

Overview of Wastewater Control/Regulatory Activities/Issues and
Directions

下水道事業、法制の現状と今後

Masahiro Takahashi, National Institute for Land Infrastructure and
Management, MLIT, Japan

国土技術政策総合研究所 高橋正宏

OVERVIEW OF WASTEWATER CONTROL/REGULATORY ACTIVITIES ISSUES AND DIRECTIONS

M. Takahashi

Director Dr. Eng.
Water Quality Control Department
National Institute for Land and Infrastructure Management
Ministry of Land, Infrastructure and Transport
Asahi 1, Tsukuba, Ibaraki, 305-0804 JAPAN

ABSTRACT

Sewerage systems play an extremely big role in the water cycle and waste material cycle in Japan. There are many regional cities where sewerage systems still must be constructed, and even in large cities, vast financial resources are necessary to improve combined sewers and upgrade system functions to introduce advanced treatment.

This paper deals with,

1. State of sewerage systems and wastewater treatment in Japan.
2. Rainfall discharge and combined sewers overflow control
3. Recent sewerage system regulations and systems that include design effluent water quality and treatment methods, planning the improvement of combined sewers, chemical risk management and The Biomass Nippon Strategy.
4. Third Five-Year Plan for Sewerage Treatment System Technology.

KEYWORD

Sewerage system, Wastewater treatment, Rainfall discharge, Combined sewers overflow control, Design effluent water quality, Chemical risk management, Third Five-Year Plan for Sewerage Treatment System Technology

STATE OF SEWERAGE SYSTEMS IN JAPAN

Prioritizing the construction of sewerage systems in Japan has increased their penetration rapidly as shown by Figure 1. But the recent reform of the administrative structure has been accompanied by a review of public works projects, resulting in a 6% cut and a 7% cut in funds for sewerage system construction last year and this year respectively. There are many parts of regional cities where sewerage systems still must be constructed, and even in large cities, vast financial resources are necessary to improve combined sewers and upgrade system functions to introduce advanced treatment. For these reasons, now is the time for a broad discussion of the way that sewerage system works are conducted.

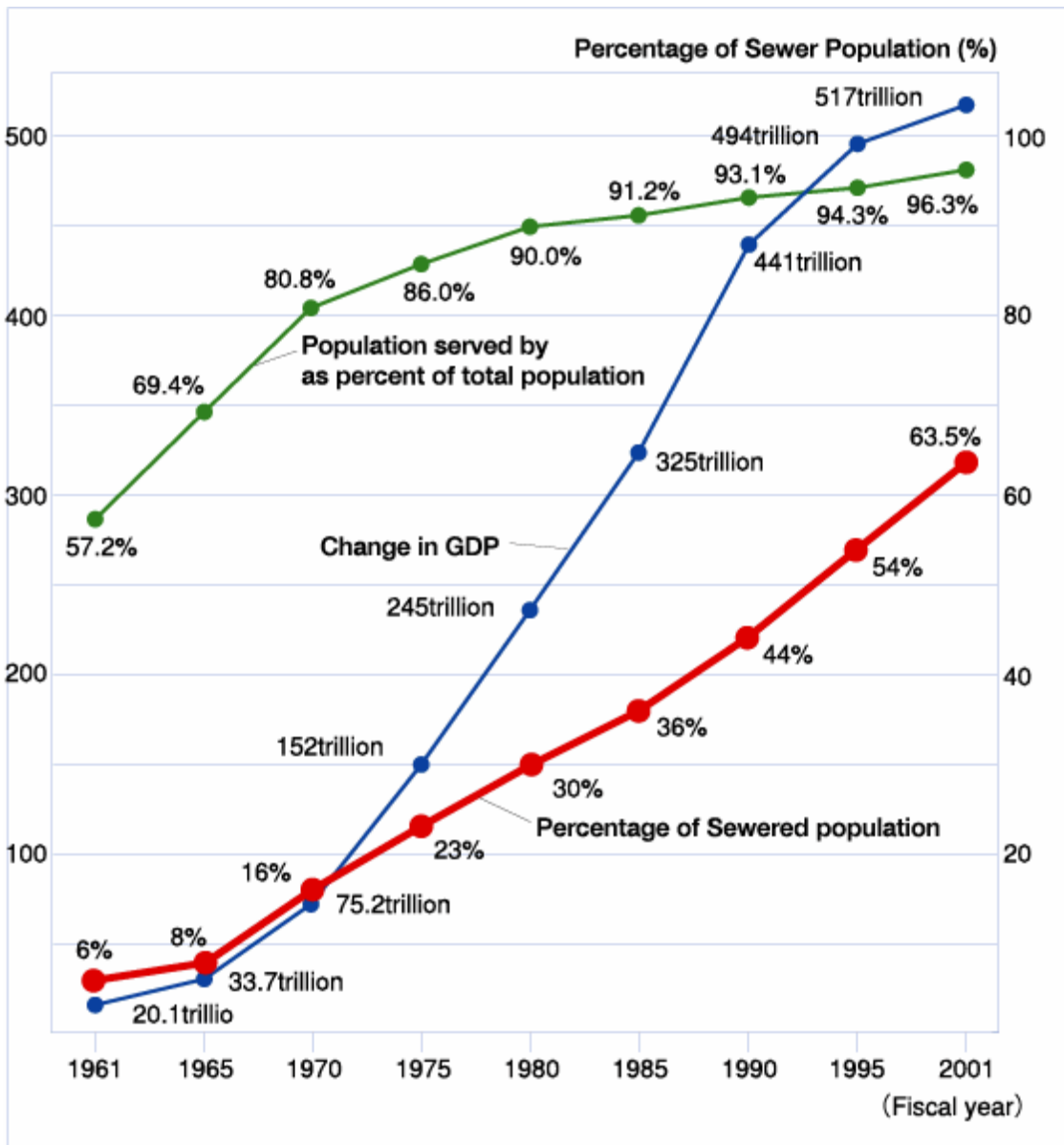


Figure 1 Rapid penetration of sewage system in Japan

Sewerage treatment

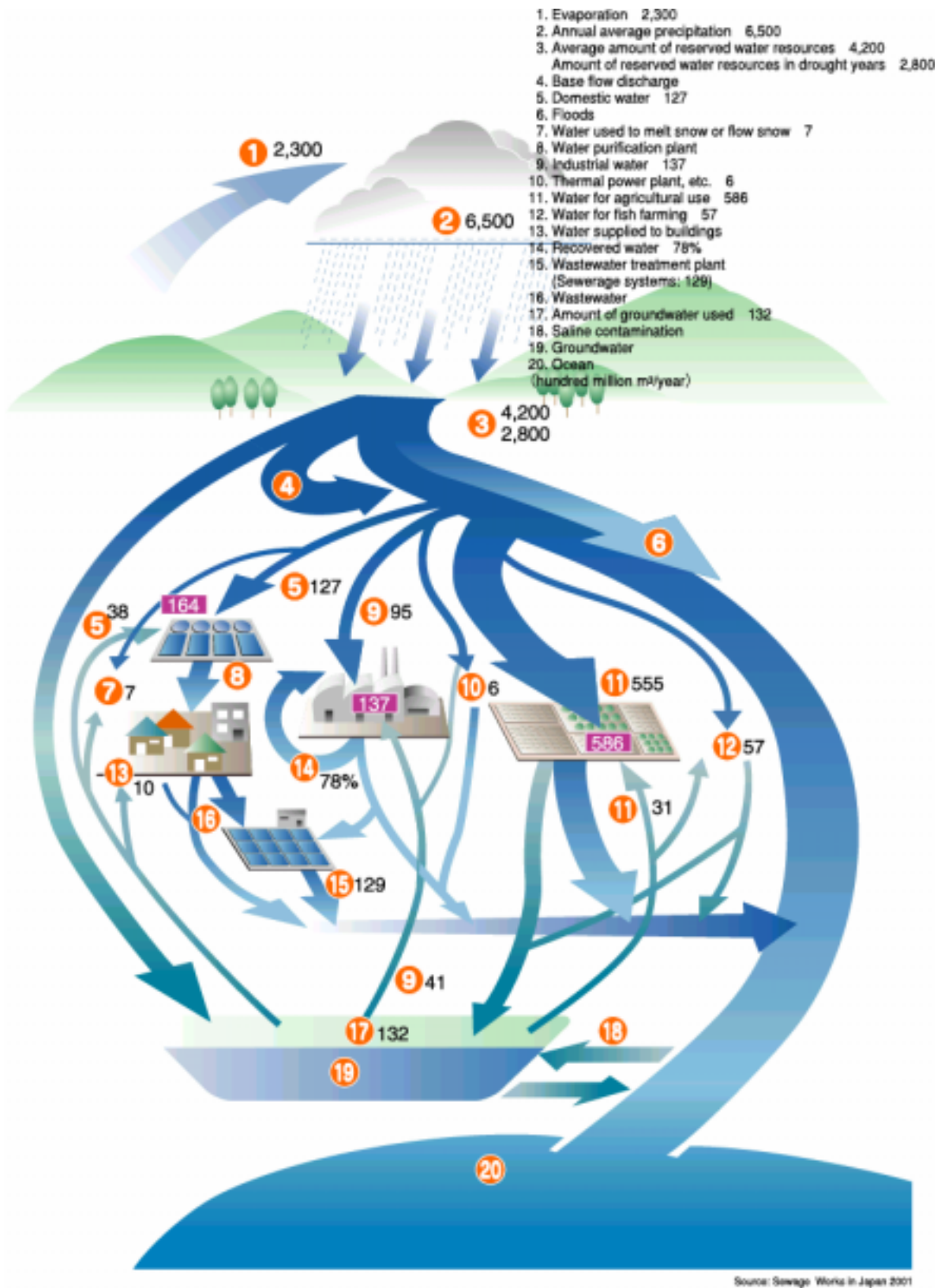
In Japan, 16 billion m³/year of water are used for domestic purposes, and 12.9 billion m³ are discharged to wastewater treatment plants (WTP) as sewerage. As shown in Figure 2, even during water shortages, wastewater treatment plant effluent is constantly discharged, becoming a valuable water resource. It is, therefore, necessary to perform more advanced treatment to conserve and restore the environment.

In March 2002, 1,718 wastewater treatment plants were in operation. Many of these wastewater treatment plants primarily remove organic material by the oxidation ditch method or the conventional activated sludge process, but many other treatment plants that discharge water to important water resource areas and to closed water bodies use the enhanced biological nutrient removal process and other methods that can remove phosphorus and nitrogen. Table 1 shows a breakdown of these plants. The wastewater

treatment plants referred to here operate treatment systems that perform centralized treatment of urban wastewater under the management of the Ministry of Land, Infrastructure and Transport. Others are wastewater treatment plants that perform centralized treatment in fishing, lumbering, and agricultural towns and on-site treatment (johkasou) that treat wastewater from individual households; two types that serve about 10% of the population.

Table 1 Breakdown of WTP

Treatment process	Designed maximum dry weather (m ³ / day)						Total
	Less than 4	5-10	10-50	50-100	100-500	More than 500	
Sedimentation	2						2
Conventional activated sludge	43	56	309	113	132	16	669
Step aeration	1		8	9	5		23
Oxygen activated sludge	1	1	4	1	4		11
Extended aeration	20	5	2				27
Oxidation ditch	586	77	36				699
Denitrification and nitrification	3		2		3		8
Anaerobic Anoxic oxic	1	1	5		4		11
Anaerobic and oxic	15	1	15	7	20	6	64
Sequencing batch reactor	59	6	4				69
High rate compact activated sludge			5		1		6
Rotating biological contactor	12	4	5	1			22
High rate trickling filter		2	2				4
Low rate biofilm	22						22
High rate biofilm	24	2					26
Anaerobic aerobic biofilm	15						15
Activated sludge with coagulant	1		4	4			9
Other	11	2	8	2	8		31
Total	816	157	409	137	177	22	1718
Subtotal of advanced treatment	62	14	45	16	64	16	217



Source: Sewage Works in Japan 2001

Figure 2 Water Cycle in Japan

Rainfall discharge and combined sewers

In Japan's cities, houses and roads are densely concentrated and rainfall penetration functions are extremely limited. In these districts, rainfall discharge is an important role of sewerage systems. But there are limits to the discharge capacity of city rivers where they flow between densely built up districts, and there are many locations where it is difficult to discharge rainwater from sewerage systems. So systems are established to integrate sewerage systems with rivers and to prevent inundation damage by, for example, storing rainwater throughout a river basin.

In large cities where sewerage systems have been constructed for a long time, many combined sewer systems are operated, but the concentration of population and industry in cities has increased the dry weather flow, and combined with the decline of rainfall penetration functions in cities, large quantities of sewerage overflows into water bodies during rainfall. In many cities, therefore, new large intercepting sewers or rainfall storage tanks are constructed in order to strengthen rainfall removal functions and reduce wet weather overflow. The improvement of combined sewers is explained in detail below.

SEWERAGE SYSTEM REGULATIONS

Comprehensive basin-wide planning of sewerage systems

This refers to planning done to enact upper-level plans over individual sewerage treatment projects in a river basin in order to most effectively provide sewerage systems needed to achieve the water quality environment standards for its rivers, and for the coastal area. When a river basin is completely inside a single prefecture, the plan is enacted under the authority of the prefectural governor to divide the pollution load among cities, towns, and villages. In a case where it spans more than one prefecture, the national government coordinates the plans to allot the load that should be reduced among the concerned prefectures. Figure 3 shows an image of such a plan. By August 2003, plans had been enacted for 126 bodies of water.

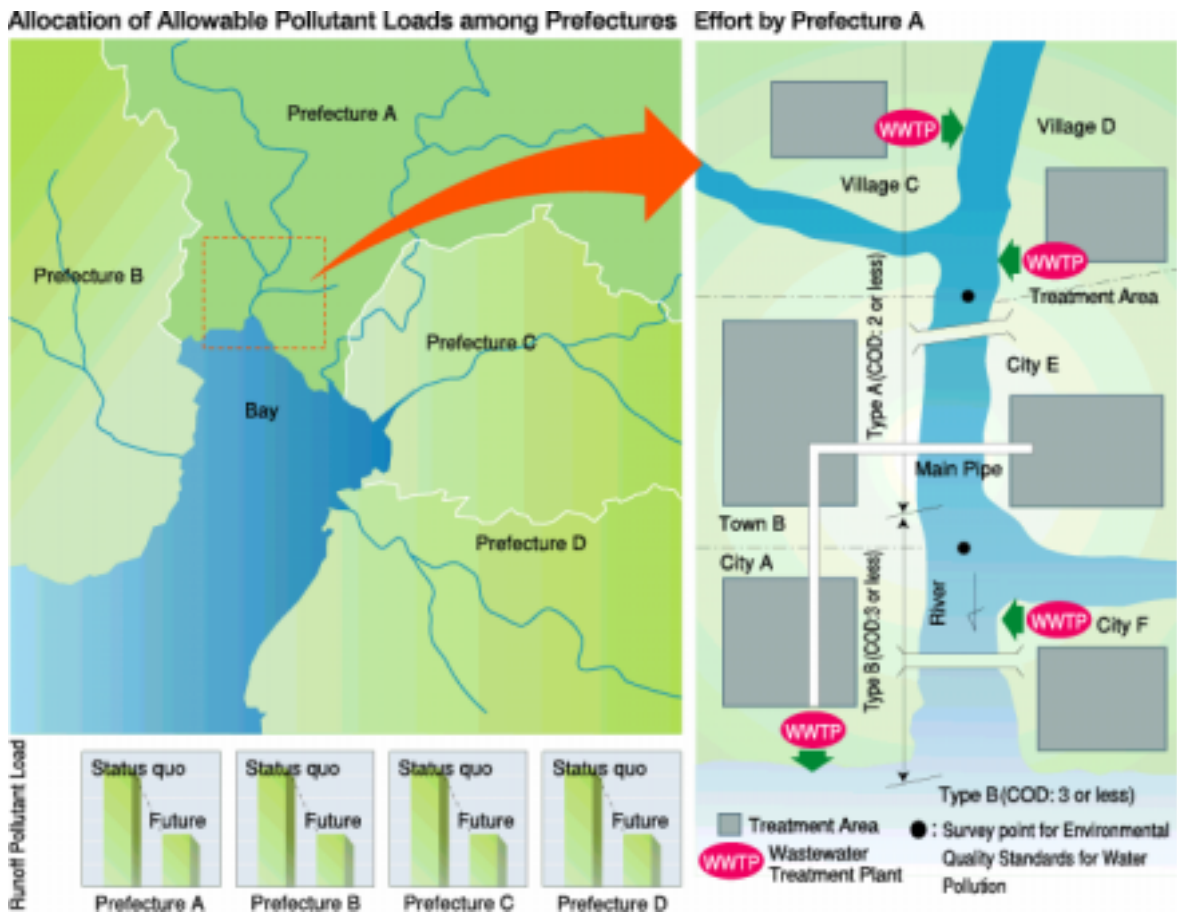


Figure 3 Image of Comprehensive basin-wide planning of sewerage systems

Design effluent water quality and treatment methods

In order to achieve the pollution load established through the comprehensive basin-wide plan for sewerage systems, each wastewater treatment plant sets its design effluent water quality. Normally this is set for the pollutant load reduction of BOD and SS, but in cases where water quality environment standards are set for phosphorus and nitrogen, these pollutant loads must also be reduced. Under the Sewerage Law Enforcement Order that was revised this year, treatment methods to achieve the designated design effluent water quality are stipulated. These stipulated treatment methods or other treatment methods that have been confirmed to provide equal or superior treatment capacity must be used. Table 2 shows the relationship of the design effluent water quality with the treatment method. And in all cases, the design effluent water quality must not be BOD of 15mg/l or higher. And the design effluent water quality for coliform groups is uniformly set at 3,000/ml, but this value must be revised in the future.

Table 2. Design Effluent Water Quality – Typical Treatment Method Relationship

Typical treatment methods	Additional processing			Design effluent water quality		
	rapid filtration	coagulant admixture	organic material admixture	BOD mg/l	T-N mg/l	T-P mg/l
Standard activated sludge method	No	No	No	10 to 15	-	-
	Yes	No	No	Max. 10	-	-
Anaerobic – aerobic activated sludge method	No	No	No	10 to 15	-	Max. 3
	Yes	No	No	Max. 10	-	1 to 3
	Yes	Yes	No	Max. 10	-	Max. 1
Anaerobic – anoxic aerobic method	No	No	No	10 to 15	(Max. 20)	(Max. 3)
	Yes	No	No	Max. 10	(10 to 20)	(1 to 3)
	Yes	No	Yes	Max. 10	10 to 20	(1 to 3)
	Yes	Yes	No	Max. 10	(10 to 20)	Max. 1
	Yes	Yes	Yes	Max. 10	Max. 10	[0.5 to 1 or Max. 0.5]
Nitrification and denitrification process	No	No	No	10 to 15	Max. 20	-
	Yes	No	No	Max. 10	10 to 20	-
	No	Yes	No	10 to 15	Max. 20	Max. 3
	Yes	No	Yes	Max. 10	Max. 10	-
	Yes	Yes	No	Max. 10	10 to 20	1 to 3
	Yes	Yes	Yes	Max. 10	Max. 10	[1 to 3 or 0.5 to 1]

Planning the improvement of combined sewers

The improvement of combined sewers is positioned in the Sewerage Law Enforcement Order that was revised this year. Its basic concept is to achieve the following three goals.

- (1) Pollution load reduction: The annual BOD load that is discharged must be equal to or less than that from a separate sewer system.
- (2) Guaranteeing public hygiene: The frequency that untreated sewerage is discharged from all outlets must be reduced by at least 50%.
- (3) Reduction of debris screening: In principle, debris must not be discharged from any outlets.

But because the improvement of combined sewers is extremely expensive and time-consuming, the above targets must be achieved within the next ten years. And for large-scale combined sewers in cases where a sewerage system operated by a city, town, or village drains a basin of 1,500ha or more and in cases where a sewerage system operated by a prefecture drains a basin of 5,000 ha or more, the goal is improvement within 20 years. The water quality of the overflow water after improvement must be average BOD of 40mg/l after a typical rainfall between 10 and 30mm. And the

temporary effluent water quality before improvement must be 70mg/l or less.

Chemical risk management

With the start of the submission of PRTR (Pollutant Release and Transfer Register) in 2001, full scale risk management of chemicals in the environment began. PRTR is a method of clarifying, tabulating, and releasing data indicating what sources discharge a wide variety of hazardous chemicals, to what extent they are discharged into the environment, or if they are carried out of business premises in waste material. Businesses that manufacture or use 354 designated chemicals that are covered by the system must independently clarify the quantity they discharge into the environment and the quantity that they transport out of their business premises to treat as waste material, and report their findings to an administrative body once a year.

The administrative body processes and tabulates the data, estimates the quantity of these chemicals that are discharged from homes, farms, automobiles, and other sources, and releases both classes of data.

Wastewater treatments plants that are predicted to treat influent containing designated chemicals above a certain scale are also legally required to submit reports. They must measure the concentration of designated chemicals in the effluent and smoke discharged from the plant under standards such as the effluent water quality standard and submit PRTR reporting on the results of these measurements.

Chemicals discharged into sewerage systems by business premises are also covered by the notification system. This permits wastewater treatment plants to confirm which business premises in their service area are discharging chemicals.

Because it is predicted that this might result in chemicals that effect the functions of the sewerage treatment plant entering the plant, or in chemicals that the sewerage treatment plant cannot process flowing into the plant then passing through the plant to have a negative impact on the water environment, or cause other problems, the Ministry of Land, Infrastructure and Transport has prepared, the “Manual for Chemical Risk Management in Sewerage Treatment Plants.” And the National Institute for Land and Infrastructure Management has undertaken research to confirm the compatibility of the relationship of PRTR notification with the quantities of these chemicals actually in water environments.

The Biomass Nippon Strategy

The Biomass Nippon Strategy is a strategy contrived to achieve Biomass Nippon: a society that utilizes all of the biomass that consists of agricultural, forestry, and marine resources, organic waste material, and other organic resources with biological origins as energy and as products.

It is positioned as a cooperative effort by the Ministry of Agriculture, Forestry, and Fisheries, the Ministry of the Environment, and the Ministry of Land, Infrastructure and Transport in the Basic Policy Concerning Economical and Financial Restructuring 2002 (Cabinet Decision of June 25, 2002).

The Biomass Nippon Strategy will rapidly and intensively advance based on achievable utilization measures in order to prevent global warming and create a recycling oriented society. Its national goals are to utilize at least 80% of biomass produced from waste material converted to quantity of carbon and at least 25% of unused biomass converted to quantity of carbon by 2010. The heart of the strategy is organic waste materials

produced by agriculture, animal husbandry, and forestry, but the priority is now sewerage sludge. The Ministry of Land, Infrastructure and Transport completed the Manual for the Enactment of Basic Plans to Utilize Bio-solids (Draft) in August 2003 for use by regional governments that are promoting the use of sludge.

Its achievements include the reuse of sewerage sludge (accounts for about 19% of all industrial waste material) as construction material or as fertilizer to achieve a sewerage sludge recycling rate of 60% by the end of 2002. Progress has also been seen in the production of electric power by digester gas from sludge, the use of heat pumps to use heat produced by sewerage, and other ways of using sludge as an energy source.

THIRD FIVE-YEAR PLAN FOR SEWERAGE SYSTEM TECHNOLOGY

Outline of the plan

As the beginning of this new century brings an astonishing and sweeping transformation of the social environment of Japan, we face global scale environmental problems and the aging society accompanied by a falling birth rate that is lowering our population. We must, therefore, not only undertake conventional sewerage treatment plant projects, but must transcend the limitations of existing technologies to create bold concepts to develop new technologies in order to provide new systems suited to the public's needs and that meet the demand to respond effectively to these rapid changes.

The Sewerage and Wastewater Management Department of the City and Regional Development Bureau of the Ministry of Land, Infrastructure and Transport and the Water Quality Control Department of the National Institute for Land and Infrastructure Management established a committee to study and enact the Third Five Year Plan for Sewerage System Technology in cooperation with other concerned research institutes in September 2003. The committee carried out its revision based on information, documents, and views obtained from academic experts and held public hearings to enact the Third Five Year Plan for Sewerage System Technology.

Based on the fundamental concept, "Society that uses technology to create safety, an environment, low cost life, and vigorousness, and that is open to all," the plan presents specific research and development goals for the relatively short period of five years while considering long-term goals, and also stipulates the content of technology development to be conducted by the national government during this period.

Background to the enactment of the plan

In 1994, the Ministry of Land, Infrastructure and Transport (at that time, the Ministry of Construction) undertook the Five Year Plan for Sewerage System Technology (First Five Year Plan for Sewerage System Technology) that was initially enacted as a sewerage technology development and introduction plan, then in 2000 at the dawning of the twenty-first century, the Ministry enacted the New Five Year Plan for Sewerage System Technology (Second Five Year Plan for Sewerage System Technology) based on the concept, "New Century of Water, Communities, and the Globe Created by Everyone," and has worked to develop, introduce, and popularize sewerage treatment technologies.

But in the midst of a technological revolution in other fields such as information and communications, it has become increasingly important to apply these new technologies to sewerage treatment plants in order to provide them more efficiently.

In response to these circumstances, the Ministry of Land, Infrastructure and Transport enacted the Basic MLIT Technology Plan in 2003, and based on the Priority Plan for the Provision of Social Capital, it clarified technology research and development policies of the MLIT for the next five years in technological fields that support the provision of all social capital including sewerage systems.

Technologies related to sewerage systems are linked to a broad range of technologies including civil engineering, building construction, hygiene, machinery, electrical, etc. In order to provide researchers conducting technological development with a shared awareness of the present state and needs of sewerage system technology so that they conduct research guided by a common policy, medium-term goals and policies must be concretely established.

We have clarified the present state of sewerage systems considering the above circumstances and enacted the Third Five Year Plan for Sewerage System Technology that describes and present policies for the development and introduction of new sewerage system technologies based on evaluations of the major technologies developed under the Second Five Year Plan for Sewerage System Technology.

Major challenges

The Third Five Year Plan for Sewerage System Technology is, as a plan enacted in line with the Basic MLIT Technology Plan that presents a broad outline of policies for technological development necessary to establish future social capital, intended to coordinate technology and development strategies throughout the Ministry of Land, Infrastructure and Transport. The five goals stipulated as development strategies in the Basic MLIT Technology Plan are presented as Major Challenges. To accurately reflect changes in social conditions influencing sewerage systems, Intermediate Challenges are listed under the Major Challenges as key words, and Technology Development Items are established as even more detailed challenges.

Table 3, Major Challenges, Intermediate Challenges, and Technology Development Items

Major Challenges	Intermediate Challenges	Technology Development Items	
I Safe and worry free life	1. Creation of cities safe from disasters	(1) Technologies to plan inundation counter-measures from the river basin management perspective	
		(2) Advanced technologies for inundation countermeasures.	
		(3) Technologies to construct earthquake resistant sewerage systems	
	2. River system risk management	(4) Technologies to monitor hazardous substances and to evaluate hazardous substance risk	
		(5) Technologies to remove/detoxify hazardous substances	
II Creating beautiful and sustainable national land	3. Creation of a sound water cycle and a good water environment through river basin management	(6) Technologies to introduce economical methods of reducing pollution load	
		(7) Technologies to enact water cycle master plans	
		(8) Technologies to construct water cycle open data bases	
		(9) Technologies to evaluate impacts on the water environment	
		(10) Technologies to conserve and create good water environments	
	4. Preserving the water quality of river basins	(11) Advanced technologies to remove nitrogen, phosphorus, etc.	
		(12) Technologies to remove pollutant load from rainfall overflow water etc.	
	5. Managing sewerage system resources	(13) Technologies to encourage the reuse of treated wastewater	
		(14) Technologies to reduce sewerage sludge	
		(15) Advanced technologies to utilize the energy retained by sewerage sludge	
		(16) Technologies to effectively use sewerage sludge as a material resource	
		(17) Technologies to optimize the organic waste material flow in regional societies	
	6. Responding to urban renewal	(18) Technologies to improve urban environments	
		(19) Advanced technologies for sewerage systems in response to changes in urban structures	
	7. Conserving the global environment	(20) Technologies to locally utilize low level heat emitted by sewerage systems	
		(21) Technologies to lower the energy consumed by sewerage treatment plants	
		(22) Technologies to use natural energy to recover and treat sewerage	
		(23) Technologies to control the emission of global warming gasses	
		(24) Technologies to recover energy by utilizing organic resources in cities	
	III Comfortable low-cost life	8. Efficient provision of wastewater treatment plants	(25) Technologies to lower life cycle costs
			(26) Technologies to economically and quickly construct wastewater treatment plants
		9. Efficient management of wastewater treatment plants	(27) Technologies to perform efficient plant management and sound plant operation
			(28) Technologies to effectively upgrade/modify and to reconstruct wastewater treatment plants
	10. Promotion of links with other industries	(29) Technologies to promote links with other industries	
IV Vigorous society with greater international competitive strength	11. Responding to internationalization	(30) Sewerage treatment system technologies to respond to globalization	
V Society in which all people feel as if they are a full member of society	12. Public participation	(31) Technologies to conduct projects cooperatively with the public	
		(32) Advanced technologies to establish project evaluation methods to promote efficiency and accountability	

CONCLUSIONS

Sewerage systems play an extremely big role in the water cycle and waste material cycle in Japan. Sewerage treatment has a big impact on all kinds of water use including its use as drinking water in river basins, the restoration of water environments, and on artificial water use in cities. Remaining problems related to the control of rainfall include preventing inundation, reducing non-point pollution sources, and using rainwater to cultivate ground water resources. It is essential to make the maximum use of the resource value of sludge that accounts for 19% of all industrial waste material in Japan in order to prevent global warming and effectively use our natural resources.

These challenges include many that cannot be easily overcome only by sewerage system related measures. It is important to establish both river basin systems and a nation-wide system to respond to these challenges.

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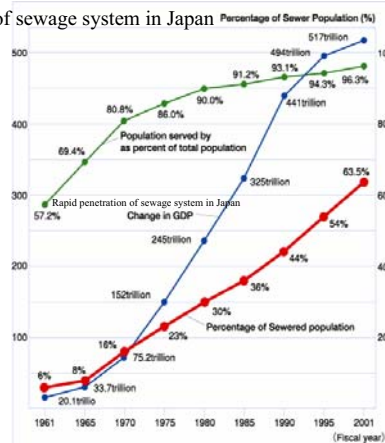


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- 4. Third Five-Year Plan for Sewerage Treatment System Technology.



Rapid penetration of sewerage system in Japan



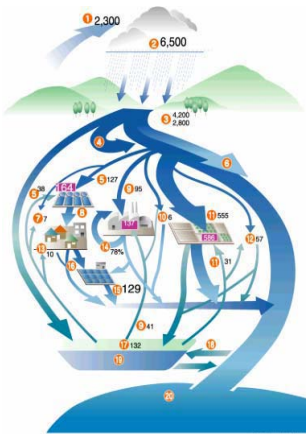
Cut in Founds for Sewerage System Construction

- FY 2004 2,225 Billion Yen
- FY 2003 2,567
- FY 2002 2,921
- FY 2001 3,260
- FY 2000 3,409
- Small Communities
- CSO control, Advanced Treatment



Water Cycle in Japan

1. Evaporation 2,300
2. Annual average precipitation 6,500
3. Average amount of reserved water resources 4,200
4. Amount of reserved water resources in drought years 2,800
5. Base flow discharge
6. Domestic water 127
7. Floods
8. Water used to melt snow or flow snow 7
9. Water purification plant
10. Industrial water 137
11. Thermal power plant, etc. 6
12. Water for agricultural use 586
13. Water for fish farming 57
14. Water supplied to buildings
15. Recovered water 78%
16. Wastewater treatment plant (Sewerage systems: 129)
17. Amount of groundwater used 132
18. Saline contamination
19. Groundwater
20. Ocean (hundred million m³/year)



Breakdown of WTP

Treatment process	Designed maximum dry weather (m ³ / day)						Total
	Less than 4	5-10	10-50	50-100	100-500	More than 500	
Sedimentation	2						2
Conventional activated sludge	43	56	309	113	132	16	669
Step aeration	1		8	9	5		23
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Extended aeration	20	5	2				27
Oxidation ditch	586	77	36				699
Denitrification and nitrification	3	2	2		3		8
Anaerobic Anoxicoxic	1	1	5		4		11
Anaerobic andoxic	15	1	15	7	20	6	64
Sequencing batch reactor	59	6	4				69
High rate compact activated sludge			5		1		6
Rotating biological contactor	12	4	5	1			22
High rate trickling filter		2	2				4
Low rate biofilm	22						22
High rate biofilm	24	2					26
Anaerobic aerobic biofilm	15						15
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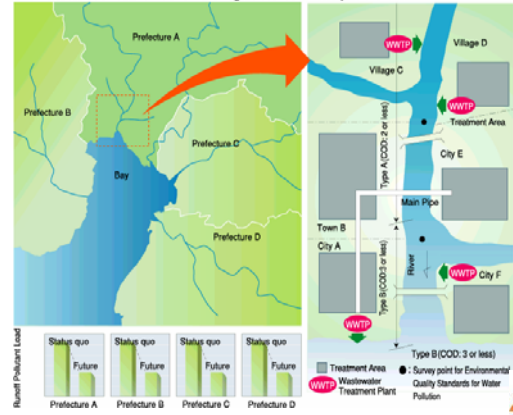


Water Quality Control by Sewerage System

- Comprehensive basin-wide planning of sewerage systems to achieve the environmental water quality standard
- 165 Systems in FY 2002



Allocation of Allowable Pollutant Loads among Prefectures Effort by Prefecture A



Design Effluent Water Quality and Treatment Methods

- Setting the design effluent water quality
 - BOD at least 15 mg/l
 - T-N and T-P=depend on necessity
 - SS, pH, Coliform groups=fixed value
- Typical treatment method
 - Conventional activated sludge process
 - Enhanced biological nutrient removal process
 - Coagulation and filtration



Table 2. Design Effluent Water Quality – Typical Treatment Method Relationship

Typical treatment methods	Additional processing			Design effluent water quality		
	rapid filtration	coagulant admixture	organic material admixture	BOD mg/l	T-N mg/l	T-P mg/l
Standard activated sludge method	No	No	No	10 to 15	-	-
	Yes	No	No	Max. 10	-	-
Anaerobic – aerobic activated sludge method	No	No	No	10 to 15	-	Max. 3
	Yes	No	No	Max. 10	-	1 to 3
	Yes	Yes	No	Max. 10	-	Max. 1
Anaerobic – anoxic aerobic method	No	No	No	10 to 15	(Max. 20)	(Max. 3)
	Yes	No	No	Max. 10	(10 to 20)	(1 to 3)
	Yes	No	Yes	Max. 10	10 to 20	(1 to 3)
	Yes	Yes	No	Max. 10	(10 to 20)	Max. 1
Nitrification and denitrification process	No	No	No	10 to 15	Max. 20	-
	Yes	No	No	Max. 10	10 to 20	-
	No	Yes	No	10 to 15	Max. 20	Max. 3
	Yes	No	Yes	Max. 10	Max. 10	-
	Yes	Yes	No	Max. 10	10 to 20	1 to 3
	Yes	Yes	Yes	Max. 10	Max. 10	[1 to 3 or 0.5 to 1]



Goal of CSO Control

- Pollution load reduction: The annual BOD load that is discharged must be equal to or less than that from a separate sewer system.
- Guaranteeing public hygiene: The frequency that untreated sewerage is discharged from all outlets must be reduced by at least 50%.
- Reduction of debris screening: In principle, debris must not be discharged from any outlets.



Chemical risk management

- Under the Pollutant Release and Transfer Register, WTP should report
 - 30 designated chemicals such as Zn, phenol, dioxin
 - According the report in FY 2002, discharged
 - Hg 290kg, Zn 440t, Se 4400kg, Pb 14,000kg,
 - Dioxin 1.46g-TEQ, 1,1,1-Trichloroethane 16t



The Biomass Nippon Strategy

- Three Ministries are involved
- National goal by 2010
 - utilize at least 80% of biomass produced from waste material converted to quantity of carbon
 - utilize at least 25% of unused biomass converted to quantity of carbon
- As construction material or as fertilizer to achieve a sewerage sludge recycling rate of 60% by the end of 2002



Third Five-year Plan for Sewerage System Technology

- First Five Year Plan for Sewerage System Technology in 1997
- Second Five Year Plan for Sewerage System Technology in 2000
- Third Five-year Plan for Sewerage System Technology in 2003



Content of the Plan 1

- Creation of cities safe from disasters
 - (1) Technologies to plan inundation countermeasures from the river basin management perspective
 - (2) Advanced technologies for inundation countermeasures
 - (3) Technologies to construct earthquake resistant sewerage systems



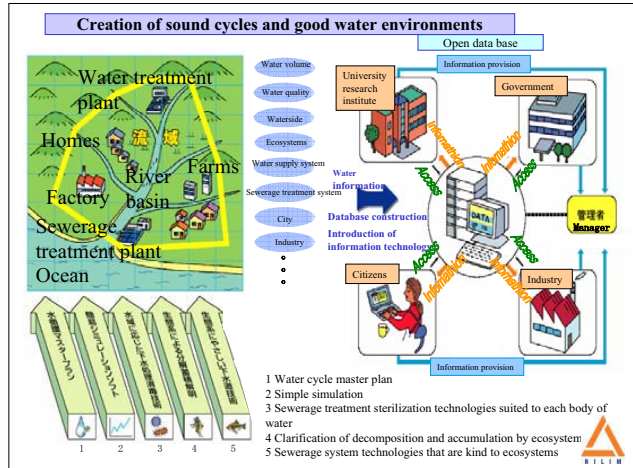
Content of the Plan 2

- River system risk management
 - (4) Technologies to monitor hazardous substances and to evaluate hazardous substance risk
 - (5) Technologies to remove/detoxify hazardous substances



Content of the Plan 3

- Creation of a sound water cycle and a good water environment through river basin management
 - (6) Technologies to introduce economical methods of reducing pollution load
 - (7) Technologies to enact water cycle master plans
 - (8) Technologies to construct water cycle open data bases
 - (9) Technologies to evaluate impacts on the water environment
 - (10) Technologies to conserve and create good water environments



Content of the Plan 4

- Preserving the water quality of river basins
 - (11) Advanced technologies to remove nitrogen, phosphorus, etc.
 - (12) Technologies to remove pollutant load from combined sewer overflow etc.

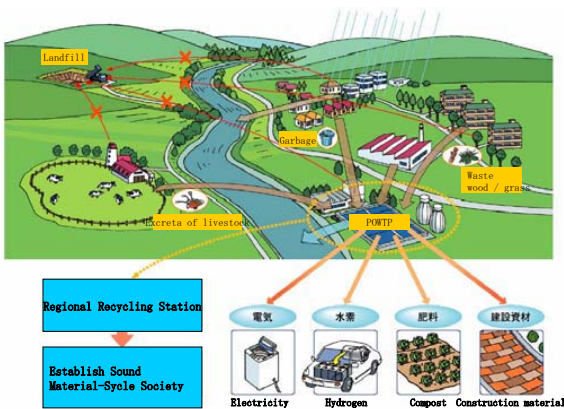


Content of the Plan 5

- Managing sewerage system resources
 - (13) Technologies to encourage the reuse of treated wastewater
 - (14) Technologies to reduce sewerage sludge
 - (15) Advanced technologies to utilize the energy retained by sewerage sludge
 - (16) Technologies to effectively use sewerage sludge as a material resource
 - (17) Technologies to optimize the organic waste material flow in regional societies



Management of Sewerage System Resources



Content of the Plan 6

- Responding to urban renewal
 - (18) Technologies to improve urban environments
 - (19) Advanced technologies for sewerage systems in response to changes in urban structures

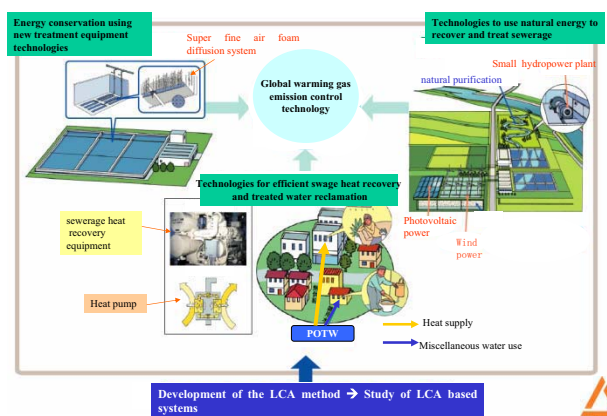


Content of the Plan 7

- Conserving the global environment
 - (20) Technologies to locally utilize low level heat emitted by sewerage systems
 - (21) Technologies to lower the energy consumed by sewerage treatment plants
 - (22) Technologies to use natural energy to recover and treat sewerage
 - (23) Technologies to control the emission of global warming gasses
 - (24) Technologies to recover energy by utilizing organic resources in cities



Conserving the Global Environment

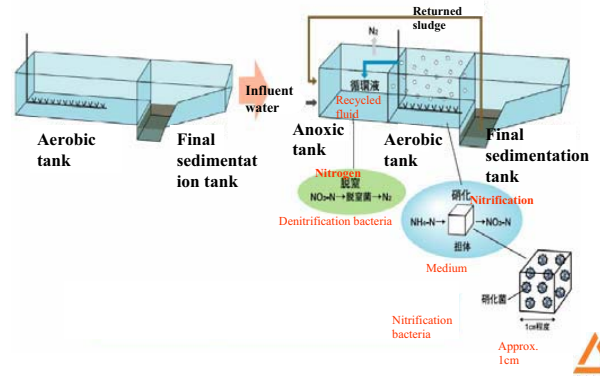


Content of the Plan 8 & 9

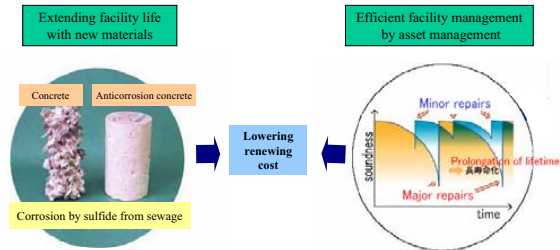
- Efficient provision of wastewater treatment plants
 - (25) Technologies to lower life cycle costs
 - (26) Technologies to economically and quickly construct wastewater treatment plants
- Efficient management of wastewater treatment plants
 - (27) Technologies to perform efficient plant management and sound plant operation
 - (28) Technologies to effectively upgrade/modify and to reconstruct wastewater treatment plants



Improving Treatment Performance Using Existing Reaction Tanks



Efficient Provision of Wastewater Treatment Plants



Content of the Plan 10 & 11

- Promotion of links with other industries
 - (29) Technologies to promote links with other industries
- Responding to internationalization
 - (30) Sewerage treatment system technologies to respond to globalization



Content of the Plan 12

- Public participation
 - (31) Technologies to conduct projects cooperatively with the public
 - (32) Advanced technologies to establish project evaluation methods to promote efficiency and accountability



THANK YOU



Ministry of Land, Infrastructure and Transport

