Urbanization and Water Quality Control in Japan

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Contents

1. History of Water Management
2. Outline of Measures
3. Water Quality Control with Suitable Wastewater Treatment
4. Spread of Sewage System
1. History of Water Management

Water Pollution of Tokyo in 1970’s

Tokyo Bay in 1970’s

A river of Tokyo in 1970’s

The Kanda river (Tokyo) in 1970’s

Photo Credit: Environmental Bureau of the Tokyo Metropolitan Government
Heavy Industry and Processing Trade

Tendency to cause more pollutant

Pollution from:

Heavy industry >> Light industry, Service industry
Production for processing trade
>> Domestic demand

Polluted effluent directly poured into the sea, 1960s

Polluted water around industrial area, Dokai Bay, 1960s, Kyushu

(City of Kitakyushu Website)
Pollution-related Disease

Minamata Disease, Niigata Minamata Disease and Itai-itai Disease had damaged the health of many people.

Minamata Disease is...
- A neurological syndrome caused by severe mercury poisoning
- First discovered in Minamata city in Kumamoto prefecture; officially identified in 1956.
- The second outbreak of Minamata disease occurred in Agano River basin in Niigata prefecture in 1965.
Challenges by local government
Prefectural governments with large industrial areas started to establish ordinances.

- Pollution Prevention Ordinances
  - Tokyo Metropolitan Government: 1949
  - Osaka Prefectural Government: 1950
  - Kanagawa Prefectural Government: 1951
  - Fukuoka Prefectural Government: 1955

Central government established the laws in 1958

- Two Water Quality Laws
  - Law Concerning Preservation of Public Water Areas
  - Law Concerning Control of Factory Effluent
Water Quality Laws of 1958 is not enough

- The public water area had to be designated to be applicable to Law Concerning Control of Factory Effluent.
- Regulations to meet Water Quality Standards were not stringent enough.

What happened?
- Polluted areas had spread from large cities to throughout nation.
- Pollution and facilities which discharged polluted water or wastewater were varied.
- Pollution had worsen rapidly.

New Measures for water environment conservation was needed.
1967

**The Basic Law for Environmental Pollution Control**

To resolve fundamental pollution problems, extending beyond direct control of pollution sources, through systematic and total administrative action.

1970

**Water Pollution Control Law**

- Took over two water quality laws
- Unified several regulations
- All public water areas
- National effluent standard
- Direct penal system
- Almost all kind of industry
2. Outline of Measures concerning Water Environment Conservation

Goals of the water environment conservation policy

- Environmental Quality Standard for Water Pollution (health items, living environment items and DXNs)

Measures concerning water environment conservation

- Wastewater regulation for factories & establishments (uniform regulation)
- System to notify specified facilities
- Water quality monitoring (continuous monitoring, voluntary measurement by enterprises)
- Measures for domestic waste water
- Measures for closed water areas
Measures for factories and establishments

- Water Quality Standard
- Effluent Standard
- Notification of facility installation
- Monitoring of waste water

Measures for domestic wastewater

Measures for closed water areas

Monitoring of public water quality

On-site Inspection Order Report

Pollution Control

Structure

Goals

Seto Inland Sea

Lakes

Ariake Sea and Yatsushiro Sea

Specific areas/Basic Plan & Control

Johkaso

Sewerage

Construction
prevent of marine pollution by ships (MOE · MLIT)

Hydroelectric power (METI)

Water resource development (MLIT)

Johkasoh (MOE · MLIT)

Forest maintenance (MAFF)

River management (MLIT)

Irrigation Agricultural water (MAFF)

Environment Quality Standards (MOE)

Industrial water supply (METI)

Effluent restriction (MOE)

Restrictions on Permeation of Harmful Substances (MOE)

Restrictions of groundwater withdrawal (MOE · METI)

On-Site Treatment System of Domestic Effluent

On-Site Treatment System of Domestic Effluent

MHLW
Ministry of Health, Labour and Welfare

MAFF
Ministry of Agriculture, Forestry and Fisheries

METI
Ministry of Economy, Trade and Industry

MLIT
Ministry of Land, Infrastructure and Transport

MOE
Ministry of the Environment
3. Water Quality Control with Suitable wastewater treatment

Water Pollution caused by Urbanization and industrialization

Water Quality Control

- With proper wastewater treatment and management in a city

Role sharing between Centralization and Decentralization system
Cost comparison between sewerage treatment system and Johkasou

- Domestic wastewater treatment
- Sewerage treatment

Cost per capita (construction & operation and maintenance)

Density of population

Equilibrium point

- Johkasou (Domestic wastewater treatment tank) is cost-effective
- Sewerage treatment system is cost-effective
### Comparison

<table>
<thead>
<tr>
<th>Function</th>
<th>Sewerage treatment system</th>
<th>Johkasou (Domestic wastewater treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wastewater treatment and Prevention of inundation</td>
<td>Wastewater treatment</td>
</tr>
<tr>
<td>Object</td>
<td>Treating wastewater collectively</td>
<td>Treating wastewater individually</td>
</tr>
<tr>
<td>Suitable area</td>
<td>Urban area</td>
<td>Area of scattered population</td>
</tr>
<tr>
<td>Administrator</td>
<td>Municipality</td>
<td>Individual or Municipality</td>
</tr>
<tr>
<td>Useful life of facility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>legal</td>
<td>Treatment plant: 23 years</td>
<td>7 years</td>
</tr>
<tr>
<td>Piping system: 50 years</td>
<td>Treatment plant: 23 years</td>
<td>7 years</td>
</tr>
<tr>
<td>past results</td>
<td>Treatment plant: 15-70 years</td>
<td>main body: over 30 years</td>
</tr>
<tr>
<td></td>
<td>Piping system: 50-120 years</td>
<td>equipment: 7-15 years</td>
</tr>
</tbody>
</table>
TREATMENT METHODS OF DOMESTIC EFFLUENT AND THEIR PREVALENCE RATE

<table>
<thead>
<tr>
<th>Year</th>
<th>Community Plant</th>
<th>Johkasou</th>
<th>Rural Community Sewerage</th>
<th>Sewerage</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY2000</td>
<td>61.8%</td>
<td>2.1%</td>
<td>65.2%</td>
<td>37.9%</td>
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<tr>
<td>FY2001</td>
<td>63.5%</td>
<td>2.3%</td>
<td>66.7%</td>
<td>39.3%</td>
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<tr>
<td>FY2002</td>
<td>68.1%</td>
<td>2.6%</td>
<td>68.1%</td>
<td>41.7%</td>
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<tr>
<td>FY2003</td>
<td>69.3%</td>
<td>2.7%</td>
<td>70.5%</td>
<td>44.1%</td>
</tr>
<tr>
<td>FY2004</td>
<td>70.5%</td>
<td>2.8%</td>
<td>71.7%</td>
<td>46.5%</td>
</tr>
<tr>
<td>FY2005</td>
<td>71.7%</td>
<td>2.9%</td>
<td>71.7%</td>
<td>49.0%</td>
</tr>
<tr>
<td>FY2006</td>
<td>74%</td>
<td></td>
<td></td>
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<tr>
<td>FY2007</td>
<td>76%</td>
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</tbody>
</table>

(Ministry of the Environment)
(Ministry of Agriculture, Forestry and Fisheries)
(Ministry of Land, Infrastructure and Transport)
Development of Sewage Works of Tokyo

Source: Sewerage Bureau of Tokyo Metropolitan Government
Investment of Sewage Works
4. How to spread the Sewerage system in Japan?

The Issue:
   a. Lack of Public’s knowledge
   b. Shortfall of Financial resources
   c. Shortage of Engineer

The Approach:
   d. Development of legal system
   e. Financial resources
a. Lack of Public’s knowledge

- In 1870s, Spread of Cholera
- In 1950s, Water pollution in rivers and the public water bodies became prominent, and environmental pollution became a serious concern.

**Necessity of sanitary facility was recognized**

National Government and Municipality inform the necessity of Sewerage system through Education and Public relations

**Basic of the Sanitation**

- Water Supply
- Sewerage System
- Cleanup the Waste
b. Shortfall of Financial resources

It is very hard to gain the profit through the sewerage works

Public responsibility for development infrastructure as National Minimum.

The Sewerage System has the great effects on the National power, because it improves the Sanitary Condition and Productive capacity.

The role of the Sewerage System is mainly to play public benefit and public purpose (Improvement of the living environment, conserve the water quality of public water body)

Incentives and Resources are necessary
At first, the Financial Regulations (Subsidy system and Fee Collection, etc.) were lacked in the Sewerage Law of Japan, so local governments were in financial distress and they could not construct the Sewage system.

National Government established a sustainable financial base by the Law

- Subsidy System
- Local Bond
- Payment by beneficiary
- Usage fee
c. Shortage of Engineer

Lack of engineers in Local government

National government make the **Technical Guidelines**

National government and Local government set up the **Japan Sewage Works Agency (JS)**

**Japan Sewage Works Agency (JS)**
- Technical Support as the dispatch of Engineer
- Construction of the Core Facilities
- Conduct the Training
- Technical Development, Technical assessment
d. Development of Legal system

To enforce the development of sewerage system Regulation and Control by National Government is important

Development of the legal system

Regulation, Control, System of approval, Right of Inspection, Right of Fee Collection
It is important to clear the following points by development of legal system.

> To clarify the Responsibility / Role-sharing
   National Government, Municipality, Public (Land owner, House owner)

> To set up the regulation as Technical Criteria

> To set up the regulation about the usage of sewage system
   Duty of setting Drainage facilities
   Duty of connecting to the Sewage system
   Duty of setting Equipment for safety disposal

> To limit the obstacle activities

> To establish the system of Check
It is important to clear the following points by development of legal system.

> To set up the system of the usage fee and the payment by beneficiary

> To set up the Subsidy system, free loan and transfer of the government-owned land
It is very important to establish a sustainable financial base

In Japan, Sewerage fee is not enough to cover all administration cost (construction and O&M).

For construction, National government subsidy and Local bond is necessary.

Money transferred from General account is necessary to make up the lack of sewerage fee.
Construction Cost of Sewerage Systems

Wastewater treatment plants

- Project subject for National government subsidy
- Local government’s independent project

- National government subsidy: 55%
- Local bonds, etc.: 40%
- Beneficiary users charge, etc.: 5%

Sewer pipes, etc.

- Cost of a project for national government subsidy
- Cost of a local government’s independent project

- Beneficiary users charge, etc.: 6%
- Local bonds, etc.: 44%
- National government subsidy: 50%
- Local bonds, etc.: 5%
About 70% of the Administration cost is Refund of Local bonds.

About 60% of the Administration cost is financed by the Sewerage Fee.
The Sewage System has the great effects on the National power, because it improves the Sanitary Condition and Productive capacity.

The role of the Sewage System is mainly to play public benefit and public purpose (Improvement of the living environment, conserve the water quality of public water body).

So National Government established the Subsidy system to develop and spread the sewage system.
Local Bond

Sewage works is not a business so local bond is issued by a low interest rate

Payment by beneficiary

Give back some of the asset value of land that is improved by the Sewage system

Usage Fee

Pay a cost according to the Polluter–pays principle (PPP)
Japan have a long history with the Water Environment. The Water Environment is linked very closely to the Lifestyle and Culture in Japan.
Thank you for your attention