WASTE MANAGEMENT in KITAKYUSHU CITY

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(Money exchange rate : 1 US$ = 100 yen)

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Content of the Presentation

1. Current waste management
   Waste collection, Recycling, Incineration and Landfill

2. Waste reduction by new recycling system

3. Future target of waste management

4. Cost of waste management
Waste Management Stream in Kitakyushu City (2009)

- **Household waste**: 210,900 ton (590g/capita/day) (Population: 981,000)
- **Business waste**: 230,000 ton (Paper, wood, textile, food etc.)
- **Municipal sewage sludge**: 10,000 ton
- **Other city’s waste**: 82,000 ton

**Garbage and Others**: 191,000 ton

**Un-recyclable waste**: 164,000 ton

**Recyclables**: 19,900 ton (66,000 ton)

**Recycling Facilities**: 19,900 ton

**Incinerators**: 447,000 ton

**Landfill**: 59,000 ton

- No raw (organic) waste landfill

※ Exclude paper recycling by community activity (30,000 ton)
Waste treatment in Kitakyushu city in 2009

Nougata city
Population: 60,000
Amount of waste: 17,000 ton/year

Yukuhashi city & Miyako town
Population: 90,000
Amount of waste: 27,000 ton/year

Nakama city & four towns
Population: 140,000
Amount of waste: 38,000 ton/year

Kitakyushu city
Population: 981,000
Household: 432,000
Area: 487 km²

Amount of waste
Kitakyushu city’s waste: 365,000 ton
Another city’s waste: 82,000 ton
Total: 447,000 ton
Two types of waste composition analysis (2009)

Household waste
- Garbage: 45.30%
- Others: 32.70%
- Paper: 5.80%
- Cardboard: 14.90%
- Plastic container, PET bottle: 1.30%
- (Others: Textile, Rubber, wood, metal)

% wet weight basis

Waste composition in household waste

Household waste: 273,000 ton/year (62%)
Business waste: 164,000 ton/year (38%)

Waste composition in incinerator pit
- Garbage: 11.4%
- Paper: 41.0%
- Others: 37.0%
- Plastic: 10.6%
- (Garbage, others)

% dry weight basis

Waste three composition
- Water content: 25%
- Combustible: 58%
- Incombustible: 17%
- Calorific value: 2,700 kcal/kg
# Treating method of Kitchen Garbage and Others

<table>
<thead>
<tr>
<th>Kitchen garbage and others</th>
<th>Collection day</th>
<th>Plastic bag Color</th>
<th>Plastic bag Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twice a week</td>
<td>Blue</td>
<td>20 liter : 22 ¢</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 liter : 33 ¢</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>45 liter : 50 ¢</td>
<td></td>
</tr>
</tbody>
</table>

### Kitchen and others
- Kitchen garbage
- Plastic
- Paper
- Wood
- Used cloth and shoes etc.

### Cash flow of plastic bags distribution

**Kitakyushu City**

- Contract
- Pay : B

**Plastic bag producing CO.**

- Cost + Benefit : b

**Sell**

- Pay

**Shops**

- Cost + Benefit : a

**Sell**

- Pay : A

### Kitakyushu City Income

\[
B = A - a - b
\]

**Total income** (Garbage, Can, Bottle, PET, Plastic) in 2009 is 19 million US$
Waste Collection

Number of collection point (32,000 points)
One point consists of around 10-15 households
Two times a week collection

Blue net used for prevention of bird picking
Incineration plants in Kitakyushu City

**Shinmoji incineration plant**
- Date of start: 2007
- Capacity: 720 ton/day (240 ton × 3)
- Power generation: 23,500 Kw
- Construction cost: 230 million US$

**Kogasaki incineration plant**
- Date of start: 1998
- Capacity: 810 ton/day (270 ton × 3)
- Power generation: 36,340 Kw
- Construction cost: 350 million US$

**Hiagari incineration plant**
- Date of start: 1991
- Capacity: 600 ton/day (200 ton × 3)
- Power generation: 6,000Kw
- Construction cost: 125 million US$

These 3 plants are operated by each incinerator constructed company. Kitakyushu City contracts with these companies under concession contract. Because the incinerator operation and maintain require special technology included patent.
Great power supporting our daily life: high refuse disposal capacity

Daily refuse disposal capacity at the Kogasaki incineration facility is 810. The City of Kitakyushu dispos- es of its wastes at three incineration facilities: Kogasaki, Hiagari (600/ton), and Shinnoji (600/ton). The combined total capacity of these three is 2,010/ton/day, assuring the stable daily refuse disposal for the City. Furthermore, an estimated maximum heat value during the incineration is 3,000 kcal/kg, which is equal to about 30% of that of kerosene.

KOGASAKI Incineration Plant
(Stoker Type Incinerator)
Capacity: 810 ton/day (270 ton/day × 3 furnaces)
Kogasaki
Volume of pit  950m³ (950 ton)
Crane Capacity  4.8 ton

Ash Pit and Ash Crane

Content of landfill materials are only in-organics. (Ash, Soil, Concrete, Rock, etc.)

Hibikinada Landfill
<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hibikinada sea side landfill</td>
<td>Managed by Kitakyushu city in 2010</td>
</tr>
<tr>
<td>Area of landfill</td>
<td>70 ha</td>
</tr>
<tr>
<td>Capacity</td>
<td>12,100,000 m³</td>
</tr>
<tr>
<td>Kind of waste</td>
<td>Domestic waste’s incineration ash</td>
</tr>
<tr>
<td></td>
<td>Small &amp; medium company ‘s concrete, sludge, plastics, glass and dust</td>
</tr>
<tr>
<td>Life span</td>
<td>from 1986 to around 2022</td>
</tr>
</tbody>
</table>
Monitoring of exhaust gas

Municipality has the responsibility of keeping the exhaust gas standard and state government has the right of inspection.

- **By City municipality**
  1. Monitoring every second by automatic analysis equipment.

- **By State government**
  1. Entering and inspection of incinerator sometimes.

---

**Actual value in 2009**

Shinmoji incinerator

- HCl : 13 ppm
- NOx : 21 ppm
- SOx : 0.019 ppm
- CO : 0.6 ppm
- Dust : 0.00029 mg/Nm³
- Dioxin : 0.003ng-TEQ/Nm³

**Standard value**

Shinmoji incinerator

- HCl : 30 ppm
- NOx : 50 ppm
- SOx : 30 ppm
- CO : 30 ppm
- Dust : 10 mg/Nm³
- Dioxin : 0.08 ng-TEQ/Nm³
Disclosing of exhaust gas analysis data

The indicator is located toward the public road.

Then people can get the information during 24 hours.

People also can check the former operation data at the incineration office.
How to cooperate with citizens lived near the incinerator
How to cooperate with citizens lived near incinerator

- **Before construction**
  1. Explain to the municipal assembly.
  2. Explain to citizens lived near incinerator.
     (Incinerator type, capacity, Pollution control, noise, EIA......)

- **During construction**
  1. Explain to citizens lived near incinerator.
     (Incinerator construction condition)
  2. Observe the construction site by citizens.

- **After construction completion and starting operation**
  1. Observe the incinerator by citizens.
  2. Disclose operation data to citizens.
     (operation data and pollution control data)
# Recycling method of Can, Glass Bottle and PET Bottle

<table>
<thead>
<tr>
<th></th>
<th>Collection day</th>
<th>Plastic bag Color</th>
<th>Plastic bag Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can and Glass Bottle</td>
<td>Wednesday</td>
<td>Brown</td>
<td>25 liter : 12 ¢</td>
</tr>
<tr>
<td>PET Bottle</td>
<td></td>
<td>Orange</td>
<td></td>
</tr>
</tbody>
</table>

**Can & Glass Bottle**
(Recycling started 1993)

**PET Bottle**
(Recycling started 1997)
## Recycling method of Plastic Container

<table>
<thead>
<tr>
<th>Plastic Container</th>
<th>Collection day</th>
<th>Plastic bag Color</th>
<th>Plastic bag Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Once a week</td>
<td>Green</td>
<td>25 liter : 12 ¥</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>45 liter : 20 ¥</td>
</tr>
</tbody>
</table>

### Plastic Container
- Egg package
- Noodle package
- Shampoo bottle
- Detergent bottle
- Food oil bottle
- Mayonnaise container
- Cap of PET bottle etc.

1. **Collection day**
2. **Plastic bag Color**: Green
3. **Plastic bag Price**:
   - 25 liter: 12 ¥
   - 45 liter: 20 ¥

### Process:
- **Plastic Container**
- Collection Point (11,000 points)
- Collection
- Recycling center
Number of collection point (11,000 points)
One point consists of around 40 households
Every Wednesday collection

PET Bottle for recycling needs pure quality.
Classification
Steel and aluminum can is separated by machine.
Pet bottle and glass bottle separated by hand.
## Separation volume and recycling income of Can & Bottle in 2009

<table>
<thead>
<tr>
<th>Material</th>
<th>Volume (ton)</th>
<th>Income (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>1,100</td>
<td>1,070,000</td>
</tr>
<tr>
<td>Steel can</td>
<td>1,300</td>
<td>290,000</td>
</tr>
<tr>
<td>Glass bottle</td>
<td>1,900</td>
<td>14,000</td>
</tr>
<tr>
<td>PET bottle</td>
<td>1,600</td>
<td>210,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,900</strong></td>
<td><strong>1,584,000</strong></td>
</tr>
</tbody>
</table>
Carried out New Recycling System for waste reduction in 2006

Because we were struggling with huge amount of waste at that time.
Amount of household waste doesn’t change in whole Japan.

Also in Kitakyushu City, amount of waste doesn’t change.
Due to decrease household waste, the national government enforced "Household Waste Reduction Law" on March 2003. The reduction target is 20%.

According to the law, Kitakyushu City carried out "Household Waste Reduction System" on July 2006. The reduction target is 20%.

Kitakyushu city succeeded to accomplish 26% waste reduction in 2008.
Amount of household waste in Kitakyushu city

Before

After

National Government enforcement

Kitakyushu City carried out

26% reduction
Kitakyushu City carried out recycling materials: Can, Glass bottle, PET bottle, Plastic container, Paper, Wood.

Amount of recycling articles in Kitakyushu city

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount (1000 ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>35</td>
</tr>
<tr>
<td>2000</td>
<td>36</td>
</tr>
<tr>
<td>2001</td>
<td>36</td>
</tr>
<tr>
<td>2002</td>
<td>35</td>
</tr>
<tr>
<td>2003</td>
<td>35</td>
</tr>
<tr>
<td>2004</td>
<td>34</td>
</tr>
<tr>
<td>2005</td>
<td>38</td>
</tr>
<tr>
<td>2006</td>
<td>63</td>
</tr>
<tr>
<td>2007</td>
<td>69</td>
</tr>
<tr>
<td>2008</td>
<td>69</td>
</tr>
</tbody>
</table>
How to reduce household waste.

1. Carried out plastic container recycling system in 2006.

2. Increased the price of designated garbage plastic bag.


<table>
<thead>
<tr>
<th>Size</th>
<th>Old Price</th>
<th>New Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 liter</td>
<td>15 ¢</td>
<td>50 ¢</td>
</tr>
<tr>
<td>30 liter</td>
<td>33 ¢</td>
<td></td>
</tr>
<tr>
<td>20 liter</td>
<td>22 ¢</td>
<td></td>
</tr>
</tbody>
</table>

- 45 liter garbage plastic bag
  - Average Weight: 6 kg/one bag
  - Treating cost: 2.5 US$/one bag (Collection and Incineration)
  - 50 ¢ = 2 US$
How to recognize the new recycling system to citizens.

How to explain the new recycling system to citizens.

1. Before enforcement

Many explanation meetings for citizens were held.

- Public information sheets were delivered to citizens.
- Explanation meetings for citizens were held for 1,376 times. (Total number of attendance is about 47,000.)
- 4,500 explanation videotapes were delivered to community centers.
- Many explanation advertisements were on TV.
2. After enforcement

Early-Morning Training was held by citizen volunteers and city officers at waste collection point. (32,000 points)

- The training was carried out for 10 days.
- The time of the training was from 6:30am to 8:30am.
- The number of citizen volunteers was 13,200 per day.
- The number of city officers was 1,550 per day.
Future Target of Waste Management

1. Reduction of household waste

   The target of the reduction should be fulfilled -7.1% until 2020 compared with 2009.

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2015</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>506 (g/capita/day)</td>
<td>495 (g/capita/day)</td>
<td>470 (g/capita/day)</td>
</tr>
<tr>
<td></td>
<td>-2.2%</td>
<td></td>
<td>-7.1%</td>
</tr>
</tbody>
</table>

   Method of reduction

   Kitchen garbage should be reduced 8% by people education.

   (Reduction of food waste and drying garbage)
2. Improvement of recycling ratio

The target of the recycling ratio should be fulfilled 35% until 2010.

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2015</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recycling ratio (B)/(A)</td>
<td>30.4%</td>
<td>32.5%</td>
<td>35%</td>
</tr>
<tr>
<td>Total amount of waste (A)</td>
<td>497,000</td>
<td>—</td>
<td>476,000</td>
</tr>
<tr>
<td>Recycled materials (B)</td>
<td>147,000</td>
<td>—</td>
<td>162,000</td>
</tr>
</tbody>
</table>

- **Method of improvement**
  - Newspaper recycling ratio should be increased more 10%.
  - Plastic container recycling ratio should be increased more 15%.
Waste management in 2009 (Cost of treating)

**Household waste**
- 210,900 ton
- Plastic bags 19 million US$

**Cans, Bottles, PET**
- 11,900 ton

**Plastic Containers**
- 8,000 ton

**Domestic waste**
- 179,000 ton

**Others**
- 12,000 ton

**Business waste**
- 164,000 ton
- 13 million US$

**Sewage sludge**
- 10,000 ton
- 1 million US$

**Other city’s waste**
- 82,000 ton
- 16 million US$

**Landfill waste by private CO.**
- 167,000 ton
- 6.3 million US$

**Honjyou Recycling Center**
- 1997 Capacity: 63 tons/day

**Hiagari Recycling Center**
- 1993 Capacity: 53 tons/day

**Plastics Recycling Center**
- 2007 Capacity: 60 tons/day

**Shinmoji Incineration Plant**
- 2007 Capacity: 720 tons/day

**Kougasaki Incineration Plant**
- 1998 Capacity: 810 tons/day

**Hiagari Incineration Plant**
- 1991 Capacity: 600 tons/day

**Recycling**
- Product CO. organization (97-95%)
- Municipality (3-5%)

**Landfill fee**
- 2.8 million US$/year
- 40 US$/ton

**Total Income**
- Waste treatment 56.1 million US$
- Electricity 9.78 million US$
- Valuable materials 1.62 million US$
- Steam 440,000 US$
- Total Income 67.94 million US$

**Selling valuable materials**
- Steel cans 1,300 ton 290,000 US$
- Aluminum cans 1,100 ton 1,070,000 US$
- PET bottles 1,600 ton 210,000 US$
- Transparent bottles 900 ton 7,000 US$
- Brown bottles 1,000 ton 7,000 US$
- Milk carton 200 ton 10,000 US$

**Residue**
- 4,900 ton (Go to landfill & incinerator)
- Total 11,000 ton 1,594,000 US$

**Sewage treatment plant**
- 0.9 million US$

**Electricity**
- Power CO. 4.5 million US$
- Waste collection office

**Steam**
- Waste collection office

**Bag ash & Main ash**
- 35,000 ton
- 40,000 US$

**City market**
- 40,000 US$

**Regional air conditioning**
- 40,000 US$
- 40,000 US$

**City market**
- Sewage plant 0.4 million US$

**Incineration fee**
- 68 million US$/year
- 150 US$/ton

**Power CO.**
- 20,000 US$
- Sewage treatment plant 0.8 million US$

**Sewage treatment plant**
- 0.9 million US$

**Waste collection office**
Expenditure and Income in 2009

Expenditure
(Unit : million US$)

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount (Unit : million US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incineration</td>
<td>68 (50%)</td>
</tr>
<tr>
<td>Collection</td>
<td>59 (44%)</td>
</tr>
<tr>
<td>Recycling</td>
<td>6 (4%)</td>
</tr>
<tr>
<td>Landfill</td>
<td>2.8 (2%)</td>
</tr>
<tr>
<td>Others</td>
<td>7.77</td>
</tr>
<tr>
<td>Total</td>
<td>48.94</td>
</tr>
</tbody>
</table>

Income
(Unit : million US$)

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount (Unit : million US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>City tax</td>
<td>67.86 (50%)</td>
</tr>
<tr>
<td>Plastic bags</td>
<td>19 (14%)</td>
</tr>
<tr>
<td>Others</td>
<td>48.94 (36%)</td>
</tr>
<tr>
<td>Business waste</td>
<td>13.4</td>
</tr>
<tr>
<td>Electricity</td>
<td>9.78</td>
</tr>
<tr>
<td>Other city’s waste</td>
<td>16.4</td>
</tr>
<tr>
<td>Valuable materials</td>
<td>1.59</td>
</tr>
<tr>
<td>Others</td>
<td>7.77</td>
</tr>
<tr>
<td>Total</td>
<td>48.94</td>
</tr>
</tbody>
</table>

Total general account city budget : 5,300 million US$
THANK YOU
Sinsuke Takeuchi