Building Eco-Cities towards Zero Waste Community

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Chief Executive, Kitakyushu Asian Center for Low Carbon Society
City of Kitakyushu
Contents

☑ About Kitakyushu
☑ History of overcoming pollution
☑ Reduction of waste and promotion of recycling
☑ Kitakyushu Eco-Town
☑ International environmental cooperation
About Kitakyushu

Location (between Tokyo & Shanghai)

Population ~1 million
Area 488 km²
Status Designated city (similar to prefectural govt)
Eco-Model City of Japan
Establishment of government-run **Yawata Steel Works**

**Industrial wastewater**

**Exhaust emissions**

**Increasing pollution**

**Women's movement against environmental pollution**

**City government**

Organizational Arrangement, and Pollution Control Agreement with Companies

**Private enterprises**

Cleaner Production, Improvement of Production Process, Treatment of Pollutants, Tree Planting

**Overcoming environmental pollution**

**Establishment of “KITA” (1980)**

KITA: Kitakyushu International Techno-cooperative Association

**International environmental cooperation (1988~)**

**Agenda 21 Kitakyushu (1996)**

**Kitakyushu Eco-Town (1998)**

Environmental Preservation and Industrial Promotion

**Reduction of domestic waste** through new system and public participation (First designated city to do so)

**Decision to establish PCB treatment facility (2001)**

**Johannesburg Summit (2002)** recognized **Kitakyushu Initiative for a Clean Environment**

**Grand design on World Capital of Sustainable Development (2004)**

**Implementation and evaluation of practical activities**


**Creation of Local and Global Sustainable Society**

**Low Carbon Society Policies**

**Sustainable Society Policies**

**Resource-Circulating Society Policies**

**Local Diplomacy Policies**

**Pollution Control Policies**

**1980's**

**2002**

**2008**

**1901**

**1950**

**1960's**
Environmental Pollution in 1950s and 1960s

- Heavy smoke from factory smokestacks
- Child covered with soot
- Heavy dust fall on roof
- Corroded boat propeller in the city’s toxic waters
- Untreated wastewater discharged into Dokai Bay
Overcoming Severe Environmental Pollution

Severe air pollution

In 1950s & 1960s

Kitakyushu’s blue sky today

Swimming in Dokai Bay

Dokai Bay, “Sea of Death”

Recovered blue skies and sea, people enjoying the clean environment
Monitored items (24 hours)

<table>
<thead>
<tr>
<th>Sulfur dioxide (SO₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen oxide (NOₓ)</td>
</tr>
<tr>
<td>Carbon oxide (CO)</td>
</tr>
<tr>
<td>Suspended particulate matter (SPM)</td>
</tr>
<tr>
<td>Photochemical oxidant</td>
</tr>
<tr>
<td>Hydrocarbon</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weather</th>
<th>Wind</th>
<th>Quantity of solar radiation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Temperature</td>
<td>Amount of ultraviolet rays</td>
</tr>
<tr>
<td></td>
<td>Humidity</td>
<td>Rainfall</td>
</tr>
</tbody>
</table>

Source: State of the Environment in Kitakyushu in Japanese
Long-Term Improvement of Air Quality

General Air Quality Monitoring (Annual Average)

- Sulfur dioxide (SO₂)
- Nitrogen dioxide (NO₂)
- Suspended particulate matter (SPM)
- Photochemical oxidant (Ox)

Source: State of the Environment in Kitakyushu in Japanese
Local Multi-stakeholder Partnerships to Improve the Environment

Residents
- Residents' observation of a private company
- Learning how to measure air pollution from a university professor

Partnership
- Environmental regulation and environmental infrastructure
- Cleaner Production and pollution control equipment

Local Government
- Local initiatives & partnerships
- Environmental technology & environmental investment
- Education & participation of residents
- Environmental governance

Private Enterprises

Reference: UNESCAP “Kitakyushu Initiative for a Clean Environment”
SO$_x$ Reduction, S, Steel, Kitakyushu

- **Fuel change** (Heavy oil to kerosene to “LPG” to “LNG”)
- **Energy saving and material saving** (Cleaner production, modernization)
- **End-of-pipe technology** (Fuel gas desulfurization plant)

Source: Imai, S. Features of Pollution Control in Japan (Tokyo: Japan International Cooperation Agency)
Economic Development & Environmental Improvement in Kitakyushu

Environmental pollution
(mg-SO₃/100cm²/day)

Economic development continues to advance in line with environmental improvement.

Domestic Waste Management Flow in Kitakyushu

Source: Environment Bureau, City of Kitakyushu
Designated bags of household-related waste

- Take recyclable resources and garbage to designated stations by 8:30 AM on collection days in specified methods.
- Specified bags are sold at supermarkets and convenience stores.

Household Garbage
- Collection days: Twice a week (Mon. and Thu. or Tue. and Fri.)
- Collection place: Household Garbage Station
- Prices:
  - Large (Ten, 45-liter bags): 500 yen
  - Medium (Ten, 30-liter bags): 330 yen
  - Small (Ten, 20-liter bags): 220 yen
  - Extra small (Ten, 10-liter bags): 110 yen

Cans and bottles
- Collection days: Every Wednesday
- Collection place: Recycling Station
- Prices:
  - Five, 25-liter bags: 60 yen

Plastic bottles
- Collection days: Every Wednesday
- Collection place: Recycling Station
- Prices:
  - Five, 25-liter bags: 60 yen

Plastic containers and packages
- Collection days: Once a week (specified day in your area)
- Collection place: Recycling Station
- Prices:
  - Large (Five, 45-liter bags): 100 yen
  - Small (Five, 25-liter bags): 60 yen

※ The Recycling Station is where cans, bottles, and plastic bottles are put out.
A scene of collection of the household-related waste
Incineration Plants

Shinmoji Incineration Plant

Total amount of waste Incinerated at three plants in the city: 2,130t/d

Utilizing excess heat for electric power generation: 192,000MWh / Y (FY2008)

Revenue by Power Generation: ¥752million (FY2008)
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A scene of separation of the recyclable waste

Cans and bottles recycling center

Plastics recycling center
Solid Waste Recycling Activities in Public Participation

Local collection of recycled paper

Recovery station for waste paper packaging and trays

Composting equipment and garden using compost fertilizer

Source: Environment Bureau, City of Kitakyushu

### Guidance for sorting domestic waste at source

<table>
<thead>
<tr>
<th>Other domestic waste</th>
<th>Cans &amp; glass bottles</th>
<th>Waste plastic PET bottles</th>
<th>Waste plastic packaging</th>
</tr>
</thead>
</table>

### Teaching residents about separating waste at source

- Reduced solid waste by 27%
- Reduction by 1.9 billion yen of the cost for waste treatment

### Participation of 10,000 residents (July 2006)

Source: Environment Bureau, City of Kitakyushu
Established: October 1962
Organization: Regular members: 155; Supporting members: 34 organizations. General organization of local communities in which 70% of residents (about 700,000 people) take part.
Activities: Citywide promotion of independent, practical activities and public awareness activities related to environmental protection and health.

### Major Activities

- Management of waste stations
- Guidance and public awareness about waste disposal and separation
- City beautification activities/prevention of illegal dumping
- Activities to create a resource-recycling society
- Activities to create a low-carbon society
Domestic waste generation (g/day/capita)

---|---|---|---|---|---|---|---|---|---|---|---|---|---
1997 | 748 | 703 | 701 | 698 | 706 | 705 | 706 | 704 | 696 | 609 | 536 | 522 | 506

Source: City of Kitakyushu
Recycling Ratio of Domestic Waste from Households

Source: City of Kitakyushu
Recent record of the cost for waste treatment borne by Kitakyushu City (FY 2008)

- FY 2003 (Baseline year)
  - Incineration and other treatment: ¥7.7 billion
  - Collection and transportation: ¥8.4 billion
  - Total amount: ¥16.1 billion

- FY 2007 (After the revision)
  - Incineration and other treatment: ¥8.0 billion
  - Collection and transportation: ¥6.7 billion
  - Total amount: ¥14.2 billion

- FY 2008
  - Incineration and other treatment: ¥8.4 billion
  - Collection and transportation: ¥6.2 billion
  - Total amount: ¥15.1 billion

Reduction by 1.9 billion yen of the cost for waste treatment

For reference
Domestic waste bag (5.97kg/45L) = about ¥200/bag

City of Kitakyushu
Facilitating Resource Circulation and Eco-Industries

Practical Research Area
Practical Research Facilities: 16
Practical Research Projects: 56

Comprehensive Eco-Industrial Complex, Hibiki Recycling Area
Industrial Plants: 29

Outcome of Projects

Environment: Reduction of environmental impact/0.38 million ton CO₂, Resource and energy conservation

Economy: Investment: 66 billion yen
Private sector: 71.7%, national government: 18.2%, local government: 10.1%
Employees: 1,340 people
Visitors: 1 million people (as of October 2011)

Source: Environment Bureau, City of Kitakyushu
<table>
<thead>
<tr>
<th>No.</th>
<th>Projects</th>
<th>Use of National Government’s Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Plastic Pet Bottle Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>2</td>
<td>Office Equipment Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>3</td>
<td>Automobile Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>4</td>
<td>Home Appliance Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>5</td>
<td>Fluorescent Tube Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>6</td>
<td>Medical Instruments Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>7</td>
<td>Mixed Construction Waste Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>8</td>
<td>Complex Core Facility</td>
<td>Agency of Natural Resources and Energy</td>
</tr>
<tr>
<td>9</td>
<td>Comprehensive Nonferrous Metal Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>10</td>
<td>Polluted Solid Purification Project</td>
<td>Ministry of Agriculture, Forestry and Fisheries</td>
</tr>
<tr>
<td>11</td>
<td>Cooking Oil Recycling Project</td>
<td>Ministry of Agriculture, Forestry and Fisheries</td>
</tr>
<tr>
<td>12</td>
<td>Detergent and Organic Solvent Recycling Project / Waste Plastic Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>13</td>
<td>Used Paper Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>14</td>
<td>Can Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>15</td>
<td>Vehicle Recycling Project: End-of-Life Vehicles</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>16</td>
<td>Pachinko Machine Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>17</td>
<td>Wind Power Generation</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>18</td>
<td>Waste Wood / Plastic Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>19</td>
<td>Beverage Container and Vending Machine Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>20</td>
<td>Wind Power Generation</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>21</td>
<td>Sludge and Metals Recycling Projects</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>22</td>
<td>Food Residue Recycling Project</td>
<td>Ministry of Agriculture, Forestry and Fisheries</td>
</tr>
<tr>
<td>23</td>
<td>Styrene Foam Recycling</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>24</td>
<td>Waste Food Recycling Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>25</td>
<td>Reuse of Office Electronics</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>26</td>
<td>Waste Paper Recycling into Foam Inhibitors used for Steel Production</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
<tr>
<td>27</td>
<td>Melting Furnace Fly Ash Recycling</td>
<td>Fukuoka Prefecture</td>
</tr>
<tr>
<td>28</td>
<td>Waste Plastic Package Regeneration Project</td>
<td>Ministry of Economy, Trade and Industry</td>
</tr>
</tbody>
</table>
Promoting Eco-Industry and Resource Circulation in Eco-Town

Plastic PET Bottle Recycling Project

Office Equipment Recycling Project

Home Appliance Recycling Project

Automobile Recycling Project
“Goal Keeper” of Zero Emissions in Kitakyushu Eco-Town

Kitakyushu Eco-Energy CO., Ltd.
Eco-Town’s Contributions to Reducing Environmental Impacts

~Estimation by Life Cycle Assessment~

**Eco-Town:**
23 Projects including
- Plastic PET bottles
- Automobiles
- Home appliances
- OA equipment
- Organic solvent
- Fluorescent lights
- Medical equipment
- Food waste, etc.

**Input of resources**
- Fuel: 48,000 ton
- Electricity: 110,000 MWh
- Water: 5,092,000 ton
- Raw materials: 17,000 ton
- Recycled materials: 475,000 ton

**Output**
- CO₂ emissions: 129,000 ton
- CO₂ reduction: 509,000 ton

**Generation of Electricity**
- 28,000 MWh

**Discharge into environment**
- Evaporation: 1,463,000 ton
- Discharge of effluent: 3,629,000 ton
- Residue: 9,000 ton

**Recycling**
- 368,000 ton

**CO₂ emissions**
- 102,000 ton

**Reduction of environmental impact:** 380,000 ton CO₂

*Source: Evaluation based upon study on material flow data in Kitakyushu City in 2010*
140 countries
6,638 people
(as of 31 March 2012)

Number of participants from overseas
(KITA)

International Cooperation Organisations in Kitakyushu

Japan International Cooperation (JICA) Kyushu International Centre
Kitakyushu International Techno-cooperative Association (KITA)
Kitakyushu Urban Centre, Institute for Global Environmental Strategies (IGES)
Kitakyushu Forum on Asian Women (KFAW)
Kitakyushu Asian Center for Low Carbon Society

City-to-city international environmental cooperation

Joint beach cleaning project
by 10 cities in 3 countries

City of Kitakyushu
Dalian Environmental Demonstration Zone Project in Dalian, China

In 1994

Present

Dalian received the Global 500 Award from UNEP in 2001
## Water Supply Improvement in Phnom Penh, Cambodia

<table>
<thead>
<tr>
<th></th>
<th>in 1993</th>
<th>→ Improvement →</th>
<th>in 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of personnel / 1,000 water tap</td>
<td>22 people</td>
<td>4 people</td>
<td></td>
</tr>
<tr>
<td>Daily water supply (max) (m³/day)</td>
<td>65,000</td>
<td>235,000</td>
<td></td>
</tr>
<tr>
<td>Water supply diffusion ratio</td>
<td>25%</td>
<td>90%</td>
<td></td>
</tr>
<tr>
<td>Operation time</td>
<td>10 hours</td>
<td>24 hours</td>
<td></td>
</tr>
<tr>
<td>Average water pressure</td>
<td>0.2 kgf/cm²</td>
<td>2.5 kgf/cm²</td>
<td></td>
</tr>
<tr>
<td>Number of households serviced</td>
<td>26,881</td>
<td>147,000</td>
<td></td>
</tr>
<tr>
<td>Ratio of non-revenue water</td>
<td>72%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Ratio of payments for water charges</td>
<td>48%</td>
<td>99.9%</td>
<td></td>
</tr>
</tbody>
</table>

At present, there has been improvement in hygienic conditions of water supply and residents can drink water directly from the tap.
Project has been expanded to **30,000 households**, as well as other cities and countries, and has resulted in a **30% reduction of solid waste** in Surabaya’s landfill.

**Environmental Education Project in Balikpapan, Indonesia**

Kitakyushu City has original Environmental Education program. Balikpapan City and Kitakyushu City are sharing each education programs supported by CLAIR.
### International Environmental Cooperation

**International projects implemented by private enterprises in collaboration with the Kitakyushu Asian Center for Low Carbon Society**

<table>
<thead>
<tr>
<th>Projects and related companies</th>
<th>Scheme utilized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Saving Project in Beijing, China&lt;br&gt;YASKAWA Electric Corporation, <em>Largest world share of industrial robots and inverters in Kitakyushu</em></td>
<td>Ministry of Economy, Trade and Industry of Japan</td>
</tr>
<tr>
<td>Promoting Water Saving Equipment in Dalian, China&lt;br&gt;TOTO Ltd., <em>International housing equipment company in Kitakyushu</em></td>
<td>Ministry of the Environment of Japan</td>
</tr>
<tr>
<td>Promoting Waste Water Purification with Provision of License for Nitrate Nitrogen Removal Technology to Chinese Company in Dalian, China&lt;br&gt;Nippon Steel Chemical CO., Ltd., <em>Coal chemical company in Japan</em></td>
<td>Providing the license of pollutant removal technology to Chinese companies</td>
</tr>
<tr>
<td>Received an order from the City of Siem Reap, Cambodia, related to water works planning project&lt;br&gt;Kitakyushu Water Supply Bureau and Hamagin Research Institute, Ltd.</td>
<td>Japan International Cooperation Agency</td>
</tr>
<tr>
<td>Year</td>
<td>Event</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>1985</td>
<td>OECD report describes Kitakyushu as “Gray City to Green City”</td>
</tr>
<tr>
<td>1990</td>
<td>UNEP’s Global 500 Award, first local government recipient in Japan</td>
</tr>
<tr>
<td>1992</td>
<td>Local Government Honours Programme at United Nations Conference on Environment and Development (UNCED), one of 12 cities in the world</td>
</tr>
<tr>
<td>2000</td>
<td>The “Kitakyushu Initiative for a Clean Environment” is adopted at UN ESCAP Ministerial Meeting</td>
</tr>
<tr>
<td>2002</td>
<td>Partnership Award / Environmental Ambassador from United Nations and Stockholm City, only one in Japan</td>
</tr>
<tr>
<td>2002</td>
<td>The “Kitakyushu Initiative for a Clean Environment” identified by World Summit on Sustainable Development (WSSD) in Plan of Implementation</td>
</tr>
<tr>
<td>2006</td>
<td>Ms. Wangari Maathai, Recipient of Novel Peace Prize, said “I will say to the world that let us ask to Kitakyushu about the environment.”</td>
</tr>
<tr>
<td>2006</td>
<td>“TIME” magazine carried a report about Kitakyushu as Environmental Model City</td>
</tr>
<tr>
<td>2006</td>
<td>UNU certificated the Kitakyushu as Regional Centre of Expertise (RCE) of Education for Sustainable Development (ESD)</td>
</tr>
<tr>
<td>2007</td>
<td>First prize in Japan’s Eco-Capital Contest</td>
</tr>
<tr>
<td>2008</td>
<td>First prize in Japan’s Eco-Capital Contest</td>
</tr>
<tr>
<td>2008</td>
<td>Eco Model City, one of six cities in Japan</td>
</tr>
<tr>
<td>2010</td>
<td>Model City on Smart Community, one of four cities &amp; areas in Japan</td>
</tr>
<tr>
<td>2011</td>
<td>Model City for OECD’s Cities and Green Growth Programme, one of four cities worldwide</td>
</tr>
</tbody>
</table>
Conclusion: Zero Waste / Zero Emissions

- Citizen participation in 3Rs (reduce, reuse, recycle)
- Social system for resource circulation
- Technologies
- Cost benefits
- Economic market for recycling...

Direct inquiries to:

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