

Industrial Wastewater Management in Japan

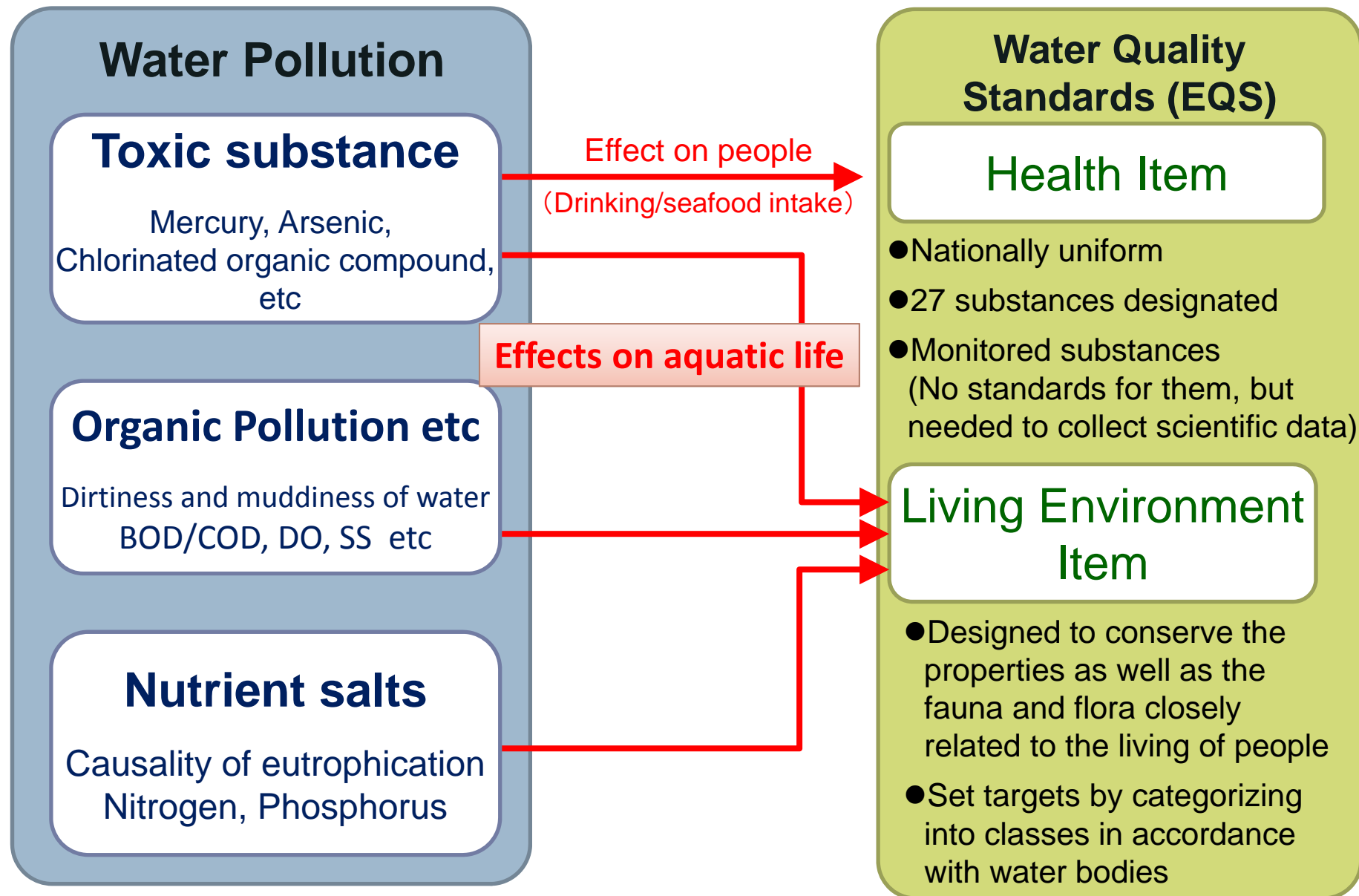
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Water Environment Quality Standards (EQS)



Items of Environmental Quality Standard for Water Pollution

Health items

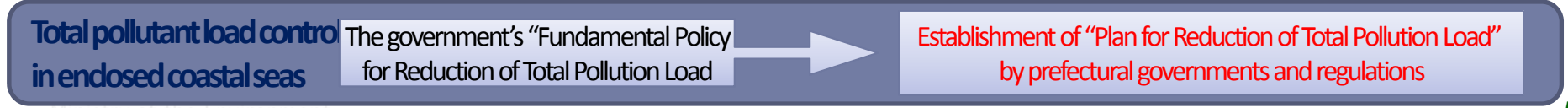
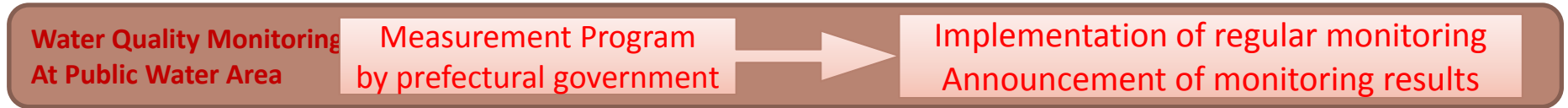
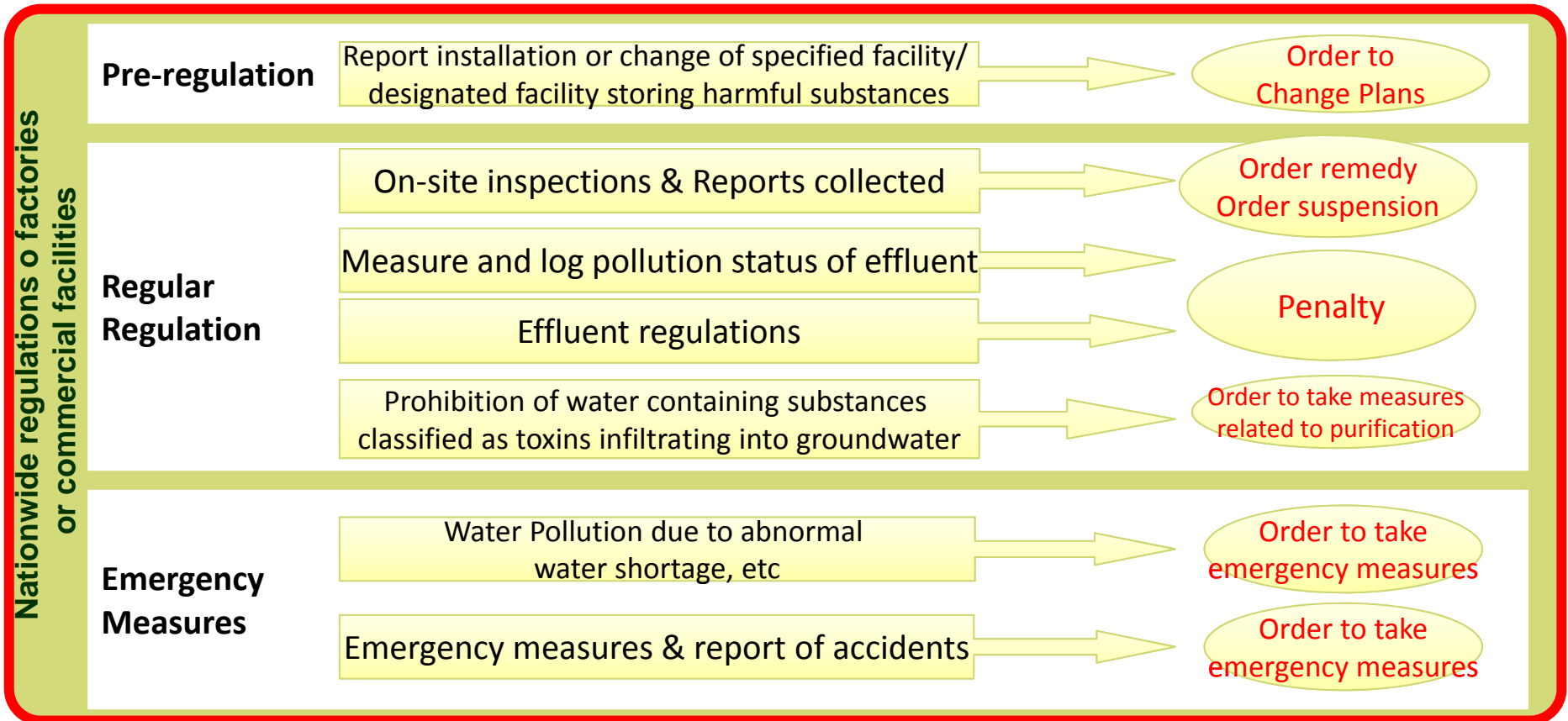
Item	Standard Value	Item	Standard Value
Cadmium	0.003 mg/L or less	1,1,1-trichloroethane	1 mg/L or less
Total cyanide	Undetected	1,1,2-trichloroethane	0.006 mg/L or less
Lead	0.01 mg/L or less	Trichloroethylene	0.01 mg/L or less
Hexavalent chromium	0.05 mg/L or less	Tetrachloroethylene	0.01 mg/L or less
Arsenic	0.01 mg/L or less	1,3-dichloropropene	0.002 mg/L or less
Total mercury	0.0005 mg/L or less	Thiuram	0.006 mg/L or less
Alkylmercury	Undetected	Simazine	0.003 mg/L or less
PCB	Undetected	Thiobencarb	0.02 mg/L or less
Dichloromethane	0.02 mg/L or less	Benzene	0.01 mg/L or less
Carbon tetrachloride	0.002 mg/L or less	Selenium	0.01 mg/L or less
1,2-dichloroethane	0.004 mg/L or less	Nitrate nitrogen & Nitrite nitrogen	10 mg/L or less
1,1-dichloroethylene	0.02 mg/L or less	Fluoride	0.8 mg/L or less
Cis-1,2-dichloroethylene	0.04 mg/L or less	Boron	1 mg/L or less
		1,4-Dioxane	0.05mg/ or less

Items of Environmental Quality Standard for Water Pollution

Living environment items

	River	Lake	Sea Area
BOD	≤ 1 - 10 mg/L	-	-
COD	-	≤ 1 - 8 mg/L	≤ 2 - 8 mg/L
pH	6.0 - 8.5	6.0 - 8.5	7.0 - 8.3
SS	≤ 25 - 100 mg/L etc.	≤ 1 - 15 mg/L etc.	-
DO	2-7.5 mg/L ≤	2-7.5 mg/L ≤	2-7.5 mg/L ≤
DO at bottom layer	-	2.0~4.0mg/L ≤	2.0~4.0mg/L ≤
Coliform bacteria count	≤ 50 - 5,000 MPN/100 mL	≤ 50 - 1,000 MPN/100 mL	≤ 1,000 MPN/100 mL
N-hexane extracts	-	-	Undetected.
Total nitrogen	-	≤ 0.1 - 1 mg/L	≤ 0.2 - 1 mg/L
Total phosphorous	-	≤ 0.005 - 0.1 mg/L	≤ 0.02 - 0.09 mg/L
All zinc	≤ 0.03 mg/L	≤ 0.03 mg/L	≤ 0.01 - 0.02 mg/L
Nonylphenol	≤ 0.0006 ~ 0.002 mg/L	≤ 0.0006 ~ 0.002 mg/L	≤ 0.0007 ~ 0.001 mg/L
LAS	≤ 0.02 ~ 0.05 mg/L	≤ 0.02 ~ 0.05 mg/L	≤ 0.006 ~ 0.01 mg/L

How the Water Pollution Control Law Works



Responsibility of National Government

- To develop basic policies and measures for environment protection, based on the fundamental principles regarding to environment protection, and to implement them

Major actions for environment protection by national government

- Development of the environmental basic plan
- Establishment of Environment Quality Standards
- Proposal of basic policies for actions against environment pollution
- Regulations to protect Environment from pollution
- To develop facilities and implement other projects for environment protection etc.

Responsibility of Local Governments

- To develop policies and to implement actions suitable to natural and social conditions of local government for environmental protection, along with fundamental principles regarding to environment protection

Major actions for environment protection by local governments

- To promote comprehensive and designed action necessary to environmental protection in natural and social condition of local governments
- Development and promotion of environment pollution protection plan etc.

Target Facilities of Effluent Control

Facility that discharges polluted water or wastewater is defined as a **specified facility** by the Water Pollution Control Law, and all factories or establishments in which specified facilities are installed are stipulated as the control subjects of Water Pollution Control Law.

Example :

- Facilities to be used for **mining**, etc.
- Facilities devoted to **stock raising, agriculture**, etc.
- Facilities to be used for various types of **food manufacturing**, etc.
- Facilities to be used for **forestry**, etc.
- Facilities to be used for **pulp manufacturing**, etc.
- Facilities to be used for **medical goods manufacturing**, etc.
- Facilities to be used for **cement products manufacturing**, etc.
- Facilities to be used for **steel or nonferrous metals manufacturing** and facilities to be used for **other types of manufacturing**
- **Hotel businesses, restaurants, laundry businesses, photograph development businesses, hospitals, scientific and technological research facilities**
- **Waste disposal sites**
- **Final sewage treatment facilities, joint waste water treatment plants,**
And so on...

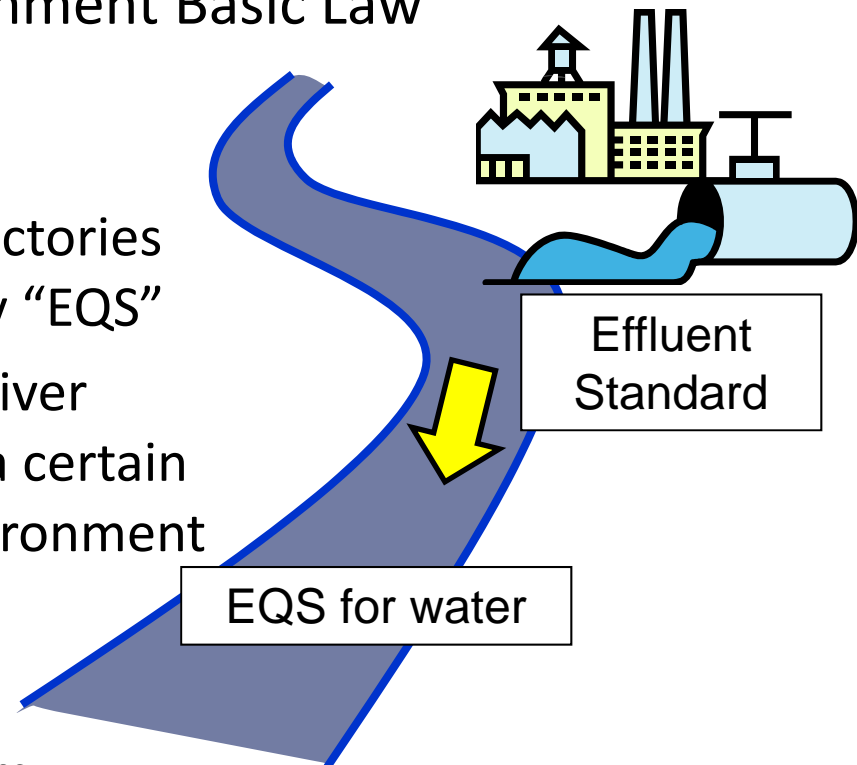


As of the end of
FY2015,
approx. **270,000**
establishments
are
control subjects

EQS and Effluent standards for water

Environmental Quality Standard (EQS)

- Established as part of the government’s objectives (standards that are to be followed) to prevent health hazards and conserve the living environment” by the Environment Basic Law
- “Effluent Standards” are applied on factories and establishments in order to satisfy “EQS”
- In consideration of dilution effect by river water, an effluent standard value for a certain item is decided as **10 times** as an environment quality standard for the same time.
- For some specific business categories that face difficulty to meet the uniform effluent standard for a specific item, **a temporary effluent standard** is applied by specifying a time limit



Wastewater standards

【Health item】

Kinds of harmful substances	Tolerable limit
Cadmium and its compounds	0.03 mg/L
Cyanide compounds	1 mg/L
Organic compound (limited to parathion, methyl parathion, methyl demeton and EPN (ethyl p-nitrophenyl phenylphosphorothioate))	1 mg/L
Lead and its compounds	0.1 mg/L
Hexavalent chromium compounds	0.5 mg/L
Arsenics and its compounds	0.1 mg/L
Mercury and alkyl mercury, and other mercury compounds	0.005 mg/L
Alkyl mercury compounds	Not detected
Polychlorinated biphenyl	0.003 mg/L
Trichloroethylene	0.1 mg/L
Tetrachloroethylene	0.1 mg/L
Dichloromethane	0.2 mg/L
Carbon tetrachloride	0.02 mg/L
1,2-dichloroethane	0.04 mg/L
1,1-dichloroethylene	1 mg/L
cis-1,2-dichloroethylene	0.4 mg/L
1,1,1-trichloroethane	3 mg/L
1,1,2-trichloroethane	0.06 mg/L
1,3-dichloropropene	0.02 mg/L
Thiram	0.06 mg/L
Simazine	0.03 mg/L
Thiobencarb	0.2 mg/L
Benzene	0.1 mg/L
Selenium and its compounds	0.1 mg/L
Boron and its compounds	Other than sea area: 10 mg/L Sea area: 230 mg/L
Fluorine and its compounds	Other than sea area: 8 mg/L Sea area: 1 mg/L
Ammonia, ammonium compounds, nitrite compounds and nitrate compounds	(*) 100 mg/L
1,4-dioxane	0.5mg/L

【Living environment item】

Kinds of harmful substances	Tolerable limit
Hydrogen ion concentration (pH)	Other than sea area: 5.8 – 8.6 Sea area: 5.0 – 9.0.
Biochemical oxygen demand (BOD)	160 mg/L (Daily mean value: 120 mg/L)
Chemical oxygen demand (COD)	160 mg/L (Daily mean value: 120 mg/L)
Suspended solids (SS)	200 mg/L (Daily mean value: 150 mg/L)
Normal-hexane extracts content (mineral oils content)	5 mg/L
Normal-hexane extracts content (animal and plant fats content)	30 mg/L
Phenols content	5 mg/L
Copper content	3 mg/L
Zinc content	2 mg/L
Soluble iron content	10 mg/L
Soluble manganese content	10 mg/L
Chromium content	2 mg/L
Coliform group number	Daily mean value: 3,000/cm ³
Nitrogen content	120 mg/L (Daily mean value: 60 mg/L)
Phosphorus content	16 mg/L (Daily mean value: 8 mg/L)

Note

The effluent standard shown in this table is applicable to the effluent water discharged by a plant, factory, or business establishment which discharges 50m³/day or more of effluent water on daily average.

(*) 0.4 times the ammonia nitrogen compound, and the total of nitrite nitrogen and nitrate nitrogen

Uniform Effluent Standards and Stringent Standards

Flat wastewater standards set by the national government
(minimum control applied nationwide)

Health items

Applied to all factories/establishments

Living environment items

Applied to factories/establishments with wastewater discharge of 50 m³/day or more

Prefectural governments authorized to tighten controls, according to local conditions

More Stringent by prefecture

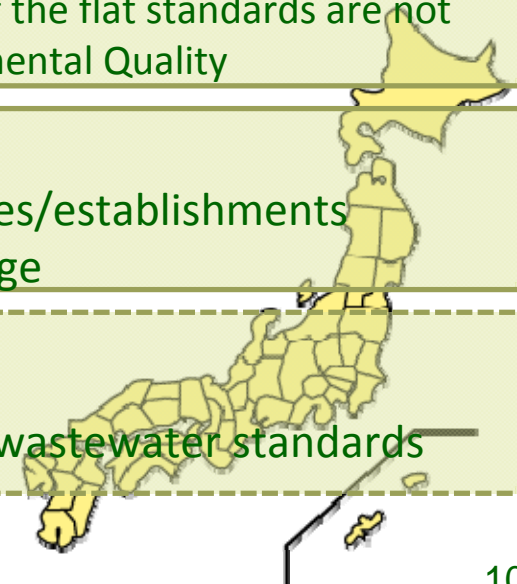
Prefectural ordinances to set more stringent wastewater standard values if the flat standards are not sufficient (for example, preventing the realization of Environmental Quality)

“Hem down” by prefecture

Extend application of the Living Environment Items to factories/establishments with less than 50 m³/day wastewater discharge

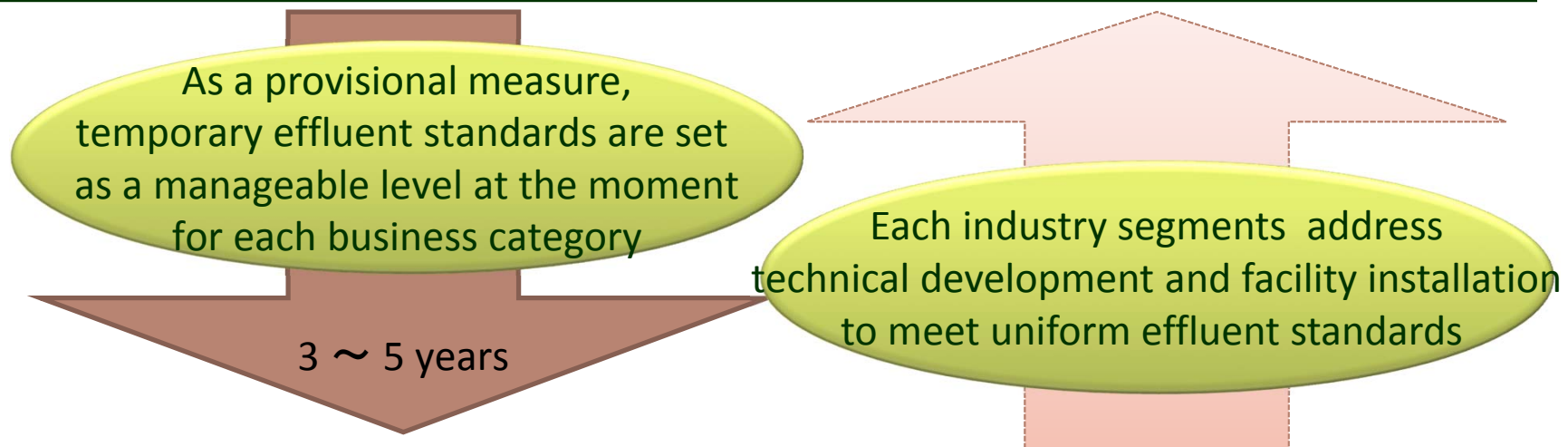
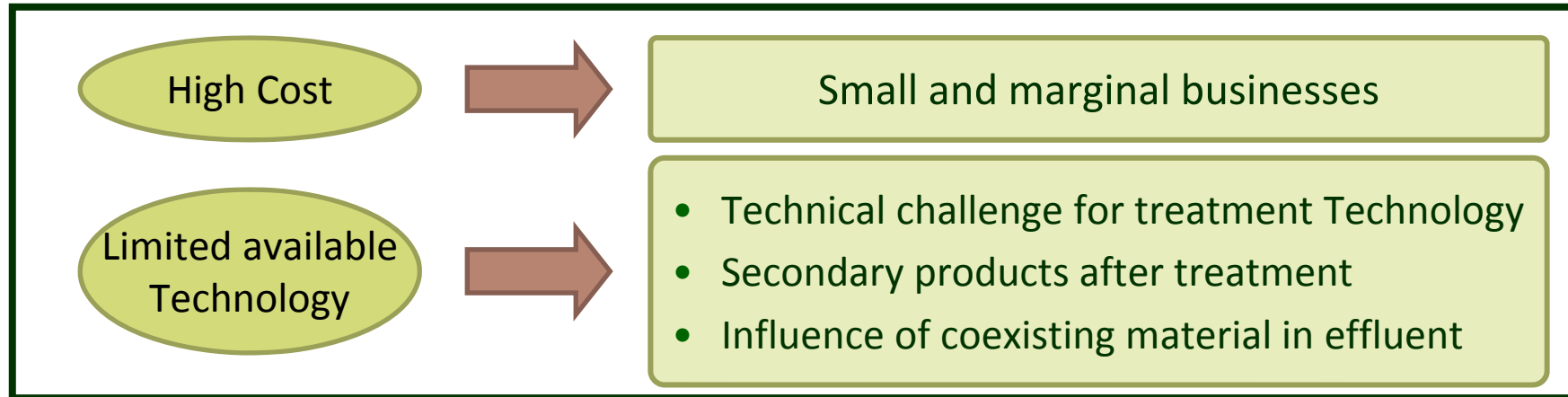
“Side stretch” by prefecture

Introduce additional wastewater control items on top of the flat wastewater standards



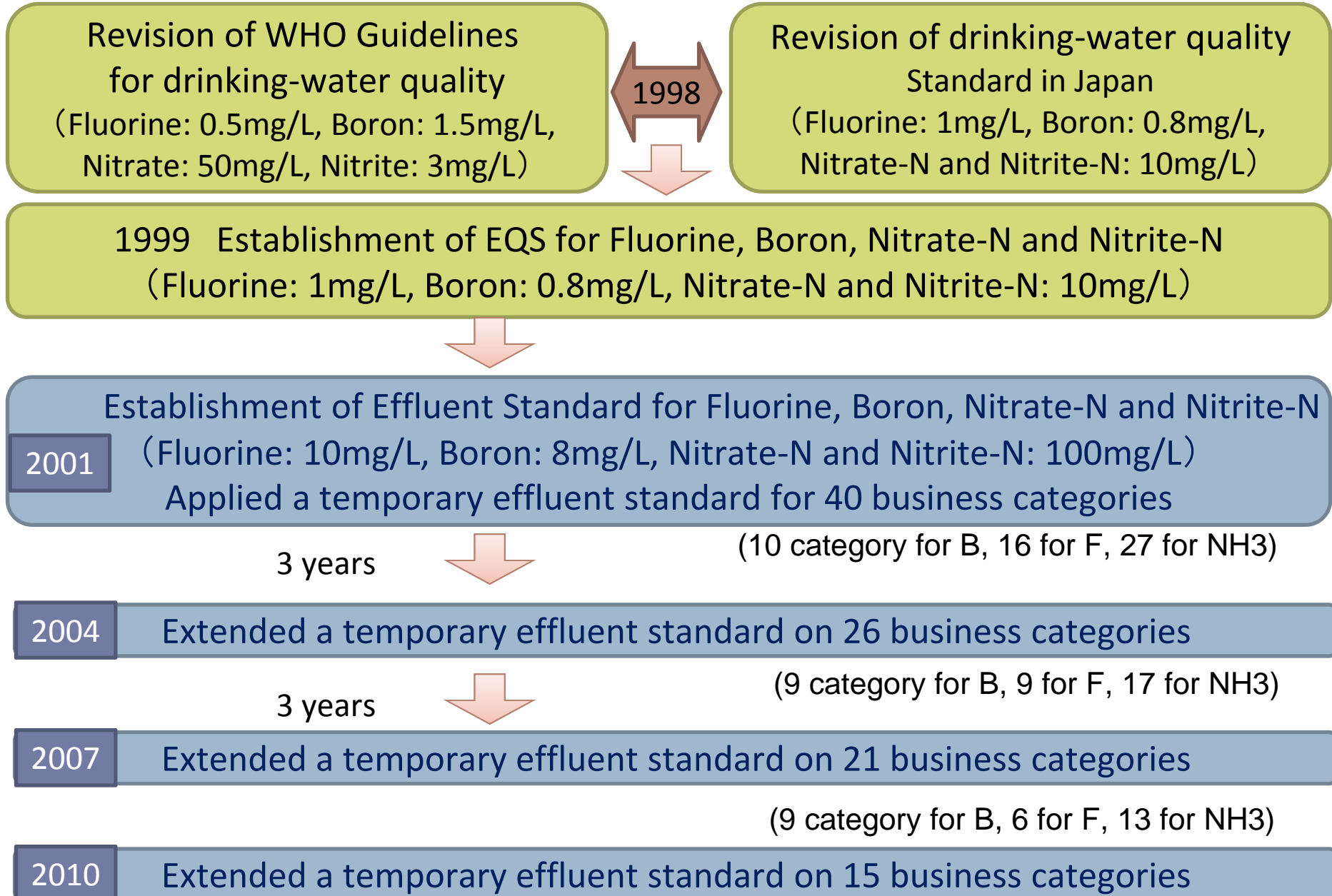
Temporary Effluent Standards

- For some specific business categories that face difficulty to meet the uniform effluent standard for a specific item when adding new regulation items or strengthen an effluent standard, a temporary effluent standard is applied by specifying a time limit



Temporary effluent standard values are reviewed and revised every 3 to 5 years, taking into account both actual conditions of effluent from factories and trend in technical development

Example of Temporary Effluent Standards (Fluorine, Boron, Nitrate-N)



Water Pollution Control Law, Article 14 & 22

Industrial Operator

- The person who discharge wastewater must monitor the status of wastewater, record and store the result of monitoring for 3 years based on the regulation of MOEJ

Local Government

- To request the industrial operator to report the result of the monitoring
- To implement on-site inspection

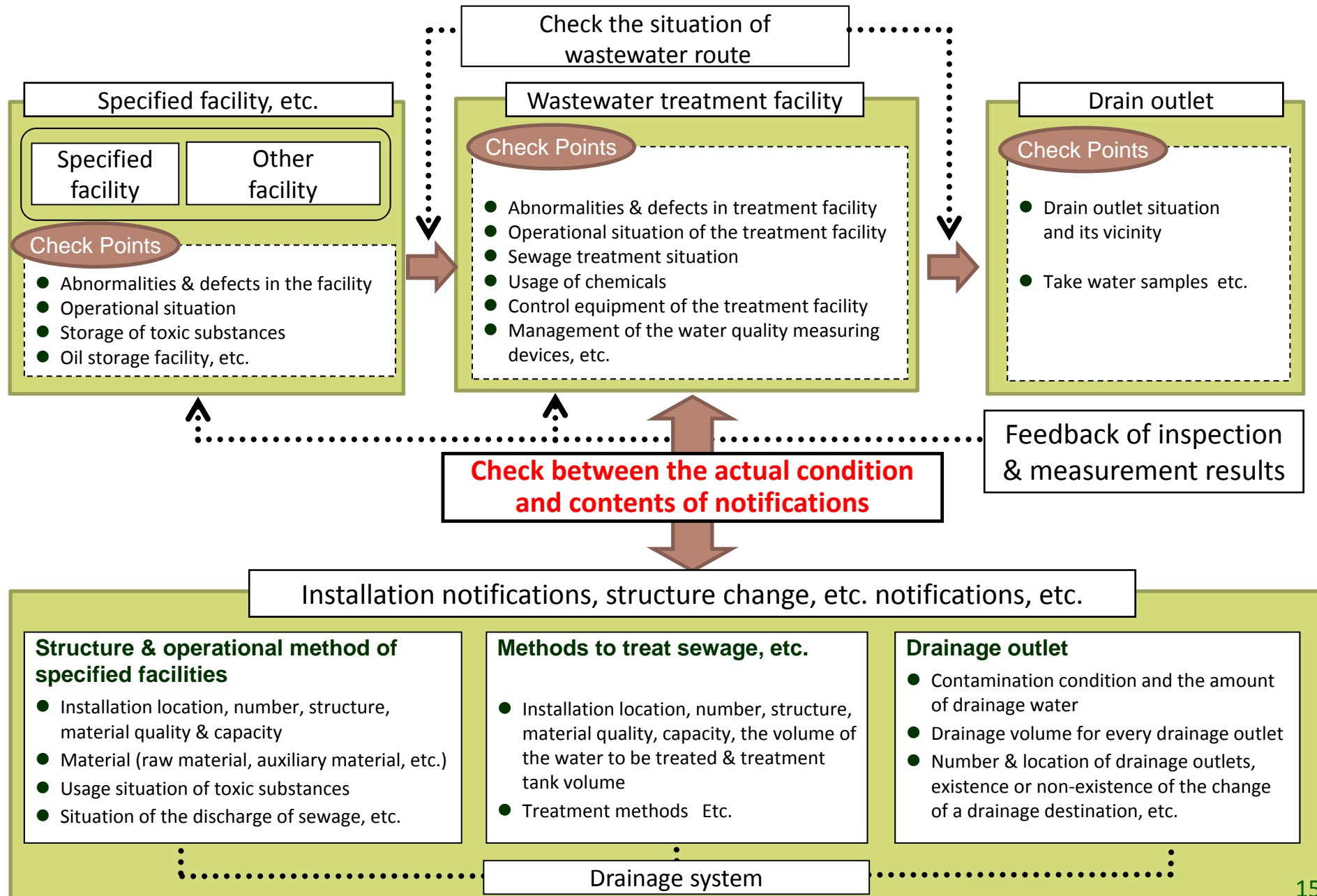
Water Pollution Control Law, Article 22

- The minister of the environment or the governor of a prefecture may in accordance with the cabinet order, call for a report from the owner of a Specified Facility concerning the condition of the Specified Facility, the method of treatment of polluted water, etc., and other necessary matters, within the limits required for the implementation of this Law; or may have his officials enter the Specified Factory and inspect the Specified Facility or other related matters.

Objective of on-site inspection

- To check whether rules for the compliance of regulation standards are operated properly in establishments so that owners always comply regulation standards, and implement necessary measures, if required.
- It is important to check not only compliance with standards by water sampling, but also comparing filed info and actual state, and self-management situation.

Check Points in on-site Inspection



Enforcement status of water pollution control law

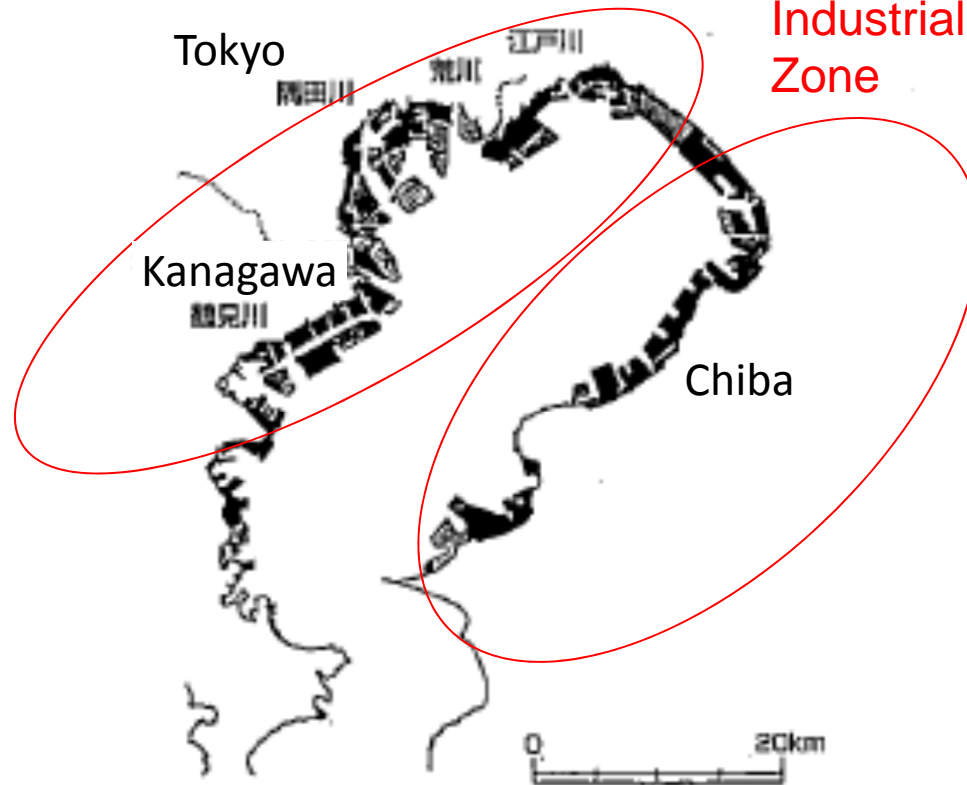
		2010	2011	2012	2013	2014
No. of specified establishments		271,242	266,860	271,168	269,847	267,328
average effluent more than 50m ³ /day		33,964	33,529	33,067	32,589	32,381
Notification	Article 5 (Establishment of Specified facilities)	5,307	4,989	6,598	5,786	6,026
	Article 7 (Structure changes etc.)	3,539	3,924	4,427	4,105	5,006
	Article 8 (Order to change plans)	0	0	0	0	0
No of establishments inspected (Article 22.1)		41,260	38,882	43,135	39,490	41,110
inspection during night		588	587	491	465	510
Order for Improvement (Article 13)		16	12	14	11	8
Order to suspend operation (Article 13)		0	0	1	0	3
Order to purify groundwater (Article 14.3)		0	0	0	0	0
Number of administrative direction	in writing	2,880	2,761	2,650	2,503	2,556
	Oral	5,095	4,826	5,432	4,753	4,981
	Total	7,975	7,587	8,082	7,256	7,537
Contents of administrative direction	Installation or improvement of wastewater treatment facilities	2,206	2,474	2,145	1,946	2,192
	temporary suppression of effluent	28	30	16	7	20
	Others	6,010	5,432	6,169	5,613	5,651
	total	8,244	7,846	8,330	7,566	7,863
Violation of effluent standards (Article 31.1.1)		11	8	6	4	4
Violation of order for improvement (Article 30)		0	0	0	0	0
Violation of water pollution control law (others)		0	0	0	0	0
Measures to be taken in case of an accident		433	504	540	565	557

Case Study: Tokyo Bay

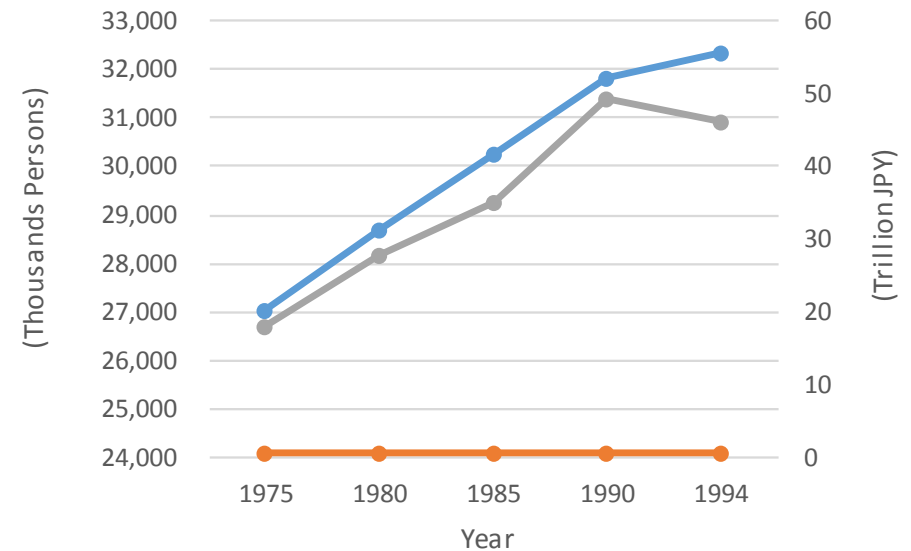
Saitama

Keihin Industrial Zone

Keiyo Industrial Zone



Industrial Zone around Tokyo Bay



- Population
- Production Value: Primary Industry (Trillion JPY)
- Production Value: Secondary Industry (Trillion JPY)

Historical Change of Population and Industrial Activity in Tokyo Bay Area

Water Pollution in Tokyo (1970's)



Tokyo Bay



A river in Tokyo



The Kanda River
(Tokyo)

Photo Credit : Environmental Bureau of the Tokyo Metropolitan Government

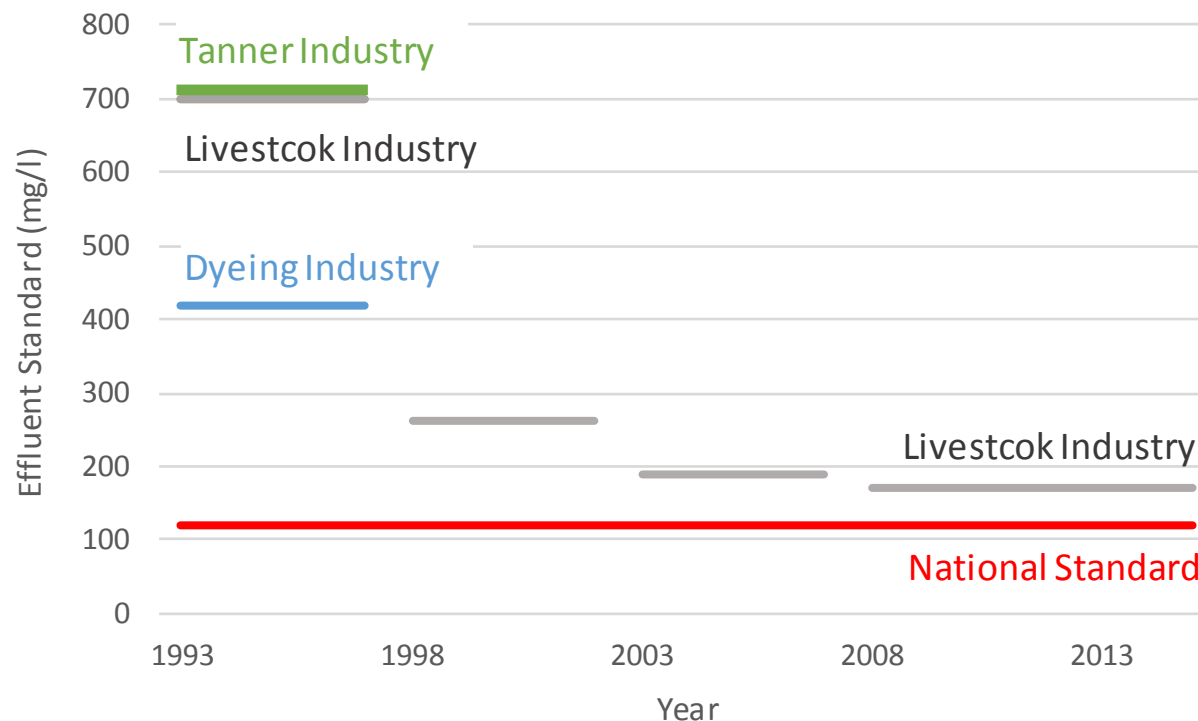
- Dissemination of access to sewerage treatment (mainly for domestic wastewater)
33 % in 1975 \Rightarrow approx. 80 % now
- Enforcement of Effluent Standard (mainly for industrial wastewater)
Prefectural Stringent Standards + Temporal Standard
- Ambient water quality standard zoning and water quality monitoring
- Total pollution load control since 1978

Prefectural Stringent Standards

- **More stringent** standard than national effluent standard
- **Smaller industry** is also subject to follow the standard

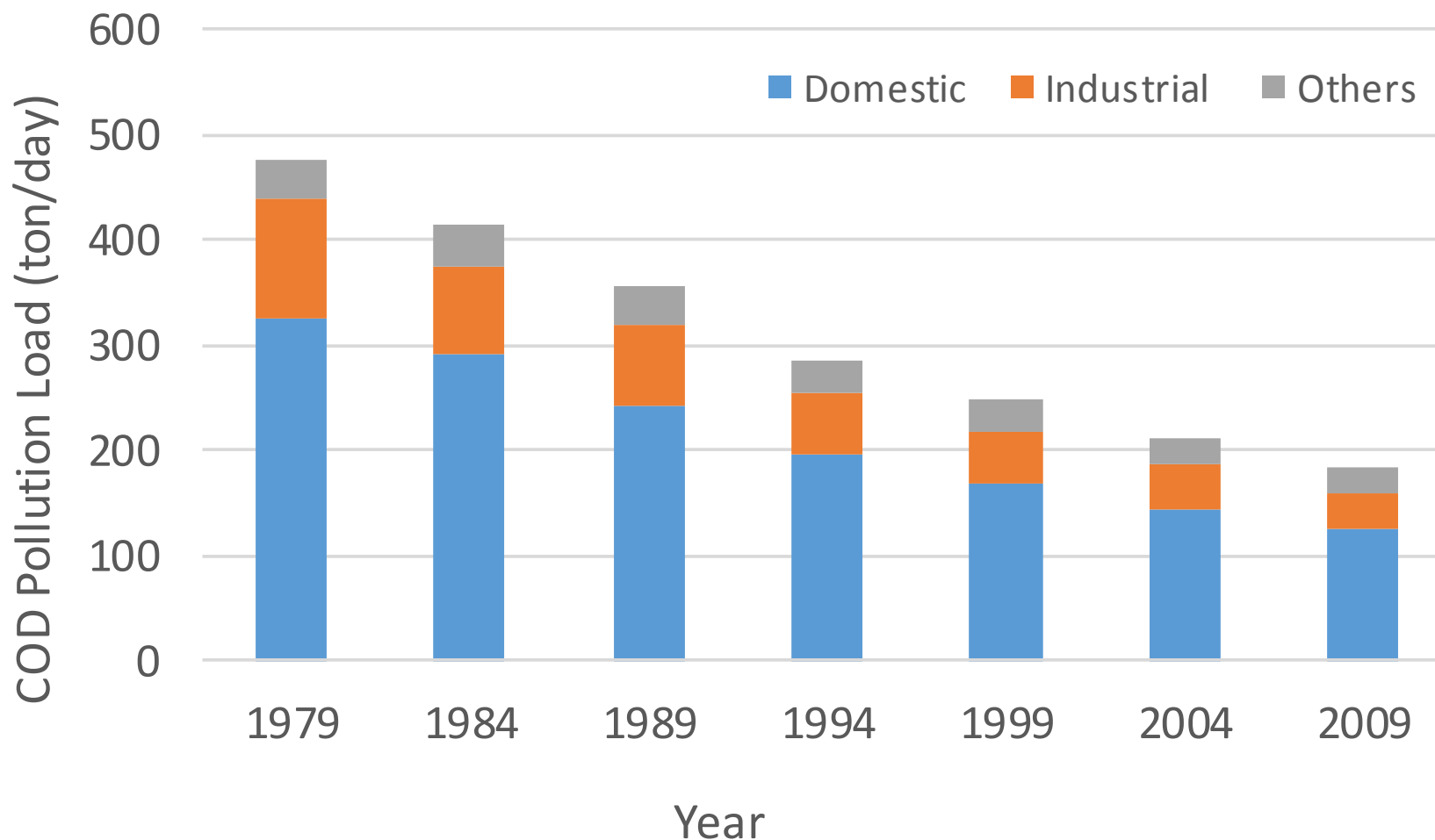
Parameter	National Effluent Standard (Daily Average)	Saitama Prefec.	Chiba Prefec.	
			500m ³ /day or more	500m ³ /day or below
pH	5.8-8.6	5.8-8.6 (5-9)	5.8-8.6 (5-9)	
BOD	160 (120)	25 (50)	10	20
COD	160 (120)	160 (120)	10	20
SS	200 (150)	60 (50)	20	40
N-Hexane extracts (mineral oil)	5	5	2	3
(animal fat & vegetable oil)	30	30	3	5
Phenols	5		0.5	0.5
Cu	3	3	1	1
Zn	5	5	1	1
Notes		10 m ³ /day or more	30 m ³ /day or more	

- **Temporal standard** is applied for some factories with difficulty in meeting the national effluent standard in a given period.
- Standard value is **reviewed periodically**.



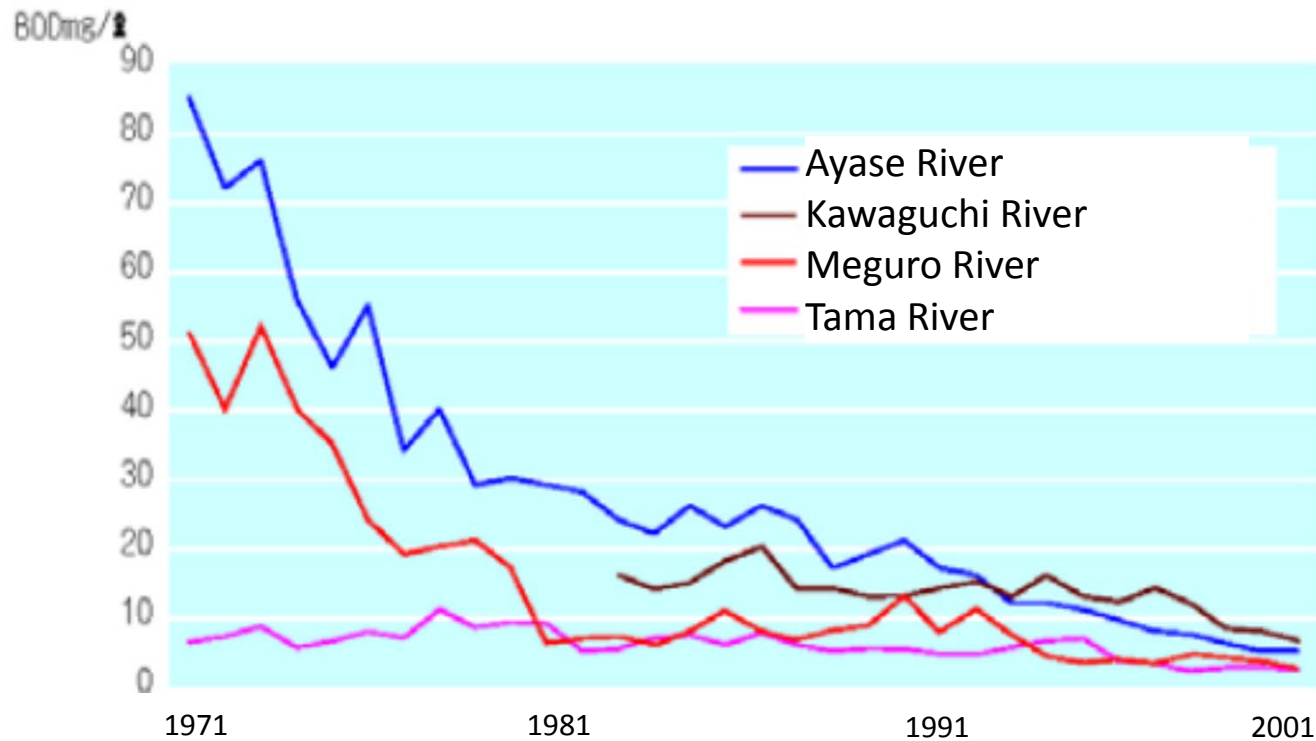
**Example of Temporal Standard
(Nitrogen for some industries flowing into marine area)**

COD Pollution Load to Tokyo Bay

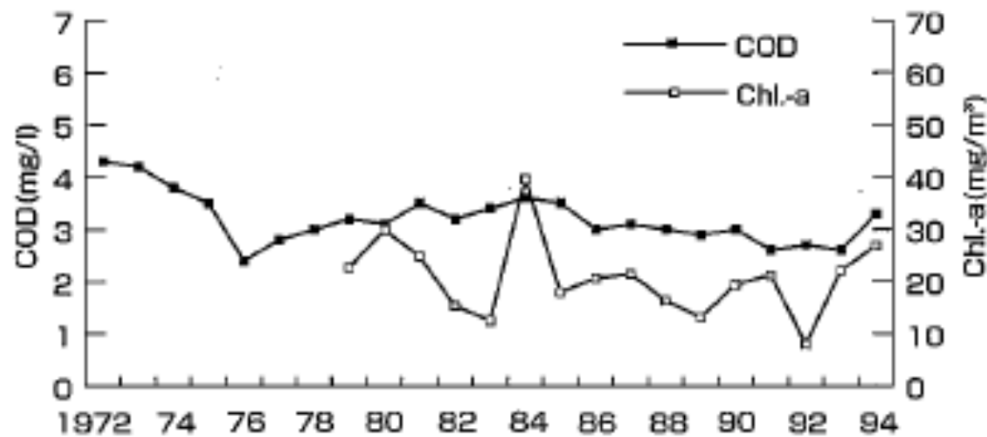


Historical Change in COD Pollution Load (Tokyo Bay)

Water Quality in Tokyo Bay



COD of rivers flowing into Tokyo Bay



COD and Chlorophyll-a trends in Tokyo Bay

- It is important for enforcement of effluent standard to establish the **monitoring system** for the effluent and implement it steadily.
- In order to improve water pollution, it is needed not only to apply **more stringent effluent standard** for the industry but also to establish the **feasible standard** considering water pollution level and technological level of the industry.