Solid Waste Management of Bangkok

Department of Environment
Bangkok Metropolitan Administration
Solid Waste Situation of Bangkok

Amount of Solid Waste in Bangkok
10,700 tons/day

How much?

2,140 of waste collection trucks are used per day!!!
The amount of solid waste in 2018 increased by 180 tons/day from 2017, representing 1.71 percent.
Challenges of Solid Waste Management

- Rapid urban growth, more people live in Bangkok

Population forecast for Bangkok 2017 *
  - registered population: 5,767,043
  - non registered population: 5,213,724

* The report on waste management as resource studied by Kasetsart University
26 August 2014, The National Council for Peace and Order (NCPO) has approved the solid waste and hazardous waste management roadmap.
Solid Waste Management Road Map!!

2014
- The solid waste and hazardous waste management roadmap was stipulated.
- NCPO approved on 26 August, 2014

2015
- National solid waste management master plan for 2016 - 2072 was prepared.
- The Cabinet approved on 3 May 2016.

2016
- Action plan "Thailand without waste" according to the Civil State Guidelines for 1 year (2016 - 2017)
- The Cabinet approved on 20 September 2016.
Challenges of Solid Waste Management

- Behavior and culture of popular consumer society
  - Discarding waste materials or packaging without being sorted, reused or recycled

- Lack of legal support measures
  - Waste separation at source
  - The use of recyclable materials
  - The manufacturer’s responsibility for managing their products wastes and packaging

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Illegal dumping of bulky waste

- mattress, sofa, table, refrigerator etc.
- obstacle of water drainage
Challenges of Solid Waste Management

The cost is very high compared to the collected fees.

Real Cost: 228 Baht/month (waste generated not more than 20 liter/house/day)

Collected Fee: 20 Baht/month

Cost of waste management:
- Collection: 4,190 MBaht
- Disposal: 2,953 MBaht

Total Cost: 7,143 million baht

Total collected Fee: 509 million baht

Department of Environment
Comparison of waste management costs and collected fees

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost of Waste Management</th>
<th>Collected Fee</th>
</tr>
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<tbody>
<tr>
<td>2007</td>
<td>4,312</td>
<td>400</td>
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<tr>
<td>2008</td>
<td>4,751</td>
<td>416</td>
</tr>
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<td>2009</td>
<td>4,470</td>
<td>419</td>
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<tr>
<td>2010</td>
<td>5,028</td>
<td>424</td>
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<tr>
<td>2011</td>
<td>5,728</td>
<td>438</td>
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<tr>
<td>2012</td>
<td>6,189</td>
<td>419</td>
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<tr>
<td>2013</td>
<td>6,119</td>
<td>455</td>
</tr>
<tr>
<td>2014</td>
<td>6,519</td>
<td>476</td>
</tr>
<tr>
<td>2015</td>
<td>6,568</td>
<td>476</td>
</tr>
<tr>
<td>2016</td>
<td>6,985</td>
<td>496</td>
</tr>
<tr>
<td>2017</td>
<td>7,143</td>
<td>509</td>
</tr>
<tr>
<td>2018</td>
<td>6,924</td>
<td>523</td>
</tr>
</tbody>
</table>

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1. Integrate solid waste management system, reduction at source, collection, transportation and waste disposal.

2. Control to reduce the amount of waste to a minimum and reuse as much as possible.

3. Collect solid waste thoroughly and efficiently.

4. Dispose waste hygienically, environmentally friendly method, reduce landfill sites and focus on using waste to energy technology.
Solid Waste Management Policy and Plan of Bangkok

National Waste Management Master Plan 2016-2021
- 75% of general wastes are managed properly
- 30% of hazardous wastes are managed appropriately
- 100% of infectious wastes are managed appropriately
- 50% of local government organizations manage waste at source
  (Base year: 2013)

20 years Bangkok Development Plan 2013-2032
- 50% of wastes are separated and utilized at source
- 20% reduction in waste that will be disposed of
- Treated waste return to be utilized up to 400%
  (Base year: 2013)

Management plan Solid waste of Bangkok 2015-2019
- Reduce the amount of disposed waste by 7%.
- Increase the amount of collected household hazardous waste up to 20%
- Increase the amount of waste disposed by appropriate technology and most utilization up to 30%
  (Base year: 2013)

20 years Bangkok Solid Waste Disposal Plan 2015-2035
- Increase waste treatment system which waste will be utilized
- Reduce 50% of waste disposed in landfill site
  (Base year: 2013)

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Solid waste management guidelines according to community waste management action plan “Clean Province” in the year 2018

- Communicate to reduce solid waste amount according to 3R Principle
- Arrange at least 4 types of waste bin to support solid waste separation.

Frameworks

- Focus on promoting the civil state including the government sector, private sector, education sector, religious sector and civil society / public sector
- To reduce, separate and utilize solid waste at the source according to the 3R principle, use less, reuse, recycle and control the increase the amount of solid waste from the source.

District Offices

- Acknowledge and make understanding for people participation
- Set up hazardous waste collection points
- Request cooperation, providing adequate solid waste bins in tourist attractions, parks.

All Organization in BMA.

Solid Waste Management Guidelines

Department of Environment 13
Solid Waste Management of Bangkok

- Support 14 target groups, 33,167 civil states groups
- Reduce use, reuse, waste utilization and waste separation

Educational
Public Relations
R&D

Reduction and Sorting

Waste Management

Disposal

Collection and Transportation

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Solid Waste Management of Bangkok

- Civil states groups and 14 target groups
  - Waste separation, set up hazardous waste collection points

- District Offices
  - Utilize waste from operations

- Schools and organizations of BMA
  - Separate wastes

at Source
Reduction and Separation

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Solid Waste Management System of Bangkok

**Source of solid waste**
- 14 target group +

**Promote Reduce & Reuse**

**Separate Solid Waste**

**Recyclable Waste**
- Promote people to separate waste and sale them to buyers or junk shops
- Domestic / aboard recyclable material
  - Factories

**Organic Waste**
- Promote people to make compost, fermented liquid fertilizer, biogas, feed animals at source
- District offices collect yard waste, vegetable and fruits waste from big places, then transform them to be compost at district learning center or transport waste to compost plants of BMA

**Household Hazardous Waste**

**General Waste**
- All unsorted wastes
  - To Waste Transfer Stations 80%
  - To Waste to Energy Incinerator 5%
  - To Compost Plants 15%
  - Separate recyclable material

**Non-Recyclable (Safe Dispose)**
- Contract a private company
- Domestic / aboard recyclable material
  - Factories

**Recyclable material Junk shops**

**Contract a private company**

**Domestic / aboard recyclable material Factories**

**To Wastewater Treatment Plants**
- Residue
  - Ash
  - Landfill Sites

**Department of Environment**
Examples of campaign activities on waste reduction and separation at sources according to the 3R principle

1. Bangkok Level
   - Setting up separate waste bins
   - Providing household hazardous waste bins in 106 of Shell gas stations
   - Project of waste reduction and separation in 14 target groups
   - Project of Community Based Solid Waste Management (CBM) 506 communities

2. District Level
   - Develop each district office to be a waste management learning center
   - Make compost from yard waste and food waste
   - Improve waste collection route map
   - Appoint date for each type of waste collection
   - Network of Solid Waste Management Cooperation
   - Public Private Partnership for Sustainable Plastic and Waste Management

3. Community Level
   - Promotion on Waste Reduction and Separation according to 3R
   - Network of Solid Waste Management Cooperation “H T S” House Temple School
   - Project of Solid Waste and Waste Water Management by Communities in 12 Canal Area
   - Integrated Solid Waste Management Learning Center 6 Schools in 6 BMA Zone
   - Project of Processing Food Waste into Biogas in 40 Schools
   - Example of campaign activities on waste reduction and separation at sources according to the 3R principle
Examples of campaign activities on waste reduction and separation at sources according to the 3R principle

1. Bangkok Level

Setting up at least 2 types of waste bins in public places to support waste separation according national policy
Examples of campaign activities on waste reduction and separation at sources according to the 3R principle

1. Bangkok Level

Cooperation with various sectors in hazardous waste management
Examples of campaign activities on waste reduction and separation at sources according to the 3R principle

1. Bangkok Level

A cooperation project of hazardous waste collection in the Shell gas station
2. District Level

Zero Waste District

Send to Farmer for animal feeding

Send to composting plant

Food Waste

Organic Waste to compost

Branches & yard waste

Vegetable & Fruit

Leaf

Water Hyacinth & Weed

District promote the waste utilization at source
3. Community level
Waste separation at source in 2018

- Total 3.90 Million ton/year
- Landfill 80%
- Incineration 5%
- Composting 15%

**General Waste**
- 10,700 Tons/day
- 85.21%

**Recycle**
- 1,197 Tons/day
- 9.53%

**Organic Waste**
- 649 Tons/day
- 5.24%

**Hazardous Waste**
- 2.7 Tons/day
- 0.02%

- Vegetable/Fruit & yard waste
- Compost Animal Feeding at source 588 tons/day
- Send to composting plant 70 tons/day

- Public
- Scavenger
- Waste collector
- Segregation for selling to recycle shop
- Drop off in community
- Drop off in shop
- Private subcontract for disposal
Solid waste management in Bangkok

Middle stream
Collection & Transportation
Waste collection: Human resources & Vehicles

- BMA’s truck:
  - 495 Unit (22%)

- Rented Truck:
  - 1,571 Unit (78%)

- Boat:
  - 111 Unit
    - (DOE 54 Unit / DO 57 Unit)

- Waste collector:
  - 10,454 person
Service Time

1. Waste collection time 06.00 p.m. – 03.00 a.m.
2. Completed all the waste collection by 05.30 a.m.
3. Community, small road, street collect by appointment or under the consideration

Type & frequency of waste collection

- General Waste: Daily or alternated day depend on location
- Organic waste from market: Daily
- Bulky/recycle waste: Once a month or appointment time
- Hazardous waste: Every Sunday or appointment time
- Infectious waste: Daily or appointment time depend on healthcare service
- Yard waste/Construction waste: By appointment from household
Solid waste management in Bangkok

- Landfill
- Composting
- Incineration (Waste to Energy)

Downstream Waste Disposal
Solid Waste Management in Bangkok (In Present)

General Waste

Scavenger

Informal separation at household

10,700 tons/day

Segregation during collection

SaiMai

2,500 tons/day (23 %)

Landfill 2,500 tons/day

NAKHON PATHOM

Landfill 3,500 tons/day

NAKHON PATHOM

Incineration 500 tons/day

Onnut

4,200 tons/day (40 %)

Landfill 3,600 tons/day

CHACHOENGSAO

Compost 1,600 tons/day

Nong Khaem

4,000 tons/day (37 %)

Landfill 3,600 tons/day

Infectious Waste
Operated by Krungthep Thanakom Company 39 Tons/Day

Household Hazardous Waste
Disposal By NIT&W Company 2.7 Tons/Day

Yard Waste & Vegetable at Night soil Management Plant 70 tons/day

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Sanitary Landfill 8,600 tons/day

Panomsarakam District, Chachoengsao Province
Total 6 layers ~ 36 M. (6 meters per layer) With Daily Cover

Kampaengsan District, Nakhon Pathom Province
Total 5 layers ~ 15 M. (3 meters per layer) With Daily Cover
Composting Plant 1,600 tons/day

Composting from Organic Waste

- Weight
- Sorting
- Drum Rotating
- Sieving 80 mm.
- Sieving 4 mm.
- Sieving 7 mm.
- Oversize of sieving will be transferred to landfill

Soil conditioner from composting process (40 kg)

Sand, glass, stone, metal sieving

Zone A and Zone B 20 days per Zone (Total 40 days)

Oversize of sieving will be transferred to landfill

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Waste to energy project

Incineration plant with capacity 500 tons/day
At Nong Khaem District

- **Stoker Type 2 Incinerators**
  (250 Tons/Unit)
- **Temperature > 1,000 °C**
- **Pollution Control System**
- **Electric Generation 5 MW**
- **BOT (Built - Operate - Transfer)**
- **20 Years**
MBT (Mechanical-Biological Treatment)
- The waste management by waste to energy with MBT (Mechanical-Biological Treatment) Technology
  > 800 tons/day : electric generation 3 MW

* Expect to be completed by 2020

Incineration
- Incineration Plant ≤ 1,000 tons/day At Onnut & NongKhaem Disposal Center
- Electric generation 30 MW/plant
  * Expect to be started by 2022

Integrated Technology
- Compactor 1,000 tons/day At Nong Khaem&Sai Mai Disposal Center
- Solid Waste Management Learning Center 300 tons/day At Onnut Disposal Center
Solid Waste Management in Bangkok (In Future)

- **General Waste**
  - 10,700 Tons/day

- **Informal sorting from household**
  - Nong Khaem
    - 4,100 Tons/day (38%)
  - SaiMai
    - 2,100 Tons/day (20%)
  - Onnut
    - 4,500 Tons/day (42%)

- **Scavenger**

- **Segregation during collection**

- **Landfill**
  - 2,100 Tons/day
    - Compactor
      - 1,000 Tons/day
  - 1,600 Tons/day
    - Incineration
      - 500 Tons/day
    - MBT
      - 1,000 Tons/day
  - 800 Tons/day
    - Landfill
  - 300 Tons/day
    - Learning Center

- **Compactor**
  - 1,000 Tons/day

- **Compost**
  - 1,600 Tons/day

- **Incineration**
  - 1,000 Tons/day

- **MBT**
  - 1,000 Tons/day

- **Landfill**
  - 800 Tons/day

- **Learning Center**
  - 300 Tons/day
By 2022

- Landfill: Decrease from 80% to 30%
- Integrated Technology: Increase to 30%
- Incineration: Increase from 5% to 25%
- Composting: Unchanged 15%
1. Improve the rate of Waste Collection Fee

➢ BMA’s Ordinance in 2003 and 2005; specify the rate of SWM fee only collection cost

➢ BMA take a responsibility on Waste Management Cost >93%

(Draft) BMA’s Ordinance on Solid Waste Management Fee under the Public Health Act A.D ...............
# Example Rate of Waste management Fee

**Draft (BMA’s Ordinance)**

<table>
<thead>
<tr>
<th>Category</th>
<th>BMA’s Cost</th>
<th>BMA’s Ordinance (2003 and 2005)</th>
<th>Draft (BMA’s Ordinance)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Collection</td>
<td>Disposal</td>
<td>Total</td>
</tr>
<tr>
<td><strong>Nightsoil</strong> (Baht/CM³)</td>
<td>2,510</td>
<td>482</td>
<td>2,992</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General Waste</strong> * (Baht/Month)</td>
<td>130</td>
<td>90</td>
<td>228</td>
</tr>
<tr>
<td><strong>Infectious Waste</strong> ** (Baht/month)</td>
<td>300</td>
<td>480</td>
<td>780</td>
</tr>
</tbody>
</table>

* Calculate by waste generation 4 Kg./day or 120 Kg./month

** Calculate by infectious waste generation 2 Kg./day or 60 Kg./month
2. The Improvement of BMA’s Ordinance on the management and controlling of the solid waste business, waste collection, waste disposal, or take a benefit of SWM by receiving the service charge B.A..............

☞ To promote the private sector for the collaboration or Public Private Partnership (PPP) on SWM

☞ Under the process of the BMA’s Ordinance drafting
Special types of waste

- Hazardous waste
- Infectious Waste
- Construction Waste
- Bulky Waste
Hazardous waste : collection & transportation

Special part for
Hazardous waste & recycle waste

Hazardous Waste in 2018
= 993 tons or 2.7 tons/day

Disposal by appropriated technology
Healthcare service in 2018
Average number 2,783 places/month
Amount of Infectious waste collection 39 tons/day

- Onnut: Infectious Incinerator
  10 tons/day : 2 units total 20 tons
- Nong Khaem: Infectious Incinerator
  10 tons/day 2 units total 20 tons
Construction waste is the waste from the construction and demolition process such as concrete, stone, metal etc.
Bulky Waste Management

- **Repair**: repaired for reusing again
- **Separation**: separated part for reusing
- **Landfill/Incineration**: Disposal with appropriated method
Thank you for your kind attention

Department of Environment
Bangkok Metropolitan Administration

www.bangkok.go.th/environment