2.4 Japan

1 | Country Information

Table 2.4.1 Basic indicators

Land area (km²)		377,975 (2024)*1
Total population		124.1 million (2024)*2
GDP (current USD)		4,260.0 billion (2022)*3
GDP per capita (current USD)		34,064 (2022)*3
Average precipitation (mm/year)		1,691 (2013–2022)*4
Total renewable water resources (km³)*5		430 (1992–2021)*4
Total annual freshwater withdrawals (billion m³)		79.7 (2020)*4
Annual freshwater withdrawal by sector	Agriculture	66.8% (2020) *4
	Industry	16.3% (2020) *4
	Municipal (including domestic)	16.9% (2020) *4

Source:
*1 Geospatial Information Authority of Japan, MLIT, 2024
*2 Statistics Bureau of Japan, 2024
*3 Cabinet Office, Government of Japan, 2024
*4 Water and Disaster Management Bureau, MLIT, 2024

Note (*5): In Japan, the average renewable water resources is calculated as the 30-year average of the value obtained by subtracting the evaporation amount from the precipitation amount and then multiplying by the area of the region.



Figure 2.4.1 Lake Biwa in Otsu City, Shiga Prefecture

2 | State of Water Resources

Japan is located in the eastern monsoon region of Asia and noted for having one of the highest rainfalls 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 average amount of approximately 20,000 m³/person/year.

Compared with the world's renewable water resources, at around 3,400 m³/person/year, the figure for Japan is less than half the world average of about 7,000m³/person/year. Moreover, much of the available water is lost to the ocean unused due to the steep topography, very short streams, and heavy rainfall during the rainy and typhoon seasons (Water and Disaster Management Bureau, MLIT 2024).

3 | State of Ambient Water Quality

The main objectives of protecting the water environment in Japan are human health protection and environmental conservation. To achieve these, environmental quality standards (EQS) for ambient water were established under the Basic Environment Law as the acceptable levels of water quality to be maintained in public waters. As such, there are two types of EQS for water: one for human health, which sets uniform standards applicable nationwide for all public waters,, including groundwater; and another for conservation of the living environment, which differs according to the water use of the water body in question.

In most locations, EQS for human health protection were attained with a 99.1% compliance rate in fiscal year (FY) 2022. EQS for conservation of the living environment have been achieved, with an 87.8% rate of compliance for biochemical oxygen demand (BOD) and chemical oxygen demand (COD), the representative water quality indicators for organic contamination (Environmental Management Bureau, MOEJ 2024) (see Fig. 2.4.2).

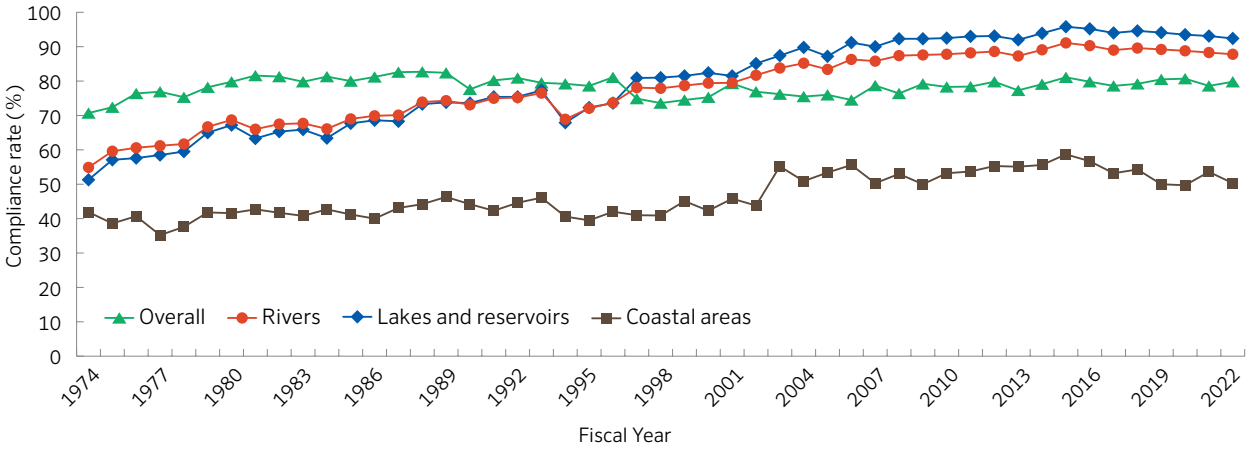


Figure 2.4.2 Trends in compliance rates for EQS (BOD and COD)

(1) Rivers

The compliance rate for BOD in rivers is 92.4% in the designated water bodies, and has been decreasing year by year.

(2) Lakes and reservoirs

The compliance rate for COD in lakes and reservoirs was 50.3% in the designated water bodies, and that for total nitrogen and phosphorus in lakes and reservoirs was 54.0%, indicating that further efforts are still needed for improvement.

(3) Coastal water

The compliance rate for COD in coastal areas was 79.8% in the designated water bodies, while the compliance rate for total nitrogen and total phosphorus was 90.1%.

(4) Groundwater

Of the 2,830 wells tested in 2022, 149 (or 5.3%) failed the standards in at least one parameter. In particular, values for nitrate-nitrogen and nitrite-nitrogen did not comply with the EQS (see Fig. 2.4.3). The main causes are assumed to be excessive fertilizer use, inappropriate management of livestock excreta and nitrogen loading from domestic wastewater (Environmental Management Bureau, MOEJ 2024).

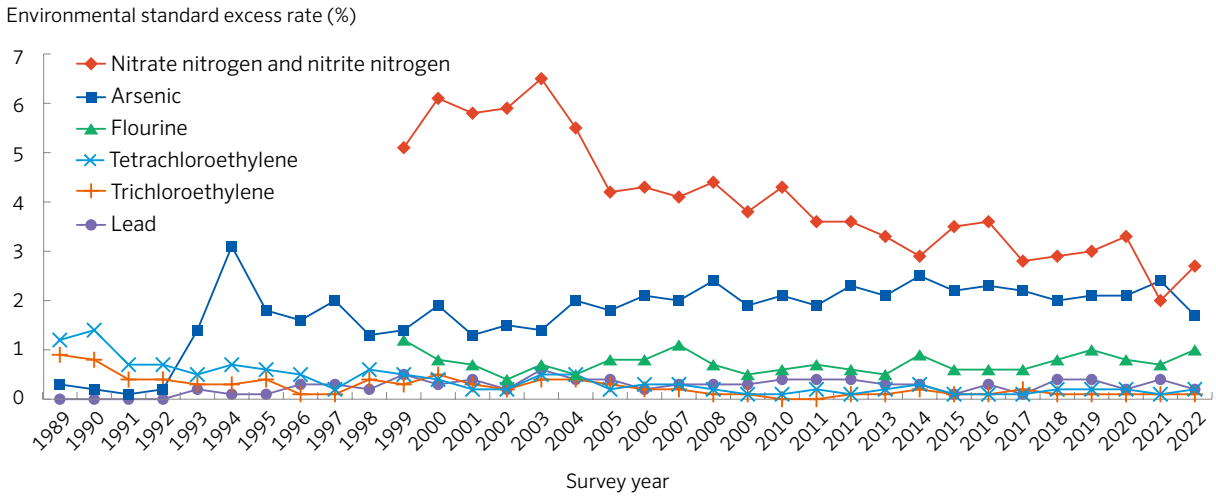


Figure 2.4.3 Trends in excess rates (failure of EQS compliance) for groundwater (key items)

Note 1: Wells measured in general survey differ by year.
Note 2: Environmental standards related to groundwater contamination were established in 1997. Actual evaluation criteria are based on standards established previously. In addition, the evaluation criterion 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 the environmental standard items in 1999.

4 | State of Wastewater Treatment

Access to domestic wastewater treatment facilities*1 in Japan stood at 93.3% for the population, as of the end of FY2023.

As shown in Fig. 2.4.4, municipalities with small populations tend to have lower rates of access to domestic wastewater treatment facilities. Additionally, *Johkasou*[*2], which is suitable for decentralized treatment on a household level, is more likely to be installed in these sparsely populated areas.

Wastewater treatment facilities are being developed continuously based on the plan titled Comprehensive Basin-Wide Plan of Sewerage Systems (known as *Todofuken Koso* in Japanese), which outlines development methods and schedules tailored to local conditions. The plan takes into account the characteristics and economics of sewers, rural sewerage systems, and *Johkasou*, and aims to eliminate areas without treatment facilities through the appropriate division of roles. In parallel with the above, implementing effective upgrades and operational and maintenance measures to ensure sustainable wastewater treatment also play an important role.

MOEJ supports upgrading from the older *Tandoku Johkasou* type of device*3 to the new *Gappei Johkasou* type through provision of a subsidy as part of domestic wastewater management measures. This subsidy is provided through the Circular Society Formation Promotion Grant, which covers the costs of conversion and related pipe installation, as well as the costs for removal and replacement of old systems.

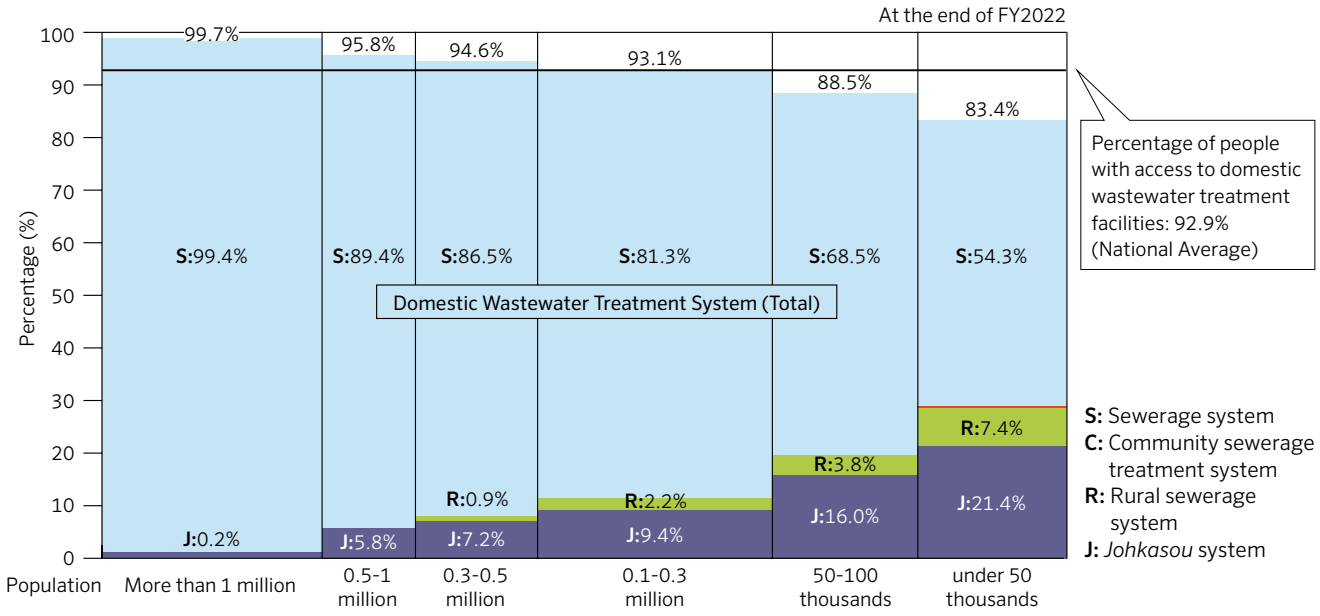


Figure 2.4.4 Percentage of people with access to domestic wastewater treatment facilities by size of municipality

(Source: MLIT 2024)

*1 The term 'domestic wastewater treatment facilities' here does 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 produce high quality effluent with aeration (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 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 type (*Gappei Johkasou*). Under the *Johkasou* Act, the term *Johkasou* refers only to newer types that treat both black and grey water. The older type that does not treat grey water is, consequently, not regarded as *Johkasou*. New installations of the older type have been forbidden since 2000 owing to the existence of the newer type. More information is available at: https://www.env.go.jp/recycle/jokaso/en/pamph/wastewater_treatment_systems.html

5 | Frameworks for Water Environmental Management

(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 waters are shown in Fig. 2.4.5.

As a measure related to domestic wastewater management, the Sewerage Act was enacted with the aim of constructing sewerage systems. In addition, the *Johkasou* Act for on-site packaged household wastewater treatment plants for areas without access to sewerage treatment was established, to define regulations relating to their manufacturing, installation, inspection, operation and maintenance and desludging.

(2) Institutional arrangement

Since water is involved in many aspects of human life, five ministries (Ministry of the Environment (MoEJ); Ministry of Land, Infrastructure, Transport and Tourism (MLIT); Ministry of Health, Labour and Welfare (MHLW); Ministry of Agriculture, Forestry and Fisheries (MAFF); and Ministry of Economy, Trade and Industry (METI)) have mainly been taking the lead and working together in water environment management in Japan (see Table 2.4.2).

In April 2024, the governance over drinking water was transferred from MHLW to MLIT and MoEJ.

The Basic Act 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.

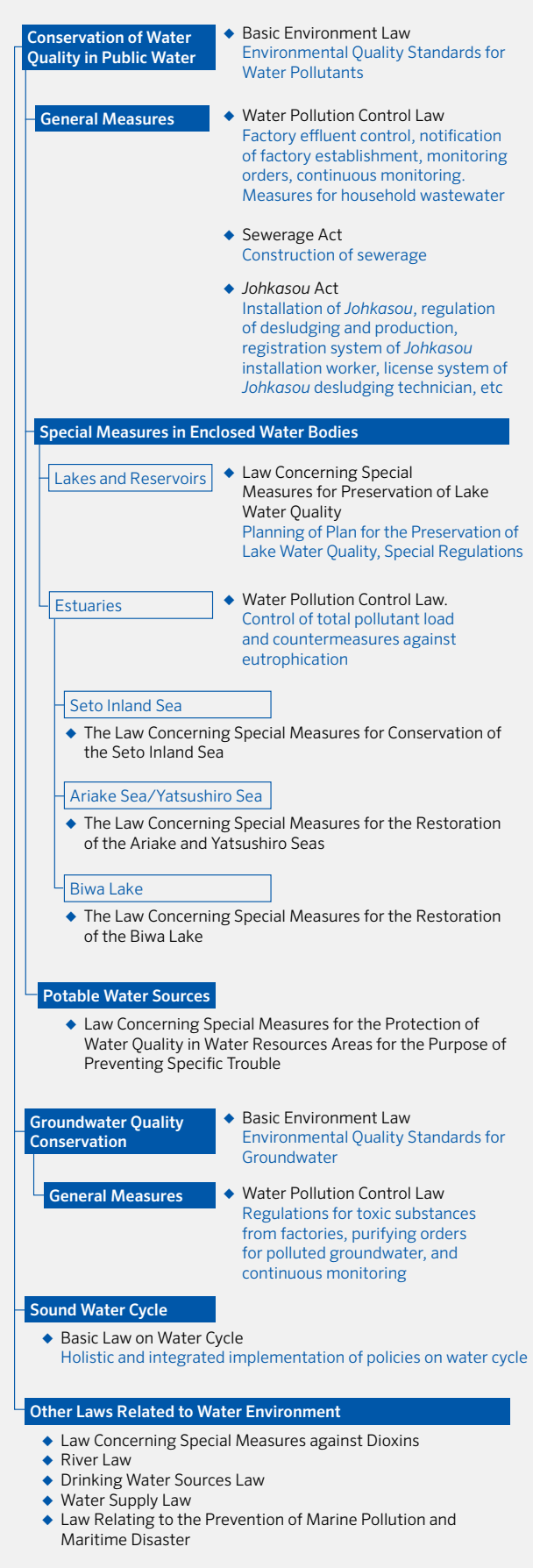


Figure 2.4.5 Structure of legal system for water environmental management in Japan (Source: MOEJ)

Table 2.4.2 Institutional arrangement for water environmental management

Ministry	Chief responsibilities
MoEJ	• Formulating and implementing a wide range of water environment management policies, such as formulation of ambient water quality standards, water quality monitoring of public waters and publication of the results, effluent standard, *Johkasou* maintenance, etc. • (From April 2024) Formulating and implementing policies related to water quality standards for drinking water, and assurance of drinking water quality.
MLIT	• 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. • (From April 2024) Formulating and implementing policies related to water supply system development and maintenance and security of drinking water quality.
MHLW	• (Until March 2024) Formulating and implementing policies related to water supply system development and maintenance, water quality standards for drinking water, and security of drinking water quality.
MAFF	• 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.
METI	• Formulating and implementing policies such as for industrial water supply development and wastewater treatment in the mining industry through the implementation of mine pollution prevention projects.

(3) Ambient water quality standards

a. Ambient water quality standards

In 1971, the EQS for water were established, and nationwide uniform standard values were set for 27 items as the EQS for water related to protection of human health (health items). 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.

As indicators of ambient water quality standards for the conservation of aquatic living resources, total zinc, nonylphenol and linear alkylbenzene sulfonic acid and its salts were registered in 2003, 2012 and 2013, respectively. In 2022, the indicator for total coliform count was revised to E. coli count.

b. Monitoring framework

According to the Water Pollution 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 also 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 from approximately 7,000 locations in public water bodies nationwide are publicly released on the MoEJ website (see Fig. 2.4.6).

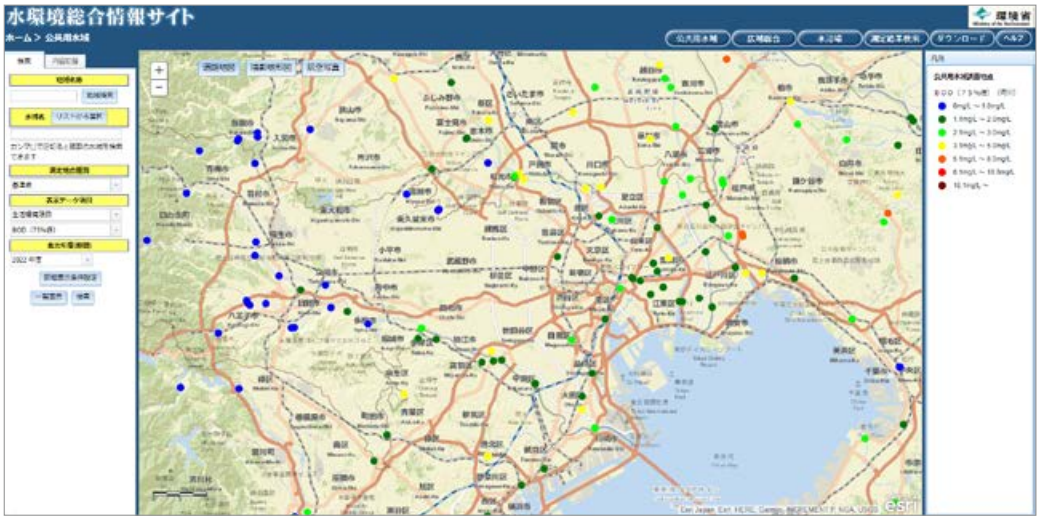


Figure 2.4.6 Comprehensive information site on the water environment (Source:MoEJ)

(4) Effluent standards

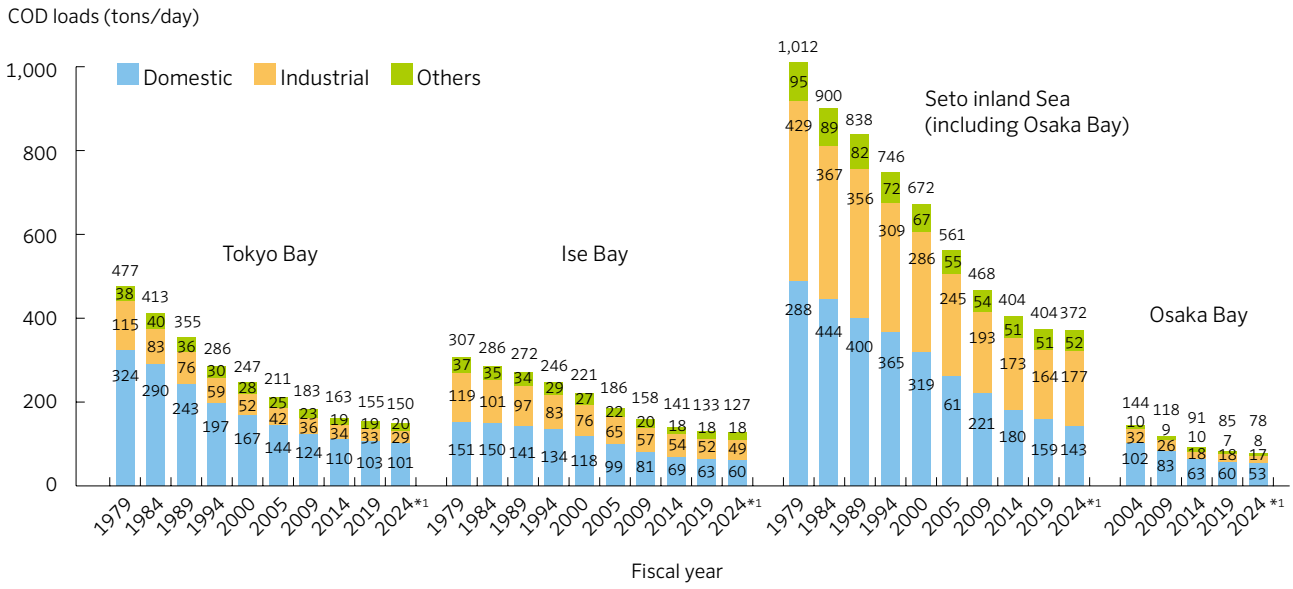
a. Effluent standards

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 50 m^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.

b. Total pollutant load control system

The total pollutant load control system (TPLCS) is an effluent control mechanism aimed at improving water quality by reducing the total load of pollutants flowing into certain enclosed coastal waters, namely Tokyo Bay, Ise Bay, and the Seto Inland Sea. Due to the presence of densely populated and industrialized areas, it is difficult to achieve EQS for these coastal waters by regulating effluent based only on concentrations of regulated substances. Under this system, the national government sets targets for pollutant loads and the years in which they are to be achieved, and the relevant prefectures specify detailed methods for achieving the targets.

To date, COD loads have been steadily reduced in target water bodies since 1979 (see Fig. 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 they were added to designated items under the system in 2001. In January 2022, Japan set the Ninth Basic Policy for the TPLCS, with the target year of FY2024.



*1 The value up to for FY2019 represents the target, while the values for other fiscal years represent estimated results in the relevant prefectures.

Figure 2.4.7 Changes in pollution load and target value (COD) (Source: MOEJ 2022)

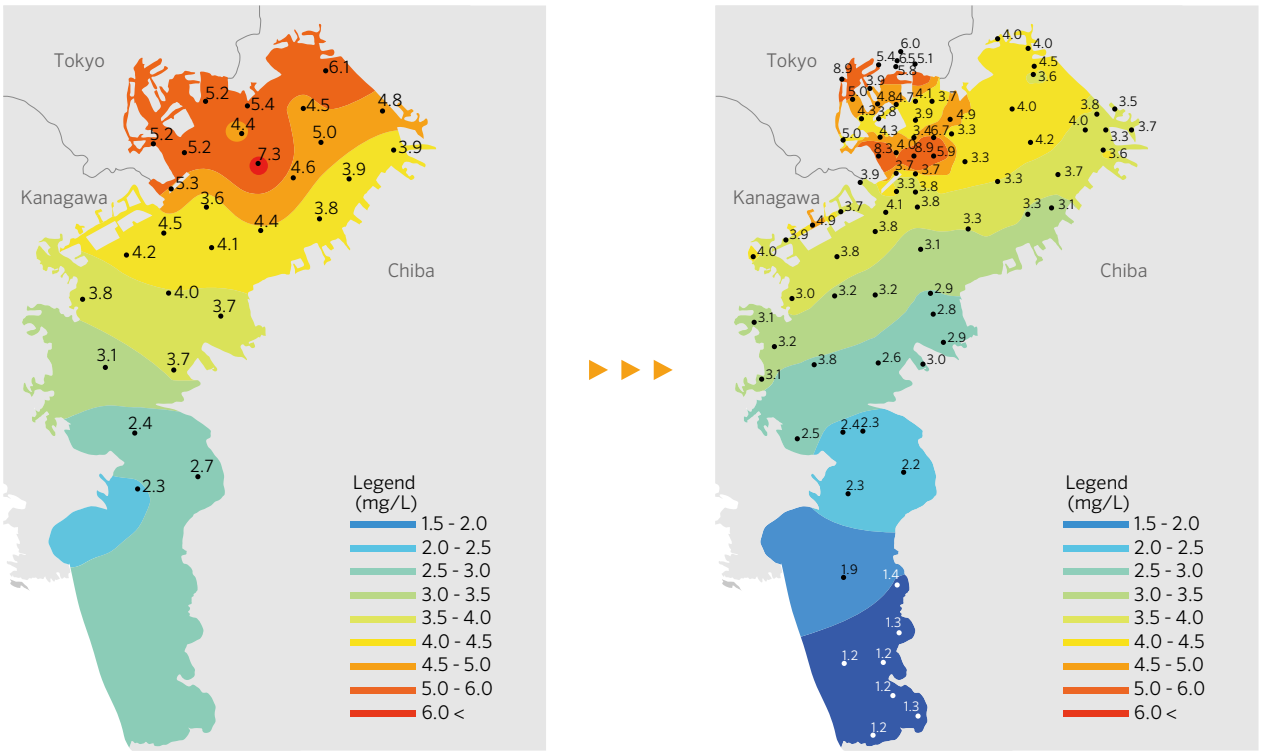


Figure 2.4.8 Improvement in COD concentrations in Tokyo Bay (Source: MoEJ)

c. 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 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 by issuing orders for improvements according to the outcomes of reports and inspections.

d. 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).

6 | Recent Developments in Water Environmental Management

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

a. Proactive measures to prevent groundwater pollution

In general, groundwater is widely used as a valuable freshwater resource 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 2011, new regulations were introduced to effectively prevent groundwater contamination. These included the obligation to report the establishment of facilities that store hazardous substances, and the requirement for such facilities to comply with structural standards, as well as to monitor and keep records of periodic inspections (see Fig. 2.4.9).

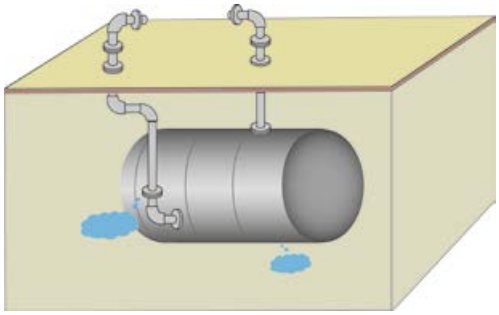


Figure 2.4.9 Underground infiltration of hazardous substances from production facilities (Source: MoEJ)

b. Monitoring of radioactive materials

Following the serious environmental pollution caused by the leakage of radioactive materials from the Fukushima Daiichi Nuclear Power Plant after the Great East Japan Earthquake in March, 2011, monitoring was instigated for radioactive materials in public water bodies and groundwater. The results of this monitoring are periodically evaluated and disclosed.

c. Ambient water quality standards

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 the living environment have been established for BOD, COD, total nitrogen, total phosphorus, total zinc, and other parameters. Based on these standards, each water body is classified according to its purpose of use. Regarding dissolved oxygen concentrations in bottom water (bottom-layer DO), which were added to the standards in March 2016, among water bodies the National Government is to designate classes for, classifications have already been designated for Lake Biwa, Tokyo Bay, Ise inland Bay, Osaka Bay (innermost part only) and Lake Kasumigaura. Further classifications for other water areas are subject to ongoing review.

In October 2021, the environmental standard for hexavalent chromium, a parameter for the protection of human health, was revised, and the indicator for fecal contamination was changed from coliform group to E. coli. The new standards went into effect in April 2022.

d. Regulation of the discharging of effluent (partial amendment of effluent standards)

Under the water pollution control law, nationwide uniform effluent standards are established for water discharged from specified facilities to preserve the quality of public water. Among the substances for which standards have been set, the provisional effluent standards for boron, fluorine, nitrate nitrogen, zinc, and cadmium were reviewed to account for the challenges related to achieving uniform effluent standards immediately.

As a result, as of July 2022, new provisional effluent standards are in effect for boron, fluorine, and nitrate nitrogen, and from December 2024, for zinc. For cadmium, all industries have transitioned to uniform effluent standards. Additionally, in response to the revision of environmental standards for hexavalent chromium and coliform bacteria, effluent standards were also revised. The new standards and provisional effluent standards for hexavalent chromium took effect in April 2024, while the revised standards for E. coli are scheduled to take effect from April 2025.

e. Partial amendment of *Johkasou* Act

In line with the development of sewage treatment facilities, the introduction of *Johkasou* is being promoted in each municipality through the use of national treasury subsidies, based on the Regional Plan for Establishing a Recycling-based Society. In particular, for the conversion from conventional *Tandoku*-type *Johkasou* to new *Gappei*-type *Johkasou*, the scope of subsidies has been expanded to include in-house plumbing work, and the subsidy rate has been increased for municipalities that promote the introduction of energy-efficient *Johkasou*. In further support of this initiative, a partial amendment to the *Johkasou* Act was enacted and promulgated in June 2019 and went into effect in April 2020.

f. Transference of drinking water governance

Prior to April 2024, the governance of water supply development and management was under the jurisdiction of the MHLW, which transferred to MLIT in April 2024 other than for water quality and sanitation-related matters, which are now handled by the MoEJ.

g. Enactment of the New Basic Plan on Water Cycle

To comprehensively and integrally promote policies related to the water cycle, the Basic Act on Water Cycle was enacted in 2014, followed by the formulation of the Basic Plan on Water Cycle in 2015 based on the act. The plan positions river basin management as one of the key directions for ensuring a healthy water cycle, emphasizing the need for collaboration among various stakeholders in each river basin towards this goal. The plan is to be reviewed approximately every five years taking into account changes in the situation related to the water cycle and evaluations of the effectiveness of policies. In light of recent developments, such as the transfer of water administration responsibilities and the Noto Peninsula earthquake in January 2024, a new Basic Plan on Water Cycle was formulated in August 2024.

The new Basic Plan focuses on four main priorities: (1) Securing a stable water supply with emphasis on substitutability and multiplicity, (2) Rebuilding sustainable and optimal water and sewage systems through facility consolidation and public-private partnerships, (3) Promoting measures against global warming in line with the goal of carbon neutrality by 2050, and (4) Expanding integrated basin-wide water management to ensure a sound water cycle. Item (4) comprises a comprehensive approach in which all stakeholders related to the basin collaborate on flood control, water use and environmental conservation, aiming to minimize damage from water-related disasters, maximize the benefits of water and ensure a rich environment connected by water. This approach is aimed at promoting river basin management to ensure a sound water cycle.

7 | Challenges and Future Plans

a. Community development through the conservation and use of the water environment

Although the measures taken to deal with the severe cases of pollution that occurred throughout the nation in the past have achieved some results, it can be said that issues such as water pollution in lakes and enclosed coastal areas, the maintenance and restoration of sound water and material cycles, and the revision of environmental standards still need to be addressed. There are also new issues, such as exploring ideal forms of environmental standards that can meet local needs as well as create a good environment. Based on the 'Future of Water and Air Quality Management' (offering an opinion) formulated in June 2023 and the Sixth Basic Environment Plan, which was approved by the Cabinet in May 2024, the Ministry of the Environment plans to promote initiatives to improve the well-being of local residents and revitalize local communities by preserving the natural environment and culture unique to each region, such as rich waterfronts, starry skies and soundscapes; promote initiatives to achieve comprehensive water environment management that contributes not only to water quality management but also to biodiversity conservation and regional development; and promote the creation of an integrated watershed management model that links regions from forests and rivers that provide water for tap water to the sea, based the use of other effective area-based conservation methods (OECM) to create a good environment. In addition, with regard to nitrogen, which also impacts on the eutrophication of water bodies and groundwater pollution, initiatives are to be promoted that contribute to society and local communities through sustainable nitrogen management, based on the 'Action Plan for Sustainable Nitrogen Management' formulated in line with the Sixth Basic Environment Plan, and through an integrated approach that combines the protection and management of the water environment with decarbonization, resource recycling and coexistence with nature.

b. Promotion of integrated risk management

Following the transfer of management of water quality and sanitation of water supply to the MoEJ in April 2024, integrated risk management from source to tap is to be promoted. Specifically, for substances such as PFOS (perfluorooctanesulfonic acid) and PFOA (perfluorooctanoic acid), which are of increasing domestic and international concern, the ministry will promote initiatives aimed at assuring safety, including reviewing water quality standards of water supply, strengthening environmental monitoring, and enhancing scientific knowledge. In addition, knowledge will be accumulated on pathogens such as protozoa and viruses that cause waterborne infectious diseases. Consideration will also be given to the effectiveness of E. coli counts as a hygiene indicator and to the potential use of alternative indicators. Given the lack of fundamental information regarding the presence of antimicrobial resistance (AMR) bacteria in aquatic environments and the potential health impacts thereof, efforts will be made to collect and analyze such data. Based on the latest scientific findings on chemical substances in the environment and research on chemical management, revisions to or establishment of additional environmental standards for the conservation of aquatic life and protection of human health will also be considered.

Furthermore, in managing the risks related to the contamination of water sources due to natural disasters or accidents, case studies and scientific evidence will be collected. Measures are to include the establishment of a rapid information-sharing system among stakeholders in environmental and water departments at national and local levels, as well as enhanced emergency preparedness, including consideration for optimal risk management frameworks.

c. Improvement of water quality of lakes

Although the water quality of lakes is gradually improving, the achievement rate of environmental standards is low at around 50%. Many issues have emerged, such as low oxygen levels at the lake bed, excessive growth of aquatic plants, reductions in native species and fish catches due to ecosystem changes, and weakened bonds between people and lakes due to reduced opportunities for people to interact with lakes. Moving forward, efforts will continue to include implementing various regulatory measures to improve water quality, comprehensively promoting the development of sewer systems and *Johkasou*, and addressing the impacts of climate change and ecological changes. These efforts are aimed at enhancing knowledge, exploring solutions, and achieving a balance between the conservation of aquatic resources and water quality preservation. Additionally, from the perspectives of preserving and restoring biodiversity and the functions of ecosystem services, ongoing efforts will be made to protect lakeshore environments, including the conservation of vegetation and aquatic life.

d. Restoring bountiful seas

Water quality is improved and preserved through human interventions in harmony with nature, resulting in seas that are clean and abundant in biodiversity and productivity—referred to as *satoumi* in Japanese. Promoting the creation of *satoumi* in coastal areas close to human settlements has been identified as a crucial task. In addition to conventional efforts to improve water quality and preserve natural coastlines, the MoEJ will promote policies that focus on meticulous nutrient management as well as the preservation, restoration, and creation of tidal flats and seaweed beds (based on the Opinion on Future Water and Air Environment Administration, issued in June 2023, and the Sixth Basic Environmental Plan, adopted by cabinet decision in May 2024). These efforts are aimed at creating a positive usage cycle of regional resources (MoEJ 2024).

e. Initiative on global water issues

Capitalizing on its experiences to date in overcoming serious instances of water pollution, Japan considers it a high priority to contribute to the preservation and improvement of the water environment in other countries, including developing countries. As such, Japan aims to utilize its technologies and knowledge to promote initiatives through international cooperation and partnerships, such as through institutional transfer and technology support. With the overarching ideal of creating a society focused on the global environment and public health, the advent of the Coronavirus pandemic in 2019 added impetus to achieving these aims.

Considering the above, the Japanese government attaches very high importance to conducting the Water Environment Partnership in Asia (WEPA) alongside public-private partnerships for the promotion of Japanese wastewater treatment technologies in other countries.