Containers and Packaging Recycling System in Japan
Today’s Contents

1. Background
2. Scheme of Containers and Packaging Recycling Law
3. Plastic Container and Packaging Recycling
4. Activities of Waste Prevention
5. Conclusion
Today’s Contents

1. Background
2. Scheme of Containers and Packaging Recycling Law
3. Plastic Container and Packaging Recycling
4. Activities of Waste Prevention
5. Conclusion
When the law was established (1997), landfill sites would have reached their capacity in 7 to 9 years if no countermeasures were taken.

As containers and packaging accounted for approx. 60% (in volume) of domestic waste, it was decided to take action.

Germany started recycling containers and packaging in 1991 (4 years before the enactment of the containers/packaging recycling law), and Japan decided it could not fall behind other countries.
Waste generation in Tokyo (23 Cities Area)

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

Key Events:
- End of WWII
- 1997 Establishment
- 1999 Enactment

DataKEY:
- (population)
- (tons)

Timeline:
- 1900 to 2010

Graph Characteristics:
- X-axis: Year
- Y-axis: Waste Generation in Tons
- Population Growth
- MSW Volume Trends
The remaining capacity of landfill sites across Japan was only 8.5 years when the law was enacted.
Ratio of containers and packaging in household waste (FY2012, in volume)

- Non-containers and packaging: 46.2%
- Containers and packaging:
  - Paper: 13.1%
  - Plastic: 53.8%
  - Glass: 1.3%
- Metal: 2.9%
- Other: 0.1%

(Source: Survey on use and disposal of containers and packaging waste by the Ministry of the Environment)
Today’s Contents

1. Background
2. Scheme of Containers and Packaging Recycling Law
3. Plastic Container and Packaging Recycling
4. Activities of Waste Prevention
5. Conclusion
It aims at household waste reduction and effective use of resources by developing a recycling program of containers and packaging waste discharged as general domestic waste.

It clarifies the division of responsibilities: service providers are responsible for recycling. (extended producer responsibility)
Classification of waste

- **Municipal Waste**: Waste other than industrial waste
  - **Industrial Waste**: 20 items including sludge, plastic waste, waste oil, C&D debris, etc.

- **Household Waste**: Containers & Packaging Waste

- **Commercial Waste**: Specially Controlled Municipal/Industrial Waste
  - Hazardous wastes, such as PCBs, asbestos, infectious waste, etc.
Roles and responsibilities

Extended Producer Responsibility (EPR)

- **Production and distribution Companies**
  - Responsible for recycling cost
  - Reduce containers and packaging that will become waste.

- **Recycling service providers**
  - Take used containers and packaging and manufacture new resources.

- **Consumers**
  - Source separation in accordance with municipal rules.
  - Reduce waste.

- **Municipal governments**
  - Collect, sort out and store waste containers and packaging.

- **Purchase, Source separation Household**
  - Source separation in accordance with municipal rules.
  - Reduce waste.

- **Collection Municipal Governments**
  - Collect, sort out and store waste containers and packaging.
Companies
- Produce plastic containers.
- Pack goods.
- Sell food.

Households
- Eat food.
- Purchase
- Rinse containers that can be cleaned easily
- Keep them temporarily.

Municipalities
- Collect them.
- Discharged in appointed day(s)
- Separate what cannot be recycled.
- Press them into blocks and store them.

Recycling plants
- Produce raw materials.
- Pallet-making plant
- Iron-making plant
- Chemically decompose them for use.
EPR (Extended Producer Responsibility)

EPR was defined by the OECD. It is an environmental policy approach of extending physical and financial responsibilities fully or partially to manufacturers who most affect the design and manufacturing of products including containers and packaging.

EPR was introduced to Japan when the responsibilities for containers and packaging waste disposal, which municipal governments used to have, were partially transferred to business operators based on the enforcement of the containers ad packaging law.
Who is responsible for recycling?

<General case> Business operators that newly use the target containers and packaging are responsible for recycling.

- **Container manufacturer and distributor**
  - Responsibility for container manufacturing (bottles, PET bottles, meal boxes, shopping bags)

- **Product manufacturer and distributor**
  - Responsibility for using containers (beverages)

- **(Wholesaler)**
  - Responsibility for using containers (beverages)

- **Retailer**
  - Responsibility for using containers (shopping bags)

- **Consumer**
  - Responsibility for using containers (trays and containers for prepared food, shopping bags)

**Responsibility**

- Container manufacturing plant
- Beverage manufacturing plant
- Boxed meal producer
- Prepared food made by supermarkets
- Supermarkets
- Shopping bags
- Prepared food

**Containers and packaging waste from families (recycling)**
## What are Containers and Packaging?

Amount of separated collection of containers and packaging recycling in all municipalities (FY2013)

<table>
<thead>
<tr>
<th>Classification of containers and packaging</th>
<th>Amount of sorted collection (in 1000 tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel containers</td>
<td>194</td>
</tr>
<tr>
<td>Aluminum containers</td>
<td>131</td>
</tr>
<tr>
<td>Paper containers for beverage</td>
<td>14</td>
</tr>
<tr>
<td>Corrugated cardboard</td>
<td>610</td>
</tr>
<tr>
<td>Glass bottles</td>
<td></td>
</tr>
<tr>
<td>(no color)</td>
<td>326</td>
</tr>
<tr>
<td>(brown)</td>
<td>273</td>
</tr>
<tr>
<td>(other colors)</td>
<td>201</td>
</tr>
<tr>
<td>PET bottles</td>
<td>302</td>
</tr>
<tr>
<td>Paper containers and packaging</td>
<td>91</td>
</tr>
<tr>
<td>Plastic containers and packaging</td>
<td>737</td>
</tr>
</tbody>
</table>

6 products for obligatory recycling

(1,931,000 tons)

(Source) "Newsletter: changes in ratio of sorted collection of all municipalities in 2013 after enforcement of Container and Packaging Recycling Law" The Ministry of the Environment (March 9, 2015)
Recycling Flow

Consumers

Special business operator (food manufacturer)

Provide products. Delivered containers.

Payment for recycling cost (performance of obligation)

The Japan Containers and Packaging Recycling Association

Municipalities

Sort out and collect used containers.

Source separation based on identifying mark.

Special business operator (plastic container manufacturer)

Competitive bidding

Business contract

Payment for commission

Recycling companies

Delivery of bale products collected at designated storage facility

(*Recycling service operator transports to plant.)

Distribution of recycled products

Manufacturing of products using recycled products.

Recycling companies

Distribution of recycled products

Payment for recycling cost (performance of obligation)

Payment for commission
Case of Meguro City

Residents

Collection and Transportation by Meguro city

Shinagawa Unyu (Compressing/baling)

Role of Local Government

MM Plastic (Material Recycling)

Showadenko (Chemical Recycling)

Role of producers of products using containers and packaging

Source: Sinjuku city
Trend of Trade Volume

Plastic containers and packaging

<table>
<thead>
<tr>
<th>Year</th>
<th>Value (ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>'00</td>
<td>548,839</td>
</tr>
<tr>
<td>'01</td>
<td>168,681</td>
</tr>
<tr>
<td>'02</td>
<td>259,569</td>
</tr>
<tr>
<td>'03</td>
<td>446,912</td>
</tr>
<tr>
<td>'04</td>
<td>581,340</td>
</tr>
<tr>
<td>'05</td>
<td>604,486</td>
</tr>
<tr>
<td>'06</td>
<td>617,151</td>
</tr>
<tr>
<td>'07</td>
<td>635,397</td>
</tr>
<tr>
<td>'08</td>
<td>650,345</td>
</tr>
<tr>
<td>'09</td>
<td>651,351</td>
</tr>
<tr>
<td>'10</td>
<td>659,169</td>
</tr>
<tr>
<td>'11</td>
<td>654,002</td>
</tr>
<tr>
<td>'12</td>
<td></td>
</tr>
<tr>
<td>'13</td>
<td></td>
</tr>
<tr>
<td>'14</td>
<td></td>
</tr>
</tbody>
</table>

(FY)
Trends in Bid Prices (weighted average)

(c.f.) net prices

(source) Created by METI in accordance with data published on the home page of the Japan Containers and Packaging Recycling Association.
Today’s Contents

1. Background
2. Scheme of Containers and Packaging Recycling Law
3. Plastic Container and Packaging Recycling
4. Activities of Waste Prevention
5. Conclusion
There are several plastic container and packaging recycling methods.

### Glass bottles
- Cullet
  - Glass bottles
  - Construction and civil engineering materials, etc.

### PET bottles
- Flakes and pellets
- Raw materials for polyester
  - Textiles
  - Sheet
  - PET bottles, etc.

### Paper containers and packaging
- Sorting out raw papermaking material + Making fuel
- Manufacturing building board, Loosen fiber products of shredded waste paper, etc. + Making fuel
  - Paper board
  - Recycled paper board
  - Solid fuel, etc.

### Plastic containers and packaging
<table>
<thead>
<tr>
<th>Material recycling</th>
<th>Chemical recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials for plastic</td>
<td>Chemical raw materials for coke oven</td>
</tr>
<tr>
<td></td>
<td>Blast furnace reductant</td>
</tr>
<tr>
<td></td>
<td>Gasification</td>
</tr>
<tr>
<td></td>
<td>Made into oil</td>
</tr>
<tr>
<td></td>
<td>Making fuel *)</td>
</tr>
</tbody>
</table>

* It is used when other methods hinder recycling.

(Examples of recycling)
Recycling Methods

Plastic containers and packaging (FY2013)

Plastic container and packaging waste

Emission from households 1,116,000 t*1

Collected by municipal governments 737,000 t*2

Transferred to associations (entrusted to recyclers) 659,000 t

From businesses

Industrial waste

Managed by municipality

*1 Plastic Packaging Recycling Council materials

*2 Ministry of the Environment PR materials

Material recycling 346,000 t

Chemical recycling 312,000 t

Solid fuel, etc. 0 t

Recycled materials 264,000 t

Chemical raw materials with coke oven 175,000 t

Synthesis gas 61,000 t

Blast furnace reducing agent 29,000 t

Thermally decomposed oil 0 t

Recycled products

Recycled materials 173,000 t

Flake, fluff, pellet

Residue: RPF, cement raw fuel incineration energy retrieval, etc.
Use of Recycled Plastic Containers and Packaging

Approx. 60% and 40% of recycled plastic is used for chemical recycling and material recycling, respectively.

Plastic traded in FY2013
Recycled products and use (white trays excluded)

- Trade volume of association: 659,169 t
- Sales volume of recycled products: 437,712 t

★ Actual value of plastic that was received in FY2013 and recycled by the end of June 2014.
Plastic Containers and Packaging: Flow of Material Recycling

1. Transported to recycling plant and put into machinery.
2. What cannot be recycled is removed and broken into small pieces.
3. Pressed into small grains.
4. Grains are melted and sent to machinery.
5. Melted matter is placed on machinery.
6. It is machine-pressed.
7. Two pressed pieces are put together.
8. Pallet

Source: What is the Containers and Packaging Recycling Law on Japan Containers and Packaging Recycling Association website
Raw chemical material for coke oven (conducted by Nippon Steel and Sumitomo Metal Corp., etc.)

**Coke oven**

- **Thermal depolymerization process**
  - Escallop plastic at 1,200°C in oxygen-free condition for thermal depolymerization.

- **Gas purification process**
  - Watering cooling
  - Coke oven gas
    - Used at a power plant at a steel plant.
    - 40%
  - Hydrocarbon oil
    - Used as a chemical material at a chemical plant.
    - 40%
  - Coke
    - Put into the blast furnace and oxygen is removed from iron ore (steel material).
    - 20%

**Chemical material**

- Generated gas
- Fuel gas
- Light oil
- Tar
- Coke oven gas
- Hydrocarbon oil
- Coke

**At a steel plant**

- Steel is made with coke made from plastic!
- Coke and iron ore (steel material) are put into the blast furnace to make steel.

**Household plastic waste**

Iron and PVC are removed from waste plastic (bale) transported from municipalities to the recycling plant and heated at 100°C to make into grains.

It is mixed into coal at the ratio of 1 to 2% and put into the carbonization chamber of a coke oven.

The carbonization chamber is oxygen free heated to 1200°C and waste plastic is thermally decomposed.

Decomposed high-temperature gas is cooled and made into coke oven gas (40%) for power generation, hydrocarbon oil (40%) to be used as a chemical material, and coke (20%) to be used as blast furnace reductant.
Iron and PVC are removed from waste plastic (bale) transported from municipalities to recycling plants and are crushed into small pieces and pressed to reduce their volume to make recycled plastic grains.

Recycled plastic grains are put into a blast furnace at a steel plant at approx. 350°C in oxygen-free conditions.

Recycled plastic grains serve as reductant to remove oxygen (O) from iron ore (Fe₂O₃) in a blast furnace to make steel.

Gas generated in the process is used for power generation.
Gasification (performed by Showa Denko K.K., etc.)

Waste plastic (bale) transported from municipalities to a recycling plant is crushed into small pieces and firmly pressed.

It is then put into a two-stage gasification furnace. Sand heated to 600-800°C flows into a low-temperature gasification furnace and waste plastic makes contact with it to be decomposed into hydrocarbon, carbon monoxide, hydrogen and char (carbonized solid).

Gas generated in a low-temperature gasification furnace is put into a high-temperature gasification furnace at 1,300-1,500°C and reacts with steam to become syngas, which is mainly made from carbon monoxide and hydrogen.

Generated syngas is used as a raw material at chemical plants producing ammonia, hydrogen, methanol, acetic acid, etc.
Today’s Contents

1. Background
2. Scheme of Containers and Packaging Recycling Law
3. Plastic Container and Packaging Recycling
4. Activities of Waste Prevention
5. Conclusion
Design for Environment (DfE)

Voluntary Design Guideline for Designated PET Bottles (1992)

Soft drinks (including milk beverages), Specific flavoring (soy sauce), Alcohol

- The Law for the Promotion of Effective Resources -> products with specific labels [promotion of sorted collection]
- 2009 Revision of Classification system for PET bottles Bottles for soy sauce are classified as bottles for specific flavoring

Caps

- Plastic caps (PE/PP ratio must be less than 1 and must float)
- 1998 Prohibited to include aluminum caps

Bottles

- PET bottles only (no color, transparent)
- 1998 Prohibited to include base cups
- 2001 Prohibited to include colored bottles

Labels

- Must be easily removable by hand
- 1994 Prohibition of PVC materials (to prevent discoloration of recycled materials)
- 1994 Prohibition of paper labels that have glue over entire surfaces

Source: Handouts used for Promotion-consortium of PET bottles (the joint meeting of METI working group of containers and packaging recycling, and Central Environmental Council working group for promotion of 3Rs for containers and packaging recycling, Dec. 5., 2013)
Discharge Control Effect of Regular Reporting System

Regular reporting system
Business operators that use **more than 50 tons of containers and packaging** annually (business operators that use a large volume of containers and packaging)

- Obliged to report the volume of containers and packaging they use, efforts for usage rationalization (charge fees on shopping bags, encourage non-use, etc.) and their effects and usage unit of containers and packaging every fiscal year.

Containers and packaging reduction after introduction of regular reporting system

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Amount of Containers and Packaging Used by Business Operators</th>
</tr>
</thead>
<tbody>
<tr>
<td>'07</td>
<td>421,903</td>
</tr>
<tr>
<td>'08</td>
<td>389,061</td>
</tr>
<tr>
<td>'09</td>
<td>346,647</td>
</tr>
<tr>
<td>'10</td>
<td>342,407</td>
</tr>
<tr>
<td>'11</td>
<td>327,997</td>
</tr>
</tbody>
</table>

(Unit: ton)

Trend of Total Amount of Containers and Packaging Used by Business Operators that Are Obliged to Submit Regular Reports
## Reduction Efforts by Business Operators

### FY2012 Results of Reduction (compared to FY2004)

<table>
<thead>
<tr>
<th>Material</th>
<th>FY2015 target (compared to FY2004)</th>
<th>FY2012 results</th>
<th>Total reduction from FY2006</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass bottle</td>
<td>2.8% reduction by average weight per bottle</td>
<td>2.1%</td>
<td>143,000 tons</td>
<td>Upward revision of 2015 target from 10%</td>
</tr>
<tr>
<td>PET bottle</td>
<td>15% reduction for all designated PET bottles</td>
<td>13.0%</td>
<td>331,000 tons</td>
<td>Upward revision of 2015 target from 10%</td>
</tr>
<tr>
<td>Paper containers and packaging</td>
<td>11% reduction in total amount</td>
<td>9.9%</td>
<td>711,000 tons</td>
<td>Upward revision of 2015 target from 8%</td>
</tr>
<tr>
<td>Plastic containers and packaging</td>
<td>13% reduction</td>
<td>11.5%</td>
<td>58,000 tons</td>
<td></td>
</tr>
<tr>
<td>Steel can</td>
<td>5% reduction by average weight per can</td>
<td>4.9%</td>
<td>115,000 tons</td>
<td>Upward revision of 2015 target from 4%</td>
</tr>
<tr>
<td>Aluminum can</td>
<td>3% reduction by average weight per can</td>
<td>3.8%</td>
<td>53,000 tons</td>
<td></td>
</tr>
<tr>
<td>Paper beverage container *2</td>
<td>3% reduction for paper 500-ml milk pack</td>
<td>1.0%</td>
<td>165,000 tons</td>
<td></td>
</tr>
<tr>
<td>Cardboard</td>
<td>5% reduction by average weight per 1 square meter</td>
<td>3.6%</td>
<td>985,000 tons</td>
<td>Upward revision of 2015 target from 1.5%</td>
</tr>
</tbody>
</table>

*1 Targets of each organization are reviewed and revised as needed.
*2 Compared to 2005. Specifications of raw paper and pack paper are compared.

Source: 2013 Follow-up report on 3R Suishin Dantai Renrakukai website
Consumers’ Efforts (shopping bags)

Trend of consumers who decline shopping bags

Source: Japan Chain Stores Association website
### Ratio of Containers and Packaging in Household Waste

<table>
<thead>
<tr>
<th>Year</th>
<th>In Volume</th>
<th>In Wet Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>60%</td>
<td>25%</td>
</tr>
<tr>
<td>2012</td>
<td>53.8%</td>
<td>24.3%</td>
</tr>
</tbody>
</table>

(Source: Survey on use and disposal of containers and packaging waste by the Ministry of the Environment)
Today’s Contents

1. Background
2. Scheme of Containers and Packaging Recycling Law
3. Plastic Container and Packaging Recycling
4. Activities of Waste Prevention
5. Conclusion
Cooperation with residents for success of the law

* Source separation
  * To set various categories
  * To be practiced perfectly through residents’ cooperation and understanding

Photo: Toshima City
Challenges Facing Containers and Packaging Recycling System

* Hard to understand separation criteria in households
* No recycling scheme for plastic goods that are not containers or packaging
* Municipality participation ratio in this system
* Cost reduction
Thank you for your attention!