3Rs & Waste Management in Tokyo

Resource Recycling Promotion Division
Bureau of the Environment
Tokyo Metropolitan Government
TODAY’S TOPIC

1. INTRODUCTION
   1-1 WASTE/RECYCLING RELATED LAWS
   1-2 CITY PROFILE
   1-3 HISTORY OF WASTE IN TOKYO

2. 3RS AND WASTE MANAGEMENT IN TOKYO
   2-1 MSW
   2-2 INDUSTRIAL WASTE
   2-3 TMG’S 5-YEAR PLAN

3. CONCLUSION
1. INTRODUCTION

1-1 WASTE/RECYCLING RELATED LAWS
WASTE/RECYCLING RELATED LAWS

Basic Law for Establishing the Recycling-Based Society
(Stipulating Basic Philosophy for Establishing the Recycling-Based Society)

- Law for the Promotion of Effective Utilization of Resources
- Waste Disposal and Public Cleansing Law
- Containers and Packaging Recycling Law
- Home Appliances Recycling Law
- Food Recycling Law
- Construction Materials Recycling Law
- End-of-life Vehicle Recycling Law
- Promotion of Recycling of Small Waste Electrical and Electronic Equipment Law (2013.4-)

Promotion of Recycling of Small Waste Electrical and Electronic Equipment Law (2013.4-)
The hierarchy ranks waste management options according to their environmental benefits. These options should be taken, in this order, whenever environmentally beneficial and economically viable.
Some waste items, such as PCB, asbestos, infectious waste, and explosives, are classified as general or industrial waste under special control. They are obliged to be kept under strict control.
WASTE DISPOSAL AND PUBLIC CLEANSING LAW

Roles of each body stated in the law

**Nation level**
- Establish basic policies,
- Formulate waste disposal standards,
- Provide support to prefectures/municipalities, etc.

**Prefecture level**
- Establish waste management plan,
- Provide control/guidance for appropriate disposal of industrial waste,
- Give licenses to industrial waste disposal contractors and approve construction of waste management facilities,
- Provide support to municipalities, etc.

**Municipal level**
- Establish general waste management plan,
- Treat general waste according to general waste management plan,
- Give licenses to general waste disposal contractors, etc.
OBLIGATION OF MAKING A MSW DISPOSAL PLAN

In the Waste Disposal and Public Cleansing Law

Prefectural Plan

• Estimates amount of waste generation/treatment,
• Establishes basic policies related to reduction and treatment,
• Ensures proper management of general waste,
• Improves industrial waste management facilities, etc.

Municipal Plan

• Estimates amount of waste generation/treatment,
• Takes waste control measures,
• Classifies waste for sorting,
• Treats waste properly,
• Improves waste management facilities, etc.
LAW FOR
THE PROMOTION OF EFFECTIVE UTILIZATION OF RESOURCES

It states the standards of 3R efforts to be made by the producers regarding 69 products and 10 types of businesses.

The law covers approx. 50% of end-of-life products and waste in Japan.
CONTAINERS AND PACKAGING RECYCLING LAW

1. Waste containers and packaging
   - PET bottles
   - Steel cans
   - Aluminum cans
   - Glass bottles
   - Plastic containers and packaging, etc.

2. Laws
   - Source Separation
   - Separate Collection

   Consumer
   (Domestic waste)

   Municipalities

   Recycling facility
   - Steel cans, etc. are sold
   - Japan Containers and Packaging Recycling Association (Designated bodies)

   Recycling costs
   - Businesses using containers and packaging user, containers and packaging producer, retailer/wholesaler, etc.
HOME APPLIANCES RECYCLING LAW

2. Laws

Payment of costs

Discharger (Consumer)

Home Appliances
Air conditioner
TV (CRT type)
Refrigerator, Freezer,
Washing machine, Dryer,

Retailer

Take-back from consumer

Designated collection site

Recycling facility

Producer/Importer

Take-back from retailers
Recycling, etc.

Designation/placement
CONSTRUCTION MATERIALS RECYCLING LAW

Items to be recycled

Order/implementation flow of sorted demolition/recycling

Waste wood from construction and demolition sites 4.71 million tons (6%)
Construction sludge 7.52 million tons (10%)
Asphalt/concrete lump 26.06 million tons (34%)
Concrete lump 32.15 million tons (42%)
Mixed construction waste 2.93 million tons (4%)
Others (Scrap metal, waste plastic, waste paper) 3.63 million tons (5%)

National Total 77 million tons

Ordering party (Formulation of sorted demolition plan)

Prefecture governor

Commission to municipality

Advice/recommendation/order/report order/inspection

Written report

Prior notification

[Change order]

Main contractor (Confirmation of recycling completion and report to ordering party)

Contractor

- Implementation of sorted demolition and other recycling work
- Work management by engineering manager

Subcontractor

Announcement

Contract

Main contractor (Construction work plan formulation and explanation to the ordering party)

Explanation

Contract

Note: Penalty with fine is imposed on an ordering party who fails to comply with notification/change order.

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FOOD RECYCLING LAW

In the Food Recycling Law, food waste that can be effectively used as fertilizer, feed, etc. is known as cyclical food resources.

<table>
<thead>
<tr>
<th>Component</th>
<th>Annual generation (10,000 tons)</th>
<th>Recycling rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food producer</td>
<td>493</td>
<td>81</td>
</tr>
<tr>
<td>Food wholesaler</td>
<td>74</td>
<td>62</td>
</tr>
<tr>
<td>Food retailer</td>
<td>263</td>
<td>35</td>
</tr>
<tr>
<td>Restaurants</td>
<td>305</td>
<td>22</td>
</tr>
<tr>
<td>Food industry total</td>
<td>1,134</td>
<td>54</td>
</tr>
</tbody>
</table>
END-OF-LIFE VEHICLE RECYCLING LAW

Vehicle owner (Final owner)
Pay recycling fee; Deliver an end-of-life vehicle to the receiver registered with the municipality

Receiver
Receives ELVs from the final owner, and delivers them to fluorocarbon recovery operators or dismantlers.

Fluorocarbon recovery operator
Recovers fluorocarbons and delivers it to automobile manufacturers or importers.

Dismantler
Dismantles ELVs, recovers airbags, and delivers them to automobile manufacturers or importers. Recovers fluorocarbons and delivers them to automobile manufacturers or importers.

Shredder operator
Shreds dismantled ELVs, and delivers shredder dust to automobile manufacturers or importers.

Automobile manufacturer/importer
When vehicles they produced or imported are scrapped, they take over shredder dust, airbags, and fluorocarbons generated from the ELVs, and recycle them.
SMALL ELECTRONIC DEVICES RECYCLING PROMOTION LAW

From April 2013

**Background**

**Limitation of Natural Resources**
- Escalating price of resources

**Limitation of Environment**
- Lack of land for final landfill site
- Proper management of the environment

**Concept**

**Non mandatory scheme**
Provide guideline, set up necessary procedure for each sector
In order to promote recycling of precious metals used in small electronic devices

![Diagram of recycling process](image)

- **Manufacturer**
- **Retailer**
- **Consumers**
- **Municipality**
- **Depot**
- **Recycling Facilities**
- **Metal Refining**

**Delivery**

- Box/station/pick up etc.

**Cyclic Use**

**Certified business operator**

**Contract**
1. INTRODUCTION

1-2  CITY PROFILE
Japan
Area: 378 thousand km$^2$
Population: 128 million
No. of Prefecture: 47

Tokyo
Area: 2,188 km$^2$
Population: 13 million
No. of City: 62
TOKYO

Tama area
Area: 1160 km$^2$
Population: 4,192,937
No. of municipalities: 30

23-ward area
Area: 622 km$^2$
Population: 9,002,488
No. of municipalities: 23

Izu/Ogasawara islands
Area: 406 km$^2$
Population: 27,335
No. of municipalities: 9

As of 1st Jan 2013
RAPID INCREASE OF POPULATION AND MSW

- **MSW**
- **Population**

End of WWII

**Population**

**MSW**

**Year**


1,000,000 2,000,000 3,000,000 4,000,000 5,000,000 6,000,000

(ton)

(population)

出典:
ごみ量は H10 までは百年史 H11 からは ごみれぽ 人口は東京都の統計資料 HP から

Rapid increase of population and MSW.
【Biggest Challenge】 Lack of land for FDS
FDS in Tokyo Bay

1. 1927-1962
2. 1957-1966
3. 1965-1974
4. 1973-1986
5. 1977-
7. 1998-
1. INTRODUCTION

1-3 HISTORY OF WASTE IN TOKYO
OPPOSITION AGAINST INCINERATOR 1950’s
OUTBREAK OF FLIES (1965)

Burning down flies on FDS in cooperation with fire department and polices.
GARBAGE WAR  1970’s

Don’t bring garbage into my city
PEAK OF WASTE GENERATION (1989)
Illegal Dumping (C&D Waste)
REDUCTION OF FINAL DISPOSAL AMOUNT

Tama Area
1,160km²
4 million people

Central Area
622km²
9 million people

Unit 1,000ton

出典:
区ごみれぽ
2014 p.23, p30 (H24データ)
ごみの発生量と資源回収量を合算

多摩東京都区市町村清掃事業年報
平成22年度 実績
※要更新
2. 3Rs and Waste Management in Tokyo

2-1 MSW
2-2 Industrial Waste
2-3 TMG’s 5-Year Plan
2. 3Rs & Waste Management in Tokyo

2-1 MSW
WASTE GENERATION IN TOKYO

In 2011

77,700t/day

M S W : 12,600t/d

Industrial : 65,100t/d

Industrial Waste 84%

Municipal Solid Waste 16%
MSW IN TOKYO

Waste generation in Tokyo

- Municipal solid waste: 16%
- Industrial waste: 84%

Waste generated by
- Households
- Small businesses

Managed and disposed by
Municipal Government

12,600 T/D
MSW Management

- Each municipal government has responsibility for MSW management
- Providing careful services to residents
RATIO OF MSW

Bulky 2%
Recyclables 16%
Incombustibles 2%
Combustibles 80%

23-ward area (2010)
Source: Clean Association Tokyo23
COMPOSITION OF COMBUSTIBLE WASTE

- Papers: 40%
- Kitchen Waste: 25%
- Plastics: 17%
- Woods & grasses: 10%
- Clothes: 6%
- Others: 2%

23-ward area (2012)
Data: Clean Association Tokyo23
CURRENT MSW FLOW

MSW

Combustibles

Incombustibles

Bulky Wastes

Recyclables

Hazardous Waste

Energy Recovery

Ash Recycling

Eco-cement

Ash

Landfill Site

Combustible Residues

Pulverization Facilities

Residues

Metals

Recycling

Processing properly
CURRENT MSW FLOW

1. MSW
2. Combustibles
   - Incombustibles
   - Bulky Wastes
   - Recyclables
   - Hazardous Waste
3. Ash Recycling
   - Slag
   - Eco-cement
4. Landfill Site
   - Recycling
   - Processing properly
SOURCE SEPARATION BY RESIDENTS

Recyclables and garbage collection point in the community
VOLUNTARY RECYCLING ACTIVITIES

Sign: Collection point for recyclables
CONTINUOUS COMMUNICATION
ENVIRONMENTAL EDUCATION
21 Incineration Plants in 23-Ward

Population: 9 million
Area: 622 km²

Source: Clean Association of TOKYO23
**FEATURE OF INCINERATION PLANT IN 23 WARD**

**Toshima incineration plant**
- next to Ikebukuro Station
  (2.7 million passengers/day)

All incineration plants in 23-ward
- equipped with power generator

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Generated Power</td>
<td>1,091 million kWh</td>
</tr>
<tr>
<td>Electricity sold</td>
<td>510 million kWh</td>
</tr>
<tr>
<td>Income from electricity sold</td>
<td>5.4 billion yen</td>
</tr>
<tr>
<td>Supplied heat (Charged)</td>
<td>580,000 GJ</td>
</tr>
<tr>
<td>Income from heat sold</td>
<td>194 million yen</td>
</tr>
</tbody>
</table>

- have certificate of ISO14001

Source: Clean Association of TOKYO23
POLLUTION CONTROL OF SYNGAS

A: Soot and dust control
B: Dioxin control
C: Mercury control
D: Hydrogen chloride and SOx control
E: NOx control

Source: Clean Association of TOKYO23
ASH RECYCLING - ASH MELTING

(23 wards Area)

Ash Melting Furnace (Arc type)

Electrode
Incineration Ash

Flue gas (Exhaust gas)

over 1200 °C

Slag
Used for construction material

Source: Clean Association of TOKYO23
ASH RECYCLING - ECO CEMENT (Tama Area)

Used for construction material

Eco-cement

Source: Tokyo Tama Regional Association for Waste Management and Resource Recycling
FINAL DISPOSAL SITE (FDS) IN TOKYO BAY

Photo: Bureau of Environment, TMG
FDS

CENTRAL BREAKWATER OUTER LANDFILL SITE / NEW SEA SURFACE DISPOSAL SITE

Landfill inside central breakwater

Tokyo Port Seaside Road

A Block to G Block

A Block
115 ha
20 ha

B Block
72 ha

C Block
69 ha

D Block
67 ha

E Block
91 ha

F Block
88 ha

G Block
73 ha

Landfill disposal site outside central breakwater (No. 1)

Landfill disposal site outside central breakwater (No. 2)

New landfill disposal site on seawater surface

FDS CENTRAL BREAKWATER OUTER LANDFILL SITE / NEW SEA SURFACE DISPOSAL SITE

Current landfill disposal site

Past landfill disposal site

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**Structure of FDS**

- **Sandwich construction technique**
  - Waste: Approx. 3 m
  - Soil: Approx. 50 cm

- **Tokyo Bay**

- **Landfill**
- **Clay layer**
- **Leachate collection**

- **Rain**
- **Landfill gas**
- **Power generator**

- **Waste water treatment facility**
- **Sewage treatment plants**
ENVIRONMENTAL EDUCATION AT FDS

No. of Visitor: 43,000 person/year (including 37,000 elementary children)
2. 3Rs & Waste Management in Tokyo

2-2 Industrial Waste
In 2011

77,700t/day
M S W : 12,600t/d
Industrial : 65,100t/d

Waste Generation in Tokyo

Municipal Solid Waste
16%

Industrial Waste
84%
**INDUSTRIAL WASTE IN TOKYO** 65,100 T/D

**Generator has responsibility for proper disposal**

Disposed by private sector licensed by Prefectural Government
COMPOSITION OF INDUSTRIAL WASTE

Water and Sewage Sludge

Construction and Demolition

Others
**DISPOSAL FLOW OF INDUSTRIAL WASTE**

- **Waste Generation**
  - 23 million tons / year
  - Construction businesses,
  - Manufacturing businesses,
  - Hospitals, etc.

- **Intermediate Treatment**
  - 23 million t/y (99%)
  - Dehydration,
  - Shredding,
  - Incineration, etc.

- **Final Disposal**
  - 839 t/y (4%)

- **Recycling**
  - 6,274 t/y (27%)

- **Licensed Private Company**
  (Issued by Prefectural Government)

- **Construction businesses,**
- **Manufacturing businesses,**
- **Hospitals, etc.**
Reduction of Final Disposal of Industrial Waste

Started recycling of construction/demolition waste by law
How wide the Industrial Waste produced in Tokyo is disposed.

<table>
<thead>
<tr>
<th>Region</th>
<th>Waste (10 thousand tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tochigi</td>
<td>10</td>
</tr>
<tr>
<td>Ibaraki</td>
<td>4</td>
</tr>
<tr>
<td>Chiba</td>
<td>35</td>
</tr>
<tr>
<td>Saitama</td>
<td>10</td>
</tr>
<tr>
<td>Gunma</td>
<td>4</td>
</tr>
<tr>
<td>Kanagawa</td>
<td>7</td>
</tr>
<tr>
<td>Tokyo</td>
<td>11</td>
</tr>
<tr>
<td>Others</td>
<td>28</td>
</tr>
</tbody>
</table>

Unit: 10 thousand tons

In 2011

出典: 東京の資源循環 2013 P73

<CHALLENGE 1>
LACK OF DISPOSAL FACILITIES IN TOKYO
**Illegal Dumping is still remained**

No. of dumping cases

<table>
<thead>
<tr>
<th>Year</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY1998</td>
<td>23</td>
</tr>
<tr>
<td>FY1999</td>
<td>21</td>
</tr>
<tr>
<td>FY2000</td>
<td>19</td>
</tr>
<tr>
<td>FY2001</td>
<td>9</td>
</tr>
<tr>
<td>FY2002</td>
<td>7</td>
</tr>
<tr>
<td>FY2003</td>
<td>4</td>
</tr>
<tr>
<td>FY2004</td>
<td>11</td>
</tr>
<tr>
<td>FY2005</td>
<td>5</td>
</tr>
<tr>
<td>FY2006</td>
<td>4</td>
</tr>
<tr>
<td>FY2007</td>
<td>4</td>
</tr>
</tbody>
</table>

Drafted amount (10,000 tons)

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount (10,000 tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY1998</td>
<td>298</td>
</tr>
<tr>
<td>FY1999</td>
<td>217</td>
</tr>
<tr>
<td>FY2000</td>
<td>528</td>
</tr>
<tr>
<td>FY2001</td>
<td>419</td>
</tr>
<tr>
<td>FY2002</td>
<td>391</td>
</tr>
<tr>
<td>FY2003</td>
<td>282</td>
</tr>
<tr>
<td>FY2004</td>
<td>242</td>
</tr>
<tr>
<td>FY2005</td>
<td>200</td>
</tr>
<tr>
<td>FY2006</td>
<td>104</td>
</tr>
<tr>
<td>FY2007</td>
<td>4</td>
</tr>
</tbody>
</table>

<Challenge 2>
Illegal deposition of dismantled waste in Chiba

Huge illegal dumping on prefectural border of Aomori and Iwate (820 thousand m³)

Treatment residue of end-of-life electronic appliances imported from developed countries (Guangdong, China)
<SOLUTION 1> TOKYO SUPER ECO-TOWN

- Construction and Demolition Waste Recycling Plant
- Central Breakwater Inner Landfill Site
- Jonanjima, Ota ward
- E-Waste Recycling Plant
- E-Waste Recycling Plant
- Food Waste
- Animal Feed from Food Waste
- Biogas Power Generation from Food Waste
- Waste Fuel Electric Power Generation Plant
- PCB Waste Treatment
- Waste to Energy
<SOLUTION 2> INSPECTION AT TOLLGATE

29 Local Government work together for eliminating illegal dumping.
<SOLUTION 3>
CERTIFICATION SYSTEM OF TOP-RUNNER INDUSTRIAL WASTE DISPOSAL COMPANY

Outline
Third party organization designated by TMG certify “Expert” and “Professional” companies which conduct proper disposal, recycling and reduction of environmental impact from their activities.

Purpose
1. Disseminate information about reliable disposal company to waste generator
2. Cultivate good company, promote proper disposal
3. Develop waste disposal & recycling industry

Evaluation item
1. Compliance
2. Stability
3. Advanced activities

The certificate and a special sticker are given to certified companies.
2. 3Rs & Waste Management

in Tokyo

2-3 TMG’s 5-Year Plan
INTEGRATED STRATEGY FOR THE SUSTAINABLE USE OF RESOURCES

TMG 5-year Plan (2011-2015)

Policy

• Reducing extraction of natural resources
• Reducing greenhouse gas emissions
• Reducing final waste disposal

Target

• Reducing 30% of final waste disposal in FY2015 (compared with FY2007)
[Promotion of 3R measures]

• Promotion of generation control and reuse
  Establishing a society that discharges no waste; Charging for domestic waste

• Promotion of recycling
  Development of urban mine; development of more efficient waste reverse logistics; development of highly efficient heat recovery; utilization of methane gas emitted from landfill disposal site

• Visualization of 3R effects
  Resource input amount; green gas reduction through cyclical use of resources; recycling costs

• Construction of support system for 3R efforts
  Promotion of popularization/enlightenment of green purchasing and environmental education
[Promotion of proper treatment]

- **Toxic waste**
  Improvement of proper treatment system for waste with minute trace of PCB; continuation of TMG disposal site’s acceptance of friable asbestos; reduction of mercury use and promotion of its proper treatment

- **Industrial waste**
  Use of non-friable asbestos; thorough screening/proper disposal of waste plasterboard; enhanced guidance for eradication of illegal dumping by using industrial waste G-men

- **General waste**
  Dangerous articles such as aerosol cans and cigarette lighters; medical waste from home medical care

- **Proper management/operation of industrial waste management facility**
  Reduction of environmental burden and maintenance cost of landfill disposal sites; providing guidance/advice to municipal recycling facilities
**Major Policy (3)**

[Promotion of development of waste disposal & recycling industry]

- Improve environment where superior disposal businesses have advantage
  
  Charging businesses discharging industrial waste for proper disposal costs; developing specialized disposal/recycling businesses by understanding industrial structure and current state

- Promotion of the Tokyo Super Eco-Town Project
  
  Actively present the outcomes of the Tokyo Super Eco-Town Project as advanced efforts and provide information to inside/outside Japan

- Collaborative technical research
  
  In order to advance waste management/recycling technology, collaborative technical research is implemented through cooperation of industry-university-public administration
CURRENT STUDY AND DELIBERATION (1)

Recycling of Small Size E-Waste

- Recovering metals such as minor metals after collecting and dismantling small size e-waste

- Result of collection
  - FY2009 (for 4 months): 13,000 units
  - FY2010 (for 5 months): 11,000 units
Training program on 3R and Waste Management on site

Participant Cities to ANMC21

- Tomsk
- Ulaanbaatar
- Delhi
- Hanoi
- Taipei
- Seoul
- Tokyo
- Manila
- Bangkok
- Kuala Lumpur
- Yangon
- Jakarta
- Singapore

Sharing Experience with Asian Major Cities
3. CONCLUSION
3. CONCLUSION

- It took a long period
- Both “soft” and “hard” are essential
- Hoping to share experiences
Thank you for your attention!