2.4 Japan

1 | Country Information

Table 2.4.1 Basic indicators

Land Area (km²)		377,977 (2020)
Total Population		125.9 million (2020)
GDP (current USD)		4,956.4 billion (2018)
GDP per capita (current USD)		35,280 (2018)
Average Precipitation (mm/year)		1,668 (2017)
Total Renewable Water Resources (km³)		430 (2017)
Total Annual Freshwater Withdrawals (billion m³)		79.3(2017)
Annual Freshwater Withdrawals by Sector	Agriculture	68% (2017)
	Industry	14% (2017)
	Municipal (including domestic)	18% (2017)

(Source: See References)

Figure 2.4.1 Lake Biwa in Shiga Prefecture, Japan

2 | State of Water Resources

Japan is located in the eastern monsoon region of Asia and noted for having one of highest accumulations in the world. The annual mean precipitation is 1,668 mm, about 1.4 times the global annual mean (inland area, 1,171 mm). On the other hand, on a per capita basis (annual mean precipitation × land area ÷ total population) this is about 5,000 m³/person/year, about a quarter of the world amount. In terms of available water resources per capita, it is about 3,400 m³/person/year, which is less than half of the world average (about 7,300m³). Moreover, most of the available water is discharged to the ocean unused due to the steep topography, very short streams as well as intensive rainfall in rainy and typhoon seasons.

3 | State of Ambient Water Quality

The main objectives of protecting the water environment in Japan are human health and environmental conservation, for which environmental standards for ambient water quality have been established in the Basic Environment Law as the acceptable levels of water quality to be maintained in public waters. As such, there are two related Environmental Quality Standards (EQS) for water– one for human health, which are uniform standards applicable to all public water bodies nationally, and the other for conservation of the living environment, which is applied to all public water bodies.

In most locations, EQS for human health have been attained with a 99.1% compliance rate in fiscal year 2018. EQS for conservation of the living environment have been achieved, with an 89.6% rate of compliance for biochemical oxygen demand (BOD) or chemical oxygen demand (COD), the representative water quality indicators of organic contamination (Figure 2.4.2).

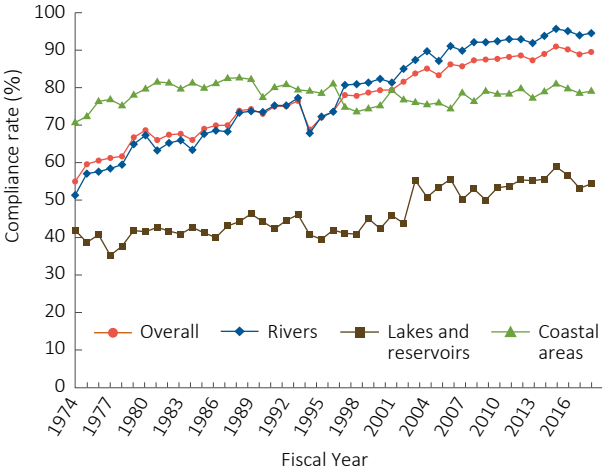


Figure 2.4.2 Shift in environmental standard compliance rate (BOD and COD) (Source: MoEJ 2020)

3.1 Rivers

The compliance rate for rivers is 94.6%, the highest among the different types of water bodies. A trend of rising compliance was observed until 2015, after which it plateaued for a few years, but in general a high water quality has been maintained.

3.2 Lakes and Reservoirs

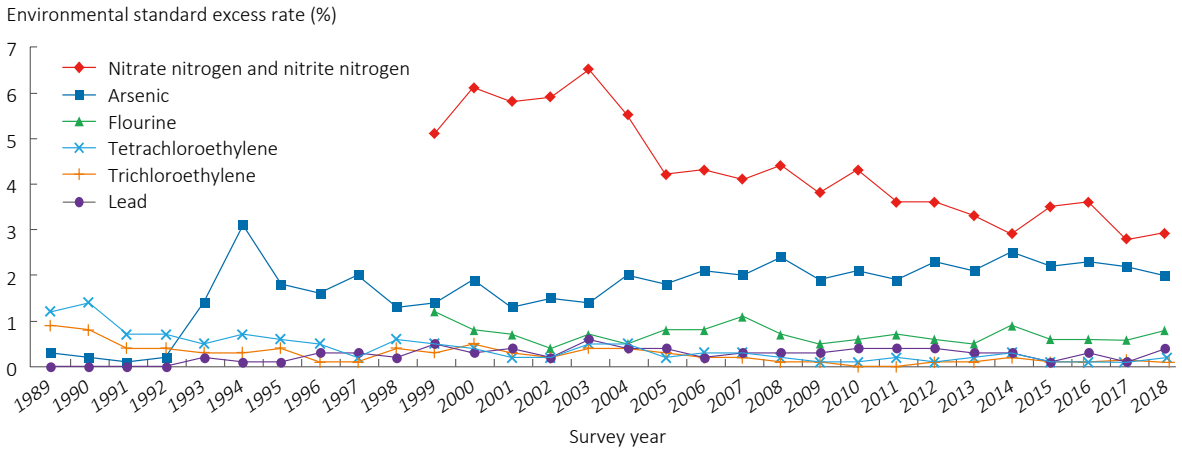
The compliance rate for lakes and reservoirs recorded is 54.3%. While the rate has improved compared to before 2000, it has hovered around 55% in recent years. The compliance rate for total nitrogen and total phosphorus for lakes and reservoirs was low at 48.8%.

3.3 Coastal Water

The compliance rate for coastal waters is 79.2%, and for total nitrogen and total phosphorus in coastal waters was 92.1%, which is higher than the previous year's record.

3.4 Groundwater

Of the 3,206 wells tested in 2018, 181 (or 5.6%) exceeded standards for some EQS. Among others, values for nitrate nitrogen and nitrite nitrogen exceeded the standards (Figure 2.4.3), the main causes of which are considered to be nitrogen load from excessive fertilization, inappropriate livestock excreta treatment facilities and domestic wastewater.



Note 1. Wells measured in general survey differ by year.

Note 2. Environmental standards related to groundwater contamination were established in 1997. Standards preceding this year are considered evaluation criteria. In addition, the evaluation criteria for arsenic was revised from "under 0.05 mg/L" to "under 0.01 mg/L", and for lead from "under 0.1 mg/L" to "under 0.01 mg/L" in 1993, and for trichloroethylene from "under 0.03 mg/L" to "less than 0.01 mg/L" in 2014.

Note 3. Nitrate nitrogen, nitrite nitrogen and fluorine were added to environmental standard items in 1999.

Figure 2.4.3 Environmental standard excess rates for groundwater (by item) (Source: MOEJ 2021)

4 | State of Wastewater Treatment

Access to domestic wastewater treatment facilities*1 in Japan stood at 91.7% for the population as a whole, as of the end of FY 2019 (except for some municipalities in Fukushima, which lacked survey data due to the Great East Japan Earthquake).

As shown in Figure 2.4.4, rates for those with access to domestic wastewater treatment facilities are low in municipalities with small populations. Further, for areas of low population density, it is noted that decentralized domestic wastewater treatment systems, or *Johkasou*[*2] are suitable, based on which *Johkasou* systems are expected to play a larger role in domestic wastewater treatment in the near future of Japan. Moreover, considering future social conditions anticipated in Japan such as low birth rate and longevity, and population decrease, it is assumed that both installations of new *Johkasou* as well as conversions of older-type ("*tandokushori*") *Johkasou*[*3] into newer-type ("*gappei-shori*") *Johkasou* will increase.

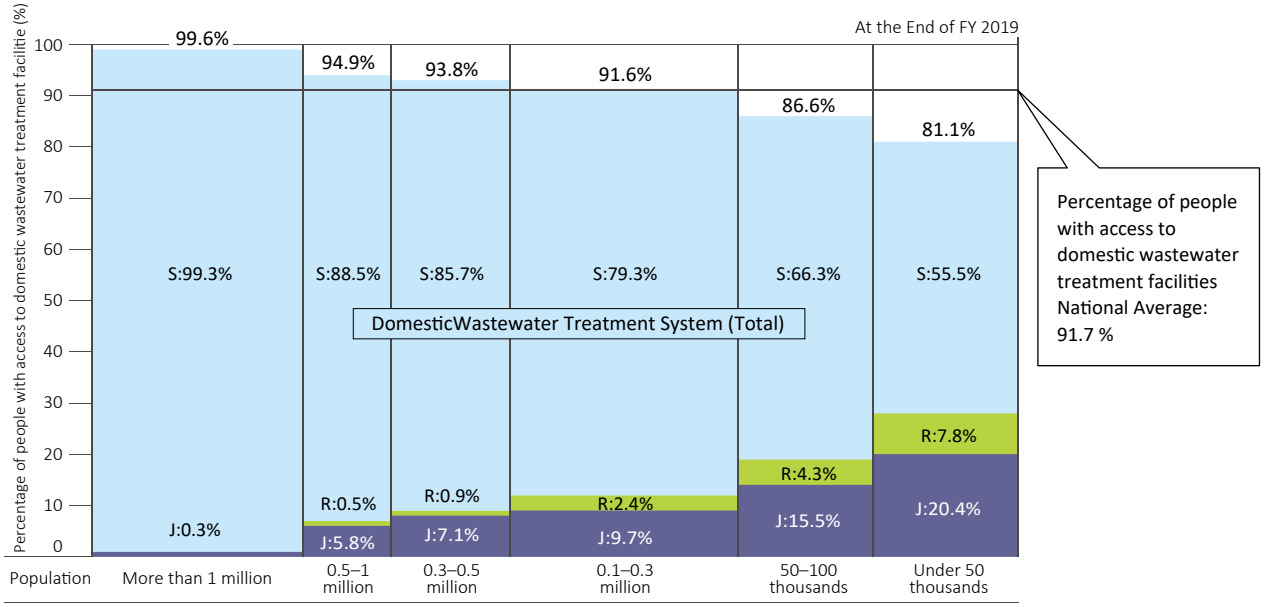
*1: Domestic wastewater treatment facilities do not include facilities that treat only black water and discharge grey water into the environment without treatment.

*2: A decentralized domestic wastewater treatment system widely used in rural areas of Japan. It can treat both black and grey water and obtain high quality effluent with aeration (less than BOD 20 mg/L according to the structural standard). Advanced types of *Johkasou* that can remove nitrogen or phosphorus are becoming increasingly prevalent recently. The *Johkasou* Law modified in 2005 defines the effluent water quality standard for *Johkasou*.

*3: *Tandoku-shori Johkasou* is an older-type *Johkasou* that treats only black water, and not grey water, and has therefore low effluent removal rates and higher pollution loads (eight times) than the newer *gappei-shori Johkasou*. Under the *Johkasou* Law, *Johkasou* indicates *gappei-shori Johkasou* that treats both black and grey water. *Tandoku-shori Johkasou* that does not treat grey water is, consequently, regarded as deemed *Johkasou*. New installations of the older type have been forbidden since 2000 based on the modified *Johkasou* Law of the same year. Although numbers of older *tandoku-shori Johkasou* are dropping, about 3.8 million are still in existence as of end of FY 2018. The issue of how to convert the older type to the newer type is very urgent.

With regards to installation of *Johkasou*, several subsidy programmes are provided by the MoEJ, such as the *Johkasou* Installation Promotion Programme, in which municipalities provide financial support to homeowners installing *Johkasou*, and the Municipal *Johkasou* Installation Programme, in which the government subsidizes municipalities installing *Johkasou*. In addition to installation subsidies, the government provides financial support for the removal of older-style *(tandoku-shori) Johkasou* to promote conversion to the newer-type *(gappei-shori) Johkasou*.

Regarding the various sewerage treatment systems, rural sewerage systems and *Johkasou* systems, it is important not only to develop domestic wastewater treatment facilities effectively and appropriately, corresponding to changing social conditions, but also to renovate, renew and operate existing facilities effectively, considering technological and financial aspects of these systems for the sustainable management of domestic wastewater treatment facilities.



*S: Sewerage system, C: Community sewerage treatement system, R: Rural sewerage system, J: *Johkasou* sysytem

Figure 2.4.4 Percentage of people with access to domestic wastewater treatment facilities by size of municipality (Source: MoEJ 2019)

5 | Frameworks for Water Environmental Management

5.1 Legislation

The purpose of the Basic Environmental Law is to "ensure healthy and cultured living for both the present and future generations of the nation as well as to contribute to the welfare of mankind" (Article 1 of the Basic Environmental Law). The EQS for water were established by the Basic Environmental Law as the administrative targets for ambient water quality.

The Water Pollution Control Law, enacted in order to protect human health and preserve the living environment sets provisions for water quality conservation such as effluent regulations from factories and business establishments, continuous monitoring of water quality and the total pollutant load control system. Other laws related to conservation of public water bodies are shown in Figure 2.4.5.

As a measure related to domestic wastewater management, the Sewerage Law was enacted in order to construct sewerage systems. In addition, the *Johkasou* Law for on-site packaged household wastewater treatment plants for areas without access to sewerage treatment was established, to define regulations relating to their installation, inspection, desludging and manufacturing.

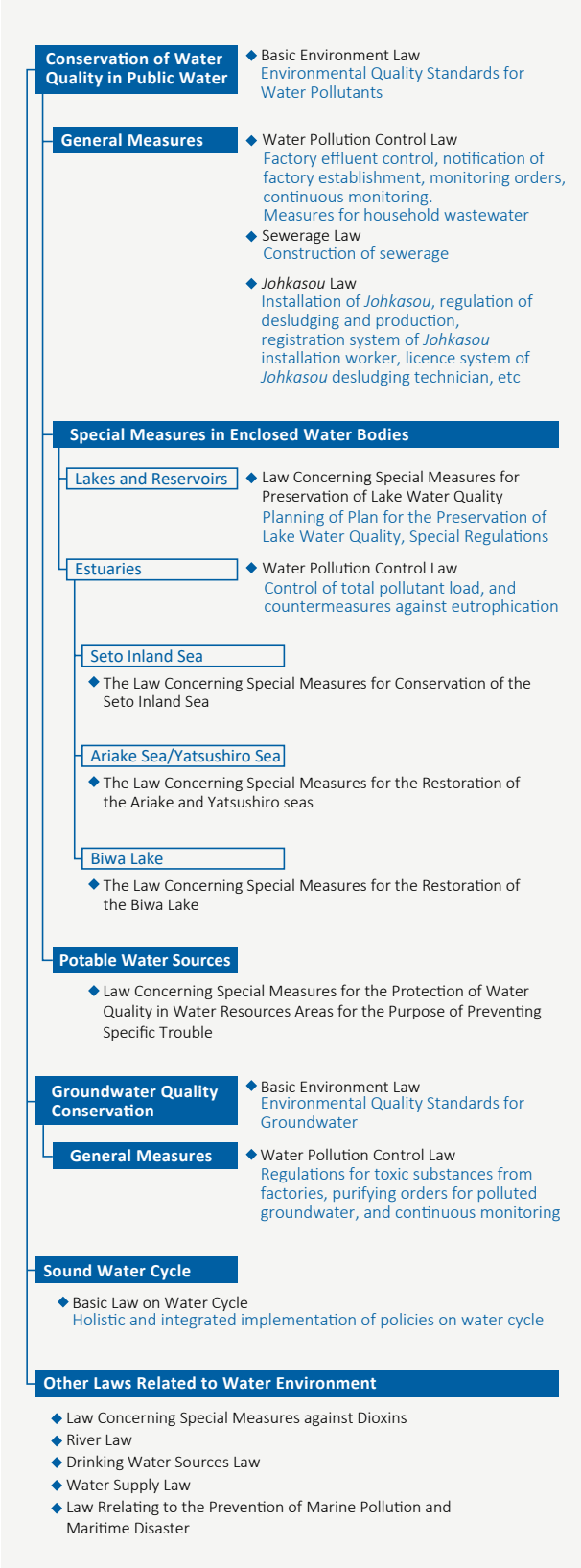


Figure 2.4.5 Scheme of legal system for water environmental management in Japan (Source: MoEJ 2009)

5.2 Institutional Arrangement

Since water is involved in many aspects of our lives, five main ministries (Ministry of the Environment; Ministry of Land, Infrastructure, Transport and Tourism; Ministry of Health, Labour and Welfare; Ministry of Agriculture, Forestry and Fisheries; Ministry of Economy, Trade and Industry) play key roles and collaborate in water environment management in Japan.

Table 2.4.2 Institutional arrangement of water environmental management

Name	Main Activities in charge
Ministry of the Environment	Formulating and implementing a wide range of water environment management policies such as formulation of ambient water quality standards, water quality monitoring of public water and publication of the results, effluent standard, *Johkasou* maintenance, etc.
Ministry of Land, Infrastructure, Transport and Tourism	Promoting sustainable river management through preparation of river-related development and management plans, disseminating sewerage policies and formulating and implementing policies related to the development and management of water resources.
Ministry of Health, Labour and Welfare	Formulating and implementing policies related to water supply system development and maintenance, water quality standards for drinking water, and security of drinking water quality.
Ministry of Agriculture, Forestry and Fisheries	Formulating and implementing policies related to the conservation and management of agricultural land and water contributing to the conservation of the rural environment, and the development of sewage treatment facilities in rural areas.
Ministry of Economy, Trade and Industry	Formulating and implementing policies such as industrial water supply development and wastewater treatment in the mining industry through the implementation of mine pollution prevention projects.

The Basic Law on Water Cycle was enacted in 2014 to promote integrated and comprehensive measures related to the water cycle. According to this act, the Headquarters for Water Cycle Policy, headed by the Prime Minister, was established in the Cabinet.

5.3 Ambient Water Quality Standards

Ambient water quality standards

Nationwide uniform standard values were set for 27 items as the EQS for water related to protection of human health (health items). In 1971, the EQS for water were established. Meanwhile, the EQS for water related to conservation of the living environment (living environment items) include environmental standards

for 13 items, such as BOD, COD, and DO, as well as total nitrogen and total phosphorus, for prevention of eutrophication in lakes and coastal waters.

Moreover, as indicators of ambient water quality standards for the conservation of aquatic living resources, total zinc, nonylphenol and linear alkylbenzene sulfonic acid and its salt were registered in 2003, 2012 and 2013, respectively.

Monitoring framework

According to the Water Control Law, prefectural governors are required to conduct regular monitoring of public water bodies and groundwater, and report to MoEJ as well as inform the public on the state of water pollution in public water bodies and groundwater. Prefectural governments prepare monitoring plans and carry out regular water quality monitoring in cooperation with relevant national government organizations based on monitoring methods specified by MoEJ. Monitoring results at approximately 7,000 locations in public water bodies nationwide are publicly released on the MoEJ website (Figure 2.4.6).

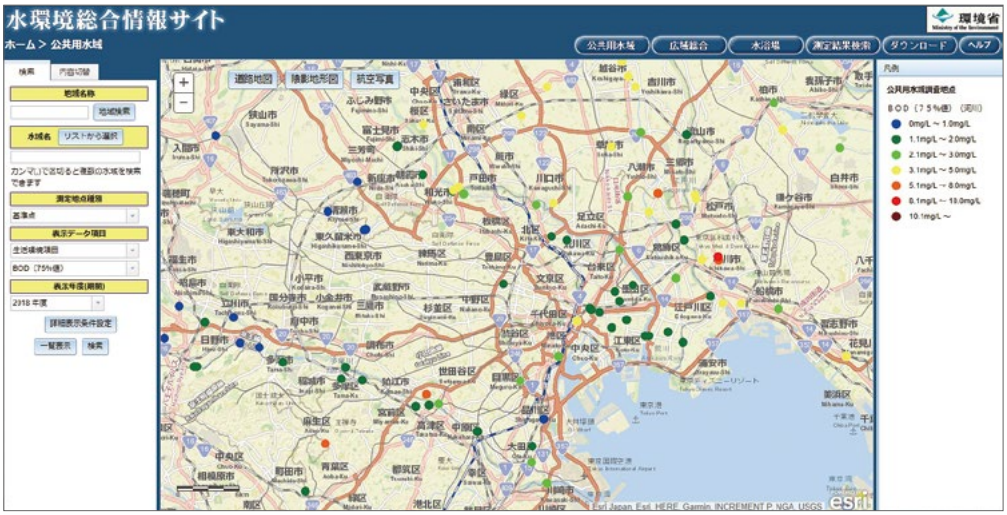


Figure 2.4.6 Comprehensive information site on the water environment (Source: MoEJ 2020)

5.4 Effluent Standards

Effluent standards

Based on the Water Pollution Control Law, uniform effluent standards were established for 28 items related to protection of human health, which are applicable to factories and business establishments. Meanwhile, effluent standards for 15 items related to the living environment target only those factories and business establishments with daily effluent volumes exceeding 50m^3 per day. Local governments (prefectures and ordinance-designated cities) may establish stricter effluent standards than the national uniform standards when the national standards are considered insufficient to achieve water quality targets.

The total pollutant load control system is a discharge control mechanism to improve water quality by reducing total pollutant loads flowing into certain enclosed coastal waters, namely Tokyo Bay, Ise Bay, and the Seto Inland Sea, where due to the presence of populated and industrialized areas it is difficult to achieve EQS for water by regulating discharge based on only concentrations of regulated substances. Under the system, the national government sets targets for pollutant loads and periods, and the relevant prefectures stipulate the tangible methods required to meet the targets.

To date, COD loads have been steadily reduced in target water bodies since 1979 (Figure 2.4.7). Figure 2.4.8 shows the improvement in COD concentrations in Tokyo Bay, for example. Nitrogen and phosphorus loads have also been reduced since their addition as designated items under the system in 2001. In September 2016, Japan set forth its basic policy with the 8th phase of total reduction, with the target year of 2019.

Effluent inspection procedure

The Water Pollution Control Law stipulates monitoring and recording of the quality of effluent from factories and business establishments. Factories and business establishments located in total pollutant load control target areas are required to measure and record

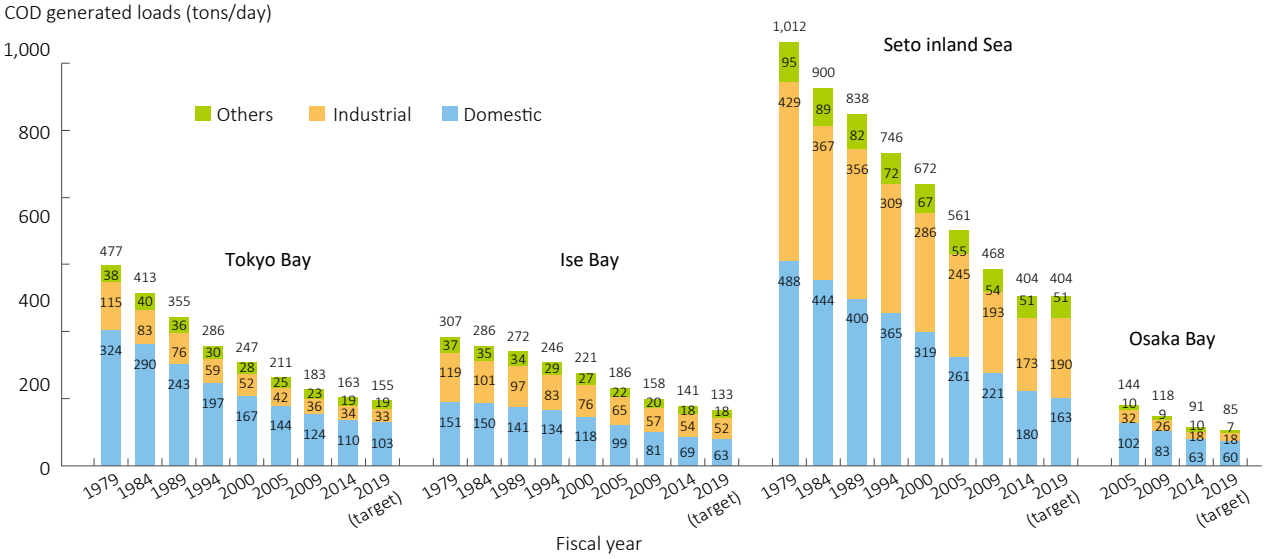
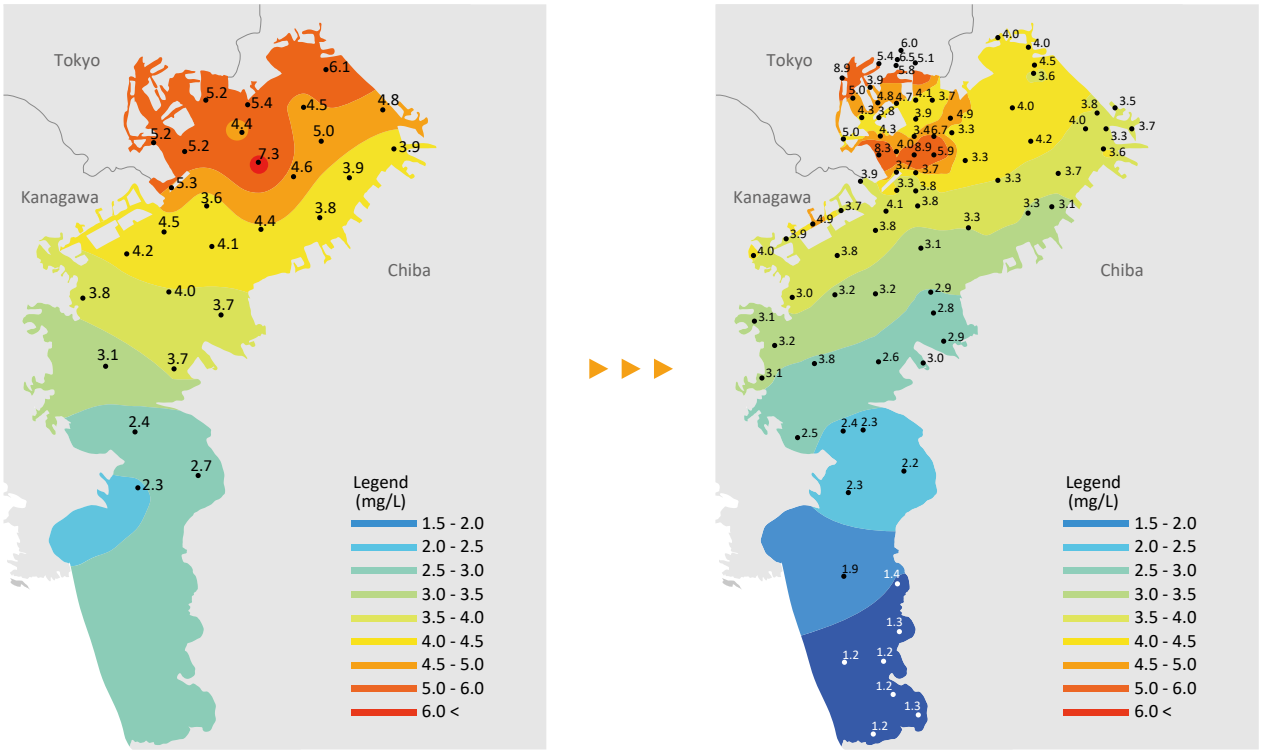


Figure 2.4.7 Challenges in pollution load and target value (in terms of COD) (Source: provided by MoEJ)



1982 – 1984 (average) 2016 – 2018 (average)

Figure 2.4.8 COD concentrations in Tokyo Bay (Source: provided by MoEJ)

pollution loads in discharged wastewater. Governors of prefectures and mayors of ordinance-designated cities can require reports to be submitted and conduct inspections of factories and business establishments on wastewater treatment methods and the quality/amount of wastewater in order to prevent violations, and are also authorized to take administrative measures in the event of violations, such as issuing orders for improvements according to the outcomes of reports and inspections.

Measures against non-compliance

If it is judged that the water discharged from factories and business establishments is unlikely to meet the effluent standard (or will exceed the standard), administrative

measures such as operational improvement orders and business suspension orders are implemented. Penalties such as imprisonment or fines are additionally applied in cases where effluent standards are not met (or are exceeded) (in the case of standard violations).

6 | Recent Developments in Water Environmental Management

The various revisions of the laws related with water environmental management have taken place according to the times and demands of society. Recent developments of water environmental management are summarized below.

Proactive measures to prevent groundwater pollution (2011 revision of the Water Pollution Control Law)

In general, groundwater is widely used as valuable freshwater resources in Japan owing to its good water quality and low variation in water temperature. However, groundwater pollution cases due to the leakage of harmful substances such as trichlorethylene from factories and business sites are continuously confirmed each year. Such groundwater pollution is caused by aging production facilities and storage facilities used in industry, as well as leakage of harmful substances due to operational errors during the use of production facilities.

Given these circumstances, in order to effectively prevent groundwater contamination, obligations to not only report on establishment of facilities that store hazardous substances but also to comply with structural standards as well as monitor and record periodic inspections of facilities that use and store hazardous substances were implemented (Figure 2.4.9).

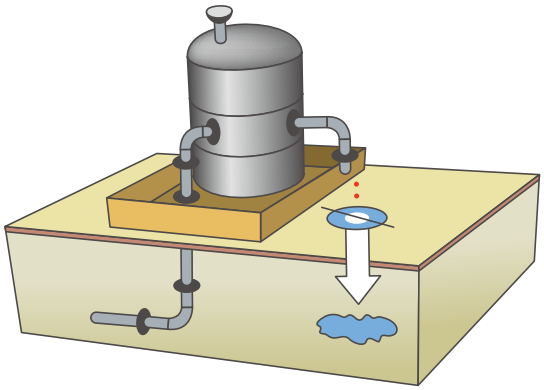


Figure 2.4.9 Underground infiltration of hazardous substances from production facilities (Source: provided by MoEJ)

Monitoring of radioactive materials (2013 revision of the Water Pollution Control Law)

Based on the serious environmental pollution resulting from leakage of radioactive materials from the Fukushima Daiichi Nuclear Power Plant during the Great East Japan Earthquake of March, 2011, monitoring of radioactive materials in public water bodies and groundwater was implemented. Results from such monitoring are evaluated and disclosed periodically by trusted sources.

Ambient water quality standards (2016)

Ambient water quality standards consist of items for protection of human health (health items) and items for conservation of the living environment (living environment items). Regarding health items, 27 items are set for public waters, including heavy metals such as cadmium and lead, organochlorine compounds and agricultural chemicals, and 28 items are set for groundwater. Standards for living environment items have been set for BOD, COD, total nitrogen, total phosphorus, total zinc, etc. The types of environmental standards for each water area are being designated based on these standards in accordance with the purpose of water usage. A study on levels of dissolved oxygen concentrations in lake bottom water, added to the standards in March 2016, is underway for water areas the type designation of which is to be specified by the national government.

Regulation of the discharging of effluent (partial amendment of effluent standards) (2019)

According to the Water Pollution Control Law, nationwide uniform effluent standards are set for water discharged from factories or workplaces with Specified Facilities (including the Specified Facilities in Designated Areas) into areas of public waters, to preserve water quality. In view of the challenges related to achieving uniform effluent standards immediately, of the substances for which standards have been set, values for boron, fluorine, nitrate nitrogen, and cadmium were reviewed. As a result, new provisional effluent standards went into effect from July 2019 for boron, fluorine, nitrate nitrogen, etc., and from December 2019 for cadmium.

Johkasou Law (partial amendment of effluent standards) (2019)

As part of the development of sewage treatment facilities, *Johkasou* maintenance activities are being promoted in each municipality by utilizing national

treasury subsidies, etc., based on the "Regional Plan for Establishing a Recycling-based Society". In particular, regarding the conversion from *tandoku-shori Johkasou* (single treatment septic tanks) to *gappei-shori Johkasou* (dual treatment septic tanks), the subsidy rate has been raised for projects of municipalities that promote in-house plumbing work in conjunction with the introduction of energy-saving septic tanks. To further support this movement, a partial amendment to the *Johkasou Law* was enacted and issued in June 2019, and went into effect in April 2020.

Enactment of the new Basic Plan on Water Cycle (2020)

The Basic Act on Water Cycle was enacted in 2014 as a new act aimed at advancing policies related to the water recycle in a unified manner. In 2015, based on this act, a Basic Plan on Water Cycle was prepared. In the plan, river basin management was established as a measure aimed at a healthy water cycle, under which the various stakeholders concerned are to collaborate in each river basin to ensure a healthy water cycle. Based on the results of the evaluation of changes in the situation regarding the water cycle and the effects of measures related thereto, The Basic Act on the Water Cycle calls for the Basic Plan on Water Cycle to be reviewed and, as necessary, modified every five years or so. The new Basic Plan on Water Cycle, formulated in June 2020, includes three main priorities: (1) Water-cycle innovation through river basin management, (2) Realization of a safe and secure society through sound water cycle initiatives, and (3) Passing on an abundant society to future generations through a sound water cycle.

7 | Challenges and Future Plans

Improvement of water quality of lakes

Although the water quality of lakes is gradually improving, the actual achievement rate of environmental standards is low at around 50%. Many issues have emerged such as low oxygenation at lake bottoms, occurrence of water plants, decreased native species and a decline in hauls of fish due to changes in ecosystems, as well as a weakening of the relationship between people and lakes due to decreased contact. There are plans to adopt various regulatory measures related to water quality improvement, as well as comprehensively promote the development of sewerage treatment and *Johkasou* in the future. Lakeside environments are also to be preserved, such as through the conservation of vegetation and aquatic life in lakeside areas from the viewpoint of conservation and restoration of purification and biodiversity.

Restoring Bountiful Seas

Water quality is preserved by human interventions in harmony with nature. Bountiful seas, rich in biodiversity and productivity, are known as “satoumi” and it is important to promote the creation of satoumi in inland seas and bays close to where people live.

In addition to conventional efforts to improve water quality and conserve natural seashore, the Ministry of the Environment, Japan promotes policies combining meticulous nutrient management, and the preservation, restoration and creation of tidal flats and seaweed beds. The policies are based on a report issued in March 2020 entitled “Environmental conservation measures of the Seto Inland Sea in the future”, as well as the statement of opinion issued in January 2021 on “Direction of reviewing the measures on environmental conservation of the designated water in the Seto Inland Sea”.

Initiatives on global water issues

Taking advantage of experiences in overcoming serious water pollution, it is quite important that Japan contributes to the preservation and improvement of the water environment in other countries including developing countries. As such, Japan will utilize its technologies and knowledge to promote initiatives in international cooperation and partnerships, such as institutional transfer and technology support. After the end of the global pandemic of the new coronavirus infection occurred in 2019, it could be required to create a society focusing on global environment and public health more than ever.

Considering these situations, it could be also crucial that the Japanese government will continue to conduct the “Water Environmental Partnership in Asia (WEPA)” as well as public-private partnerships for the promotion of Japanese wastewater treatment technologies in other countries.