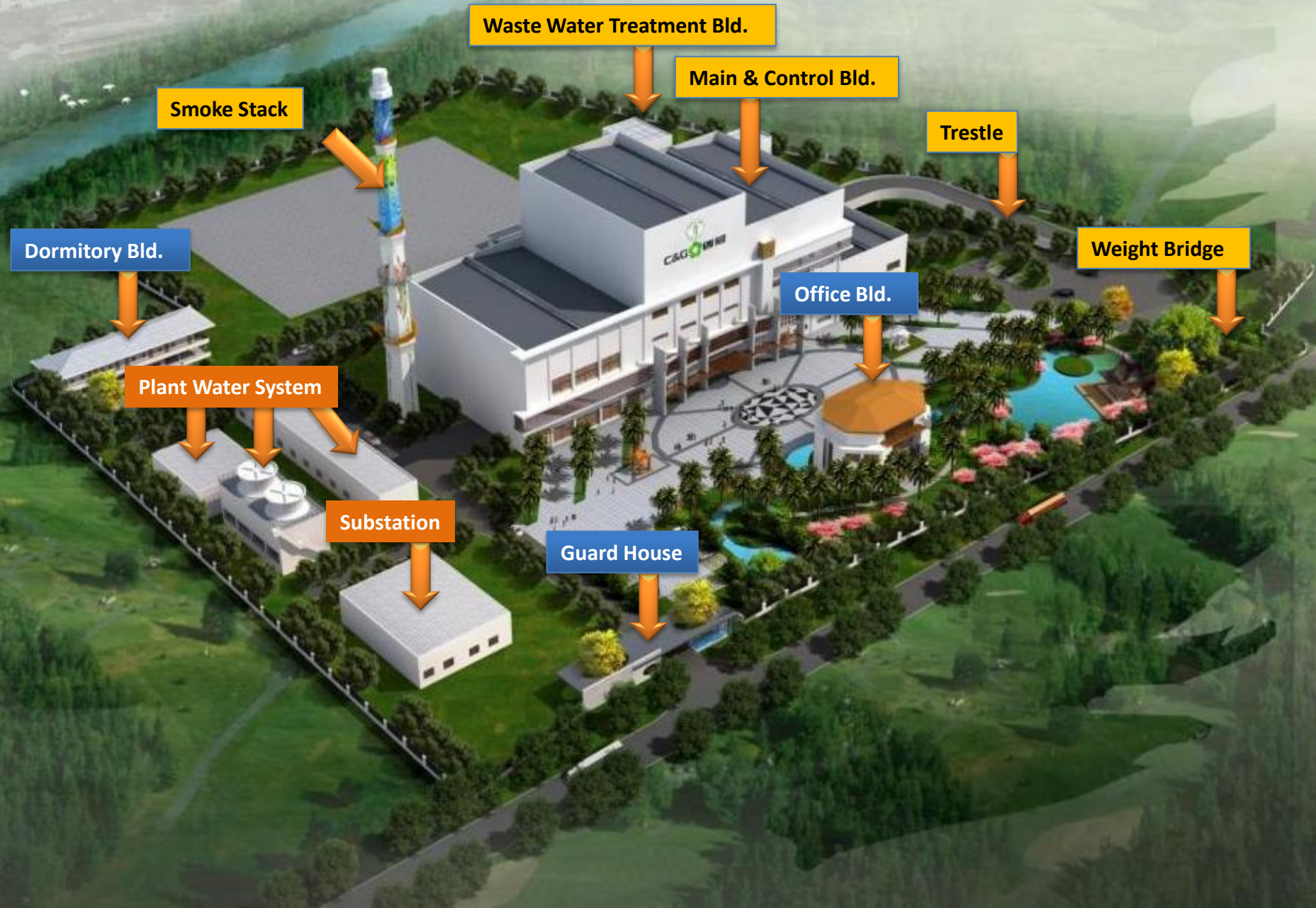
Incineration 500 Tons/Day

NongKheam Disposal Center

Started Operation on 10 May 2016

- **Stoker Type 2 Incinerators (250 Tons/Unit)**
- **Temperature > 1,000 °C**
- **Pollution Control System**
- **Electric Generation 5 MW**
- **BOT (Built - Operate - Transfer) Time 20 Years**

# Incineration Plant with Capacity 500 Ton/day





# Infectious waste collection and Disposal



- ❖ 2,430 health care services/month (in 2015)
- ❖ Amount of Infectious waste 34 tons/day
- ❖ 22 trucks of infectious waste collection
- ❖ 100 staffs of infectious waste collection and disposal

- Infectious Waste Incinerator On-nut Transfer Station Capacity 10 tons /day (x2) Total 20 tons /day
- Infectious Waste Incinerator Nong Khaem Transfer Station Capacity 10 tons /day (x2) Total 20 tons /day



# 6. E-Waste Management

## Current Situation

### ❖ In Thailand :

- (draft) National Integrated E-waste Management Strategy

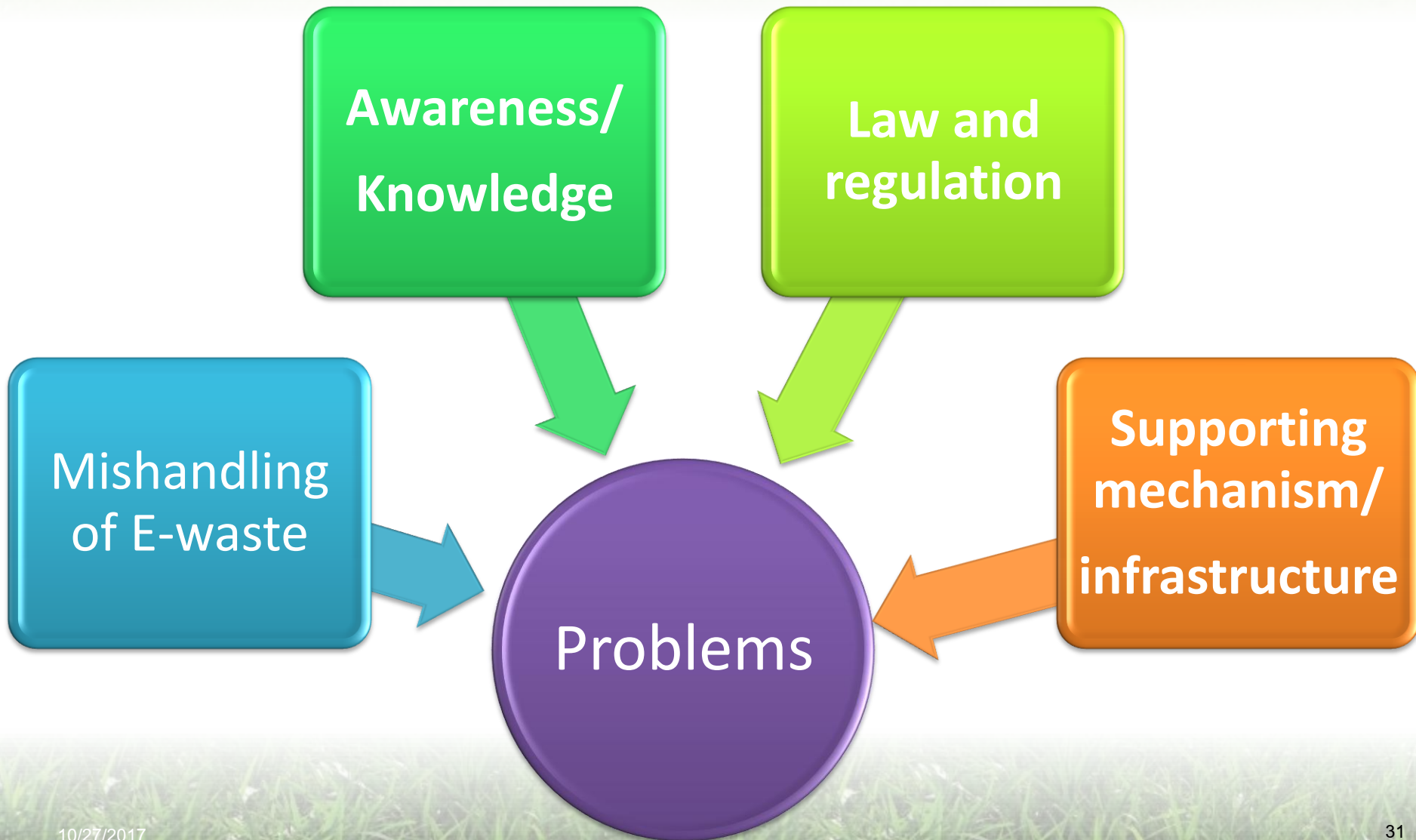
- PCD Estimated that the amount of E-waste in 2014 is 376,801 tons and 384,233 tons in 2015.

### ❖ In Bangkok :

- Recording data about Hazardous waste , including E- waste such as batteries , lamp and electronic products



# 6. E-Waste Management





# 6. E-Waste Management







# 6. E-Waste Management

## Future Plan

- ❖ **Capacity Building**
- ❖ **Information System**
- ❖ **Law and regulation**
- ❖ **Co-operate with national Level**



# Thank you Very Much



**Department of Environment**

**Bangkok Metropolitan administration**