

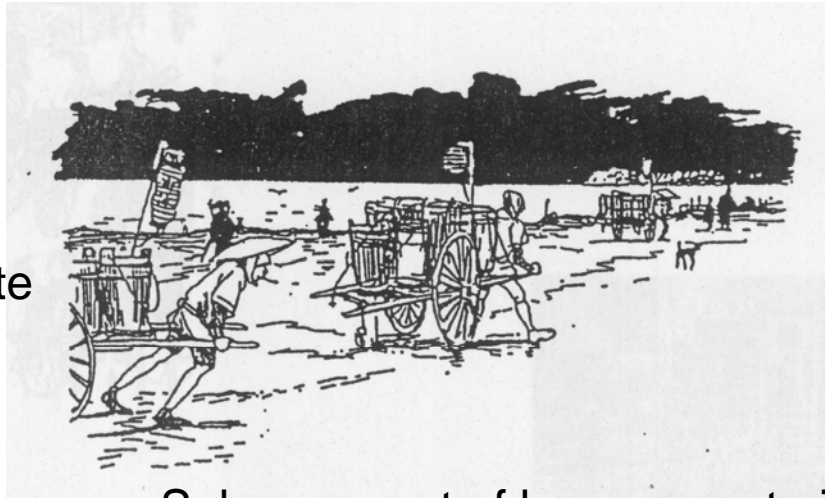
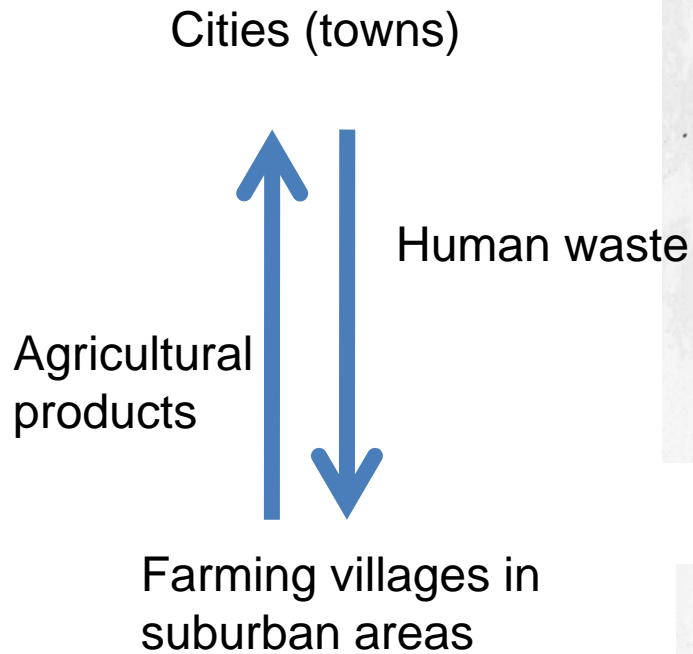
**Strategy for extending sanitation services
by an integrated coverage of on-site and
off-site systems in Japan**

Muneharu HAMADA

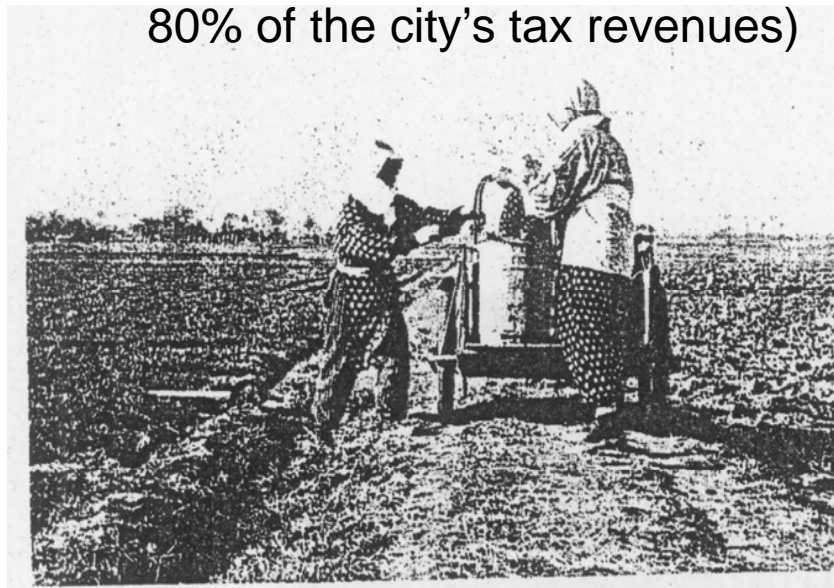
Sewage Works Expert

Japan Sanitation Consortium

Human waste (night soil) in cities was a valuable fertilizer 100 year ago



Sales amount of human waste in the City of Kyoto was ¥80,000 in 1909 (Equivalent to 80% of the city's tax revenues)

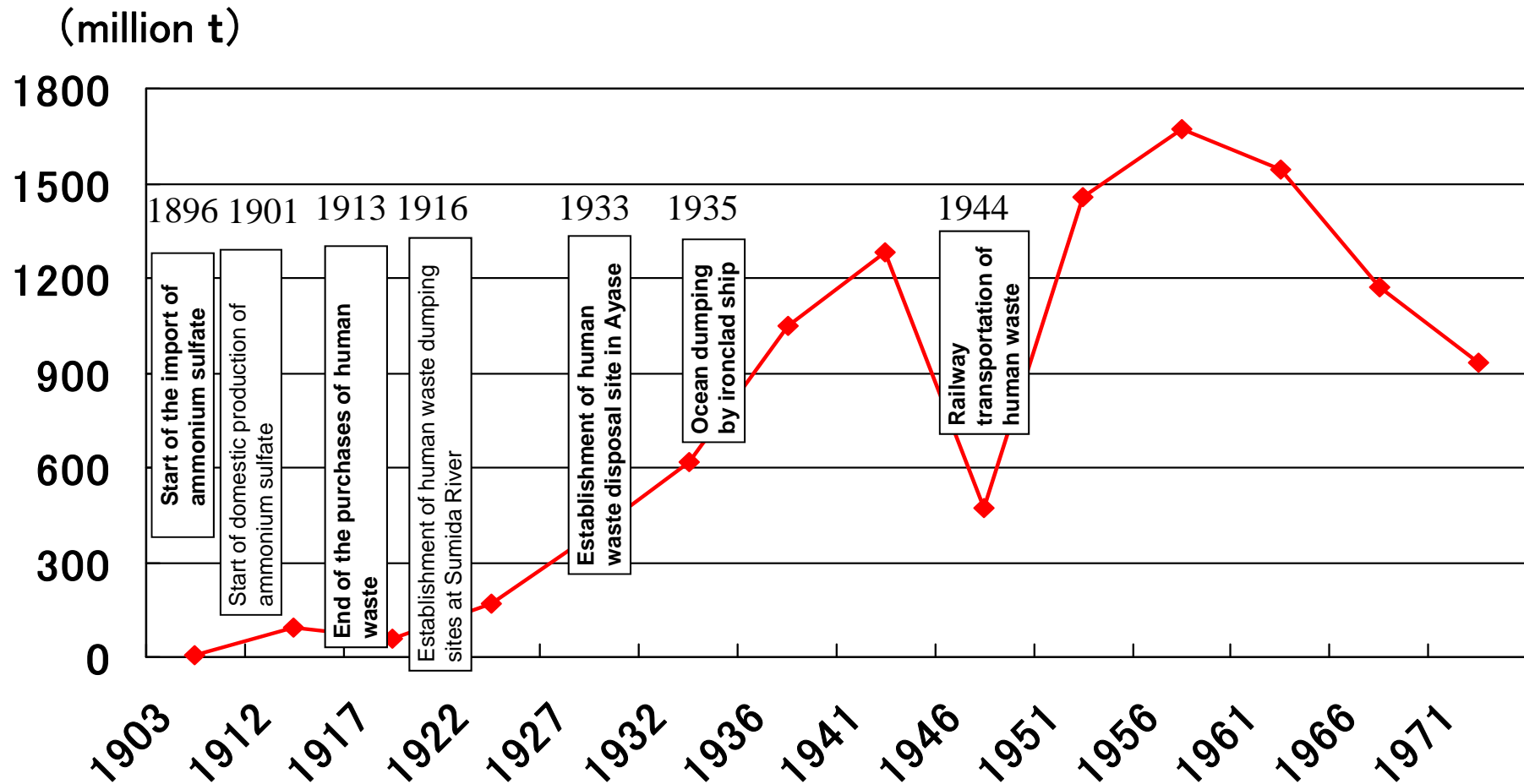


ca. 1900.

Impact of Cholera outbreaks

- The first priority was set to prevent Cholera outbreak
- Water supply was under focus since *V. Cholera* isolation by R. Koch (1884).
- Water supply was first developed also in Japan, followed by sewer systems after World War II.

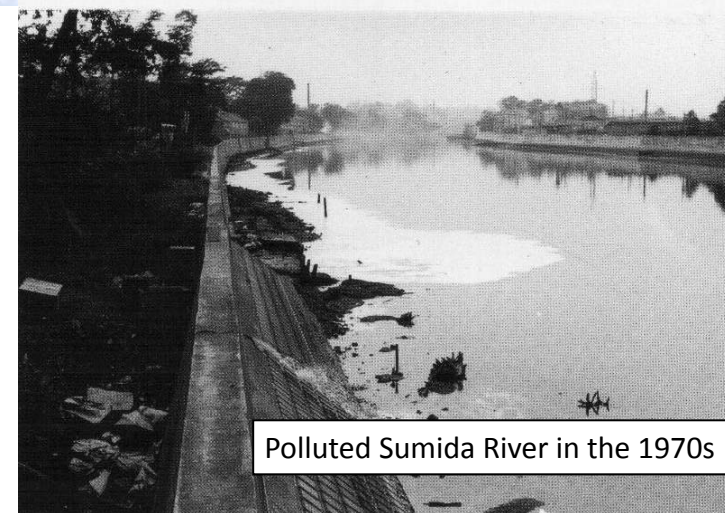
Development of chemical fertilizer (ammonium sulfate), consumption and changes of human waste disposal methods



(Dictionary of Plant Nutrition and Soil Fertility: published by Yokendo, 1980)

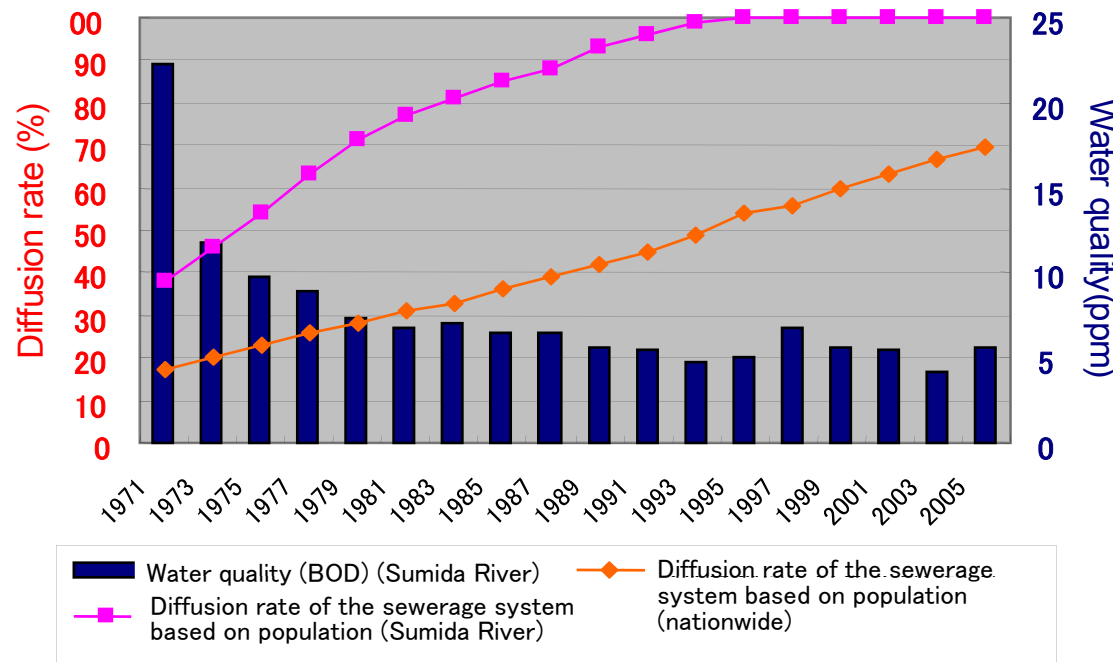
Pollution and clean-up of Sumida River

- ✓ In Japan, legal and institutional improvement, in addition to technological development in the 1970s, has enabled the rapid increase of sewerage coverage, leading to the improvement of river water quality and urban environments.

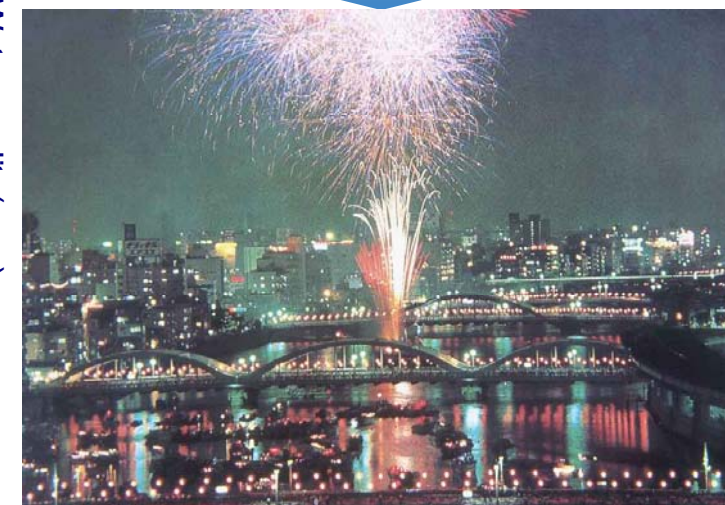


Polluted Sumida River in the 1970s

Diffusion of the sewerage system and change of water quality in Sumida River

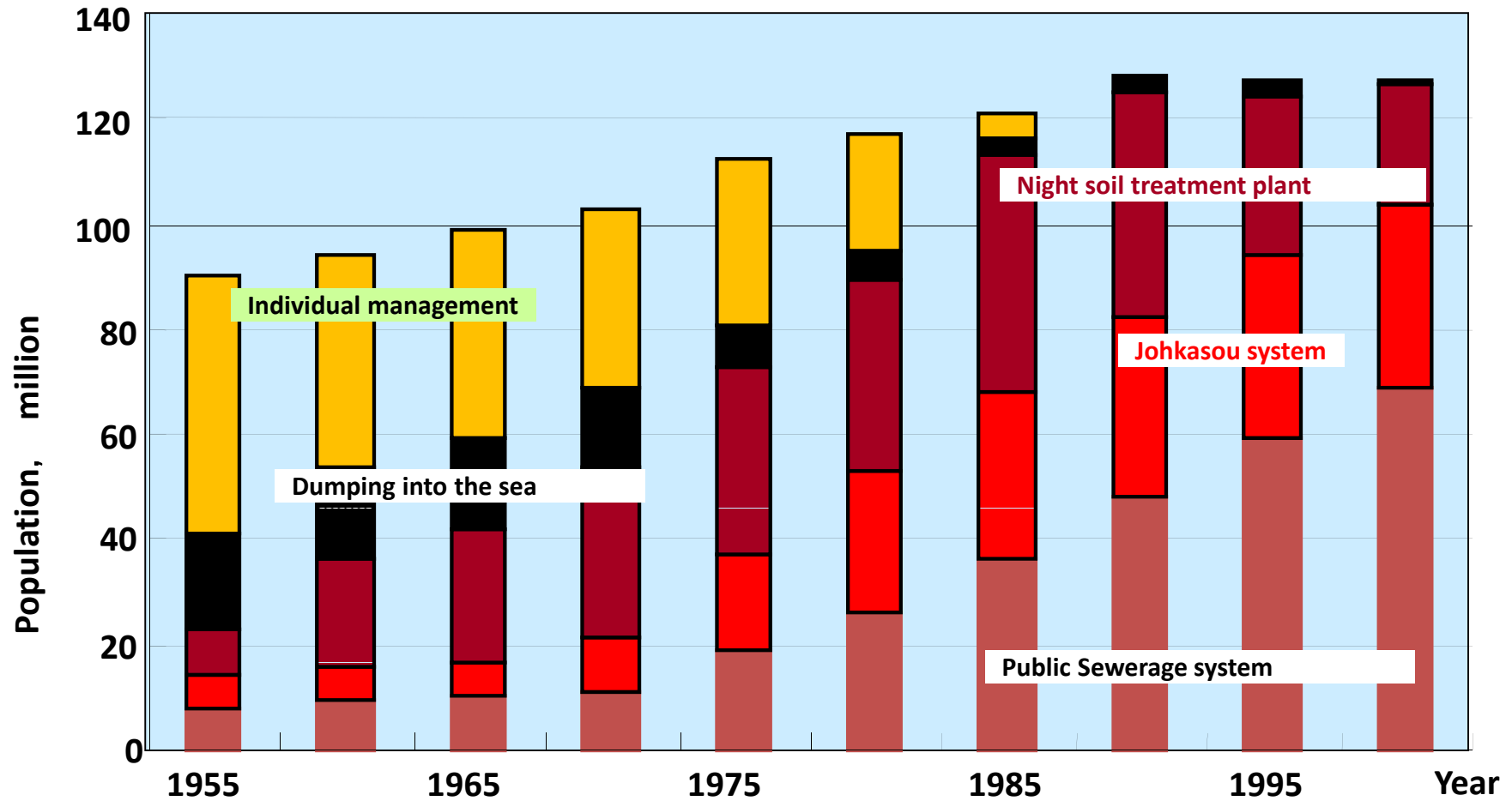


Construction of sewerage facilities



Water quality improvement resulted in the restoration of firework displays along Sumida River

History of Domestic Wastewater Management in Japan

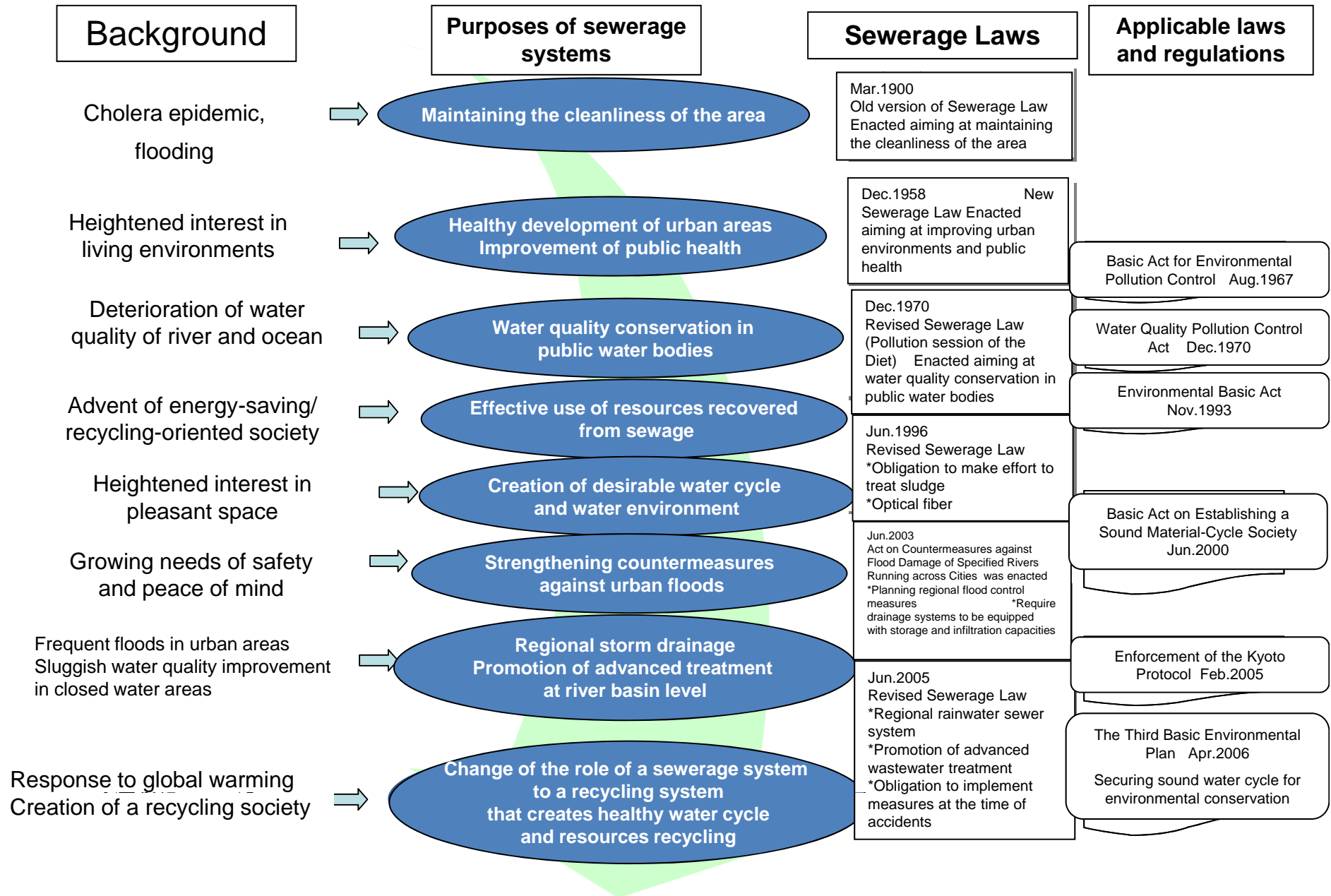


Development of domestic Wastewater management in Japan(1955-2000)

Wastewater Law

- Local governments are primarily responsible for public health and the promotion of a sound city environment as well as the protection of public water bodies.
- To ensure water quality, local governments have the responsibility for the planning, construction and operation of wastewater treatment systems.
- Rainwater management is also included in local governments' responsibilities.

Changing purposes of sewerage systems

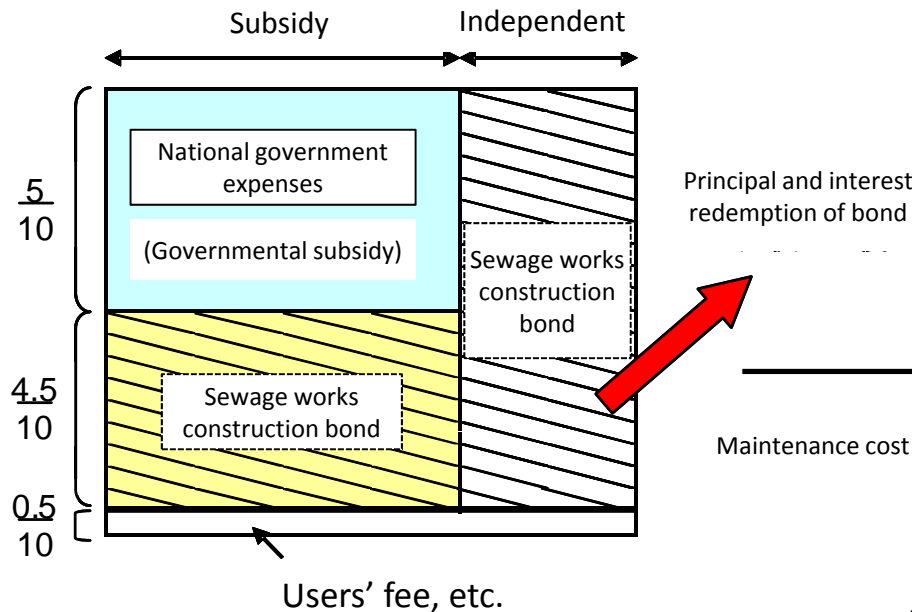


Financial system supporting the evolution of sewerage services

In view of personal benefits, such as flush toilets, and public policy objectives including water quality conservation of public water area and control of flood, the national government expenses, local expenditure, and charges have been properly combined to promote the sewerage service.

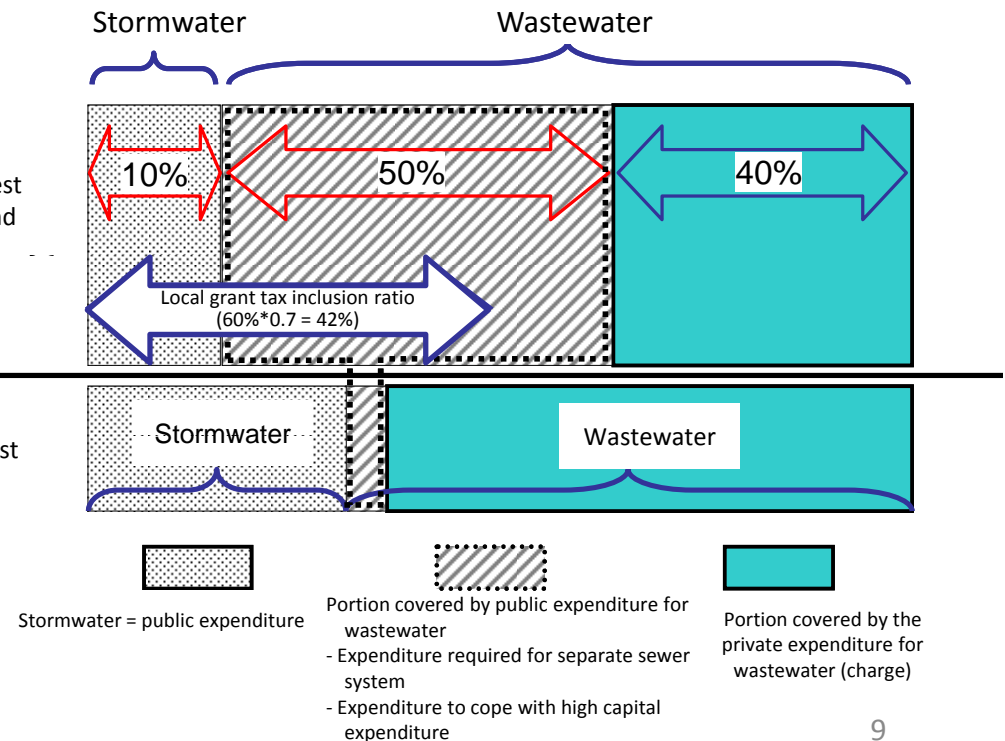
Fund composition for construction costs

Example: Separate sewer system



Fund composition for sewerage maintenance costs

Example: Treatment area with the internal population density of 25 – 50 people/ha

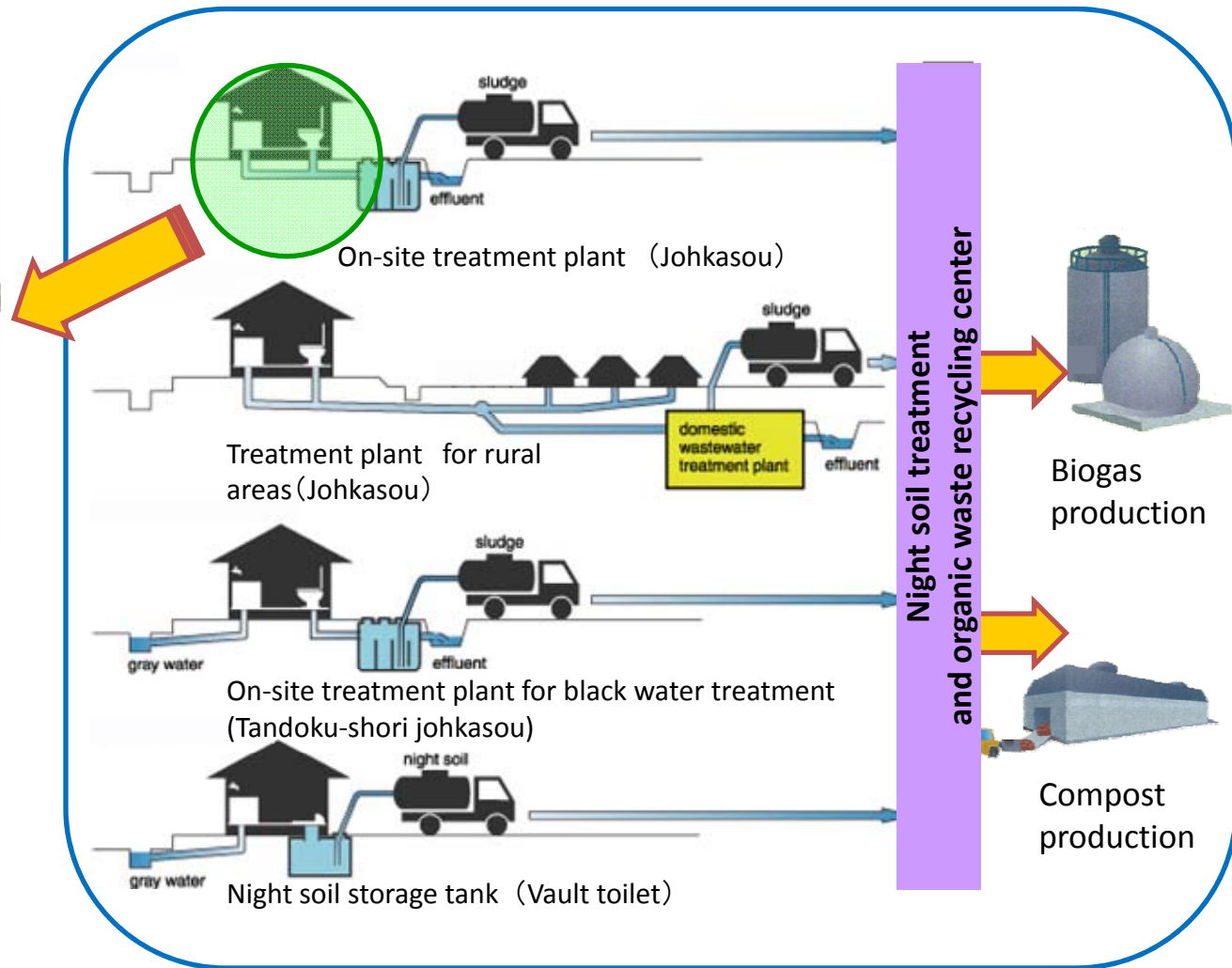


On-site Sanitation Systems (Johkasou) and night soil treatment



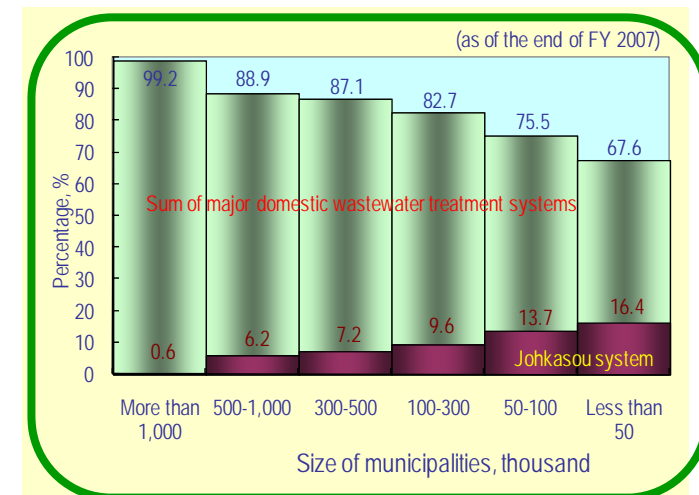
This type of Johkasou can be used for organic pollutants removal as well as nitrogen and phosphorous removal

On-site treatment plant for individual houses (Johkasou)



Advantages of On-site Sanitation Systems (Johkasou)

- Low initial investment cost, high treatment performance
- Little topographic limitation, short installation time and early realization of the effects
- Invaluable contribution to maintaining sufficient water in small rivers and aquatic environments near inhabited areas
- Johkasou-treated water and sludge are easy to reuse
- Be flexible enough to respond to population decrease
- Less vulnerable to earthquakes and other disasters

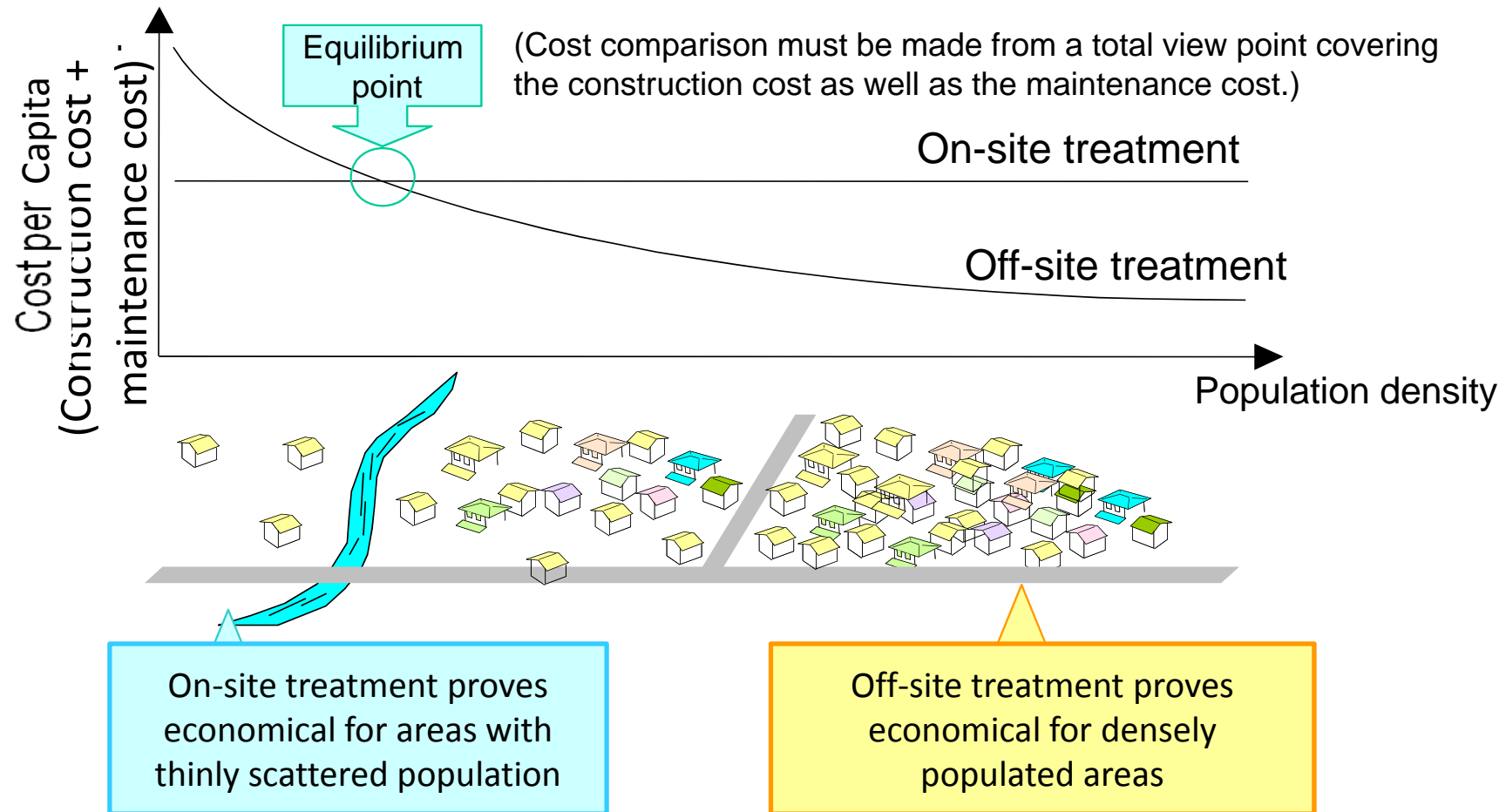


Johkasou Law and Service Population

- 1983: Johkasou Law, 1985 set into effect.
 - Regulating manufacturing, installing, operating and sludge-disposal of johkasou.
- 1987: National subsidy program for individuals, 100 million yen.
- 1994: Subsidy to municipalities for promotion of gappei-johkasou
- 2000: Revision of Johkasou Law, banning tandoku-shori johkasou.
- 2004: National subsidy amounted 25.7 billion.
- 2008: Johkasou serves 11.3 million people, i.e. 8.9% of the total population.

Sanitation systems based on careful study of population density and the cost

Conceptual diagram of cost comparison



※In comparing the cost per person between centralized treatment (sewerage systems, rural sewerage systems, etc.) and individual treatment (*gappei-shori johkasou*), there is an equilibrium point, which is determined by the characteristics of the region. 13

Conclusion

- History of sanitation in Japan: custom of storing
 - Cause less environmental pollution
 - From ocean dumping to night soil treatment
- Spread of flush toilets: further improvement of living environments
 - Sewerage systems cover densely-populated areas and work as storm-water drainage facilities in urban areas
 - (*Tandoku-shori/gappei-shori*) *Johkasous* cover thinly-populated areas
- Japan's experience: key to the improvement of sanitation
 - High coverage rate of Japan's sanitation services was realized by an ideal combination of on-site and off-site systems
 - Financial support
 - Regulations and standards / standardization
 - Hygiene education

Thank you

Thank You for Your Attention

Data on sewerage charge

- **User's charge per month**
(average water consumption amount from typical family: 20m³/month)

(USD/20m³/month)

category \ year	1996	1997	1998	1999	2000
Major Cities	14.6	15.3	15.9	16.5	17.2
General Cities	21.0	22.0	22.7	23.3	24.3
Average of Nation	20.9	21.9	22.6	23.2	24.2

International charge comparison

(USD /20m³/month)

	Sewerage	Water supply	Sewerage/ water supply
Tokyo	16.9	25.8	0.65
Hamburg	57.4	32.3	1.78
Berlin	41.8	29.2	1.44
New York	11.3	7.1	1.58
Paris	13.9	32.4	0.42
London	17.8	18.7	0.95

Researched in December 1994