

V. Change in Water Quality (Water Temperature in Summer)

Water temperature in summer/mean

20 years ago, a mean water temperature in summer over 25 °C was observed at 201 locations. Among these, the highest water temperature was observed at the mouth of the Taka River, the lower Yodo River basin, where it meets the Kanzaki River, at 31.2 °C.

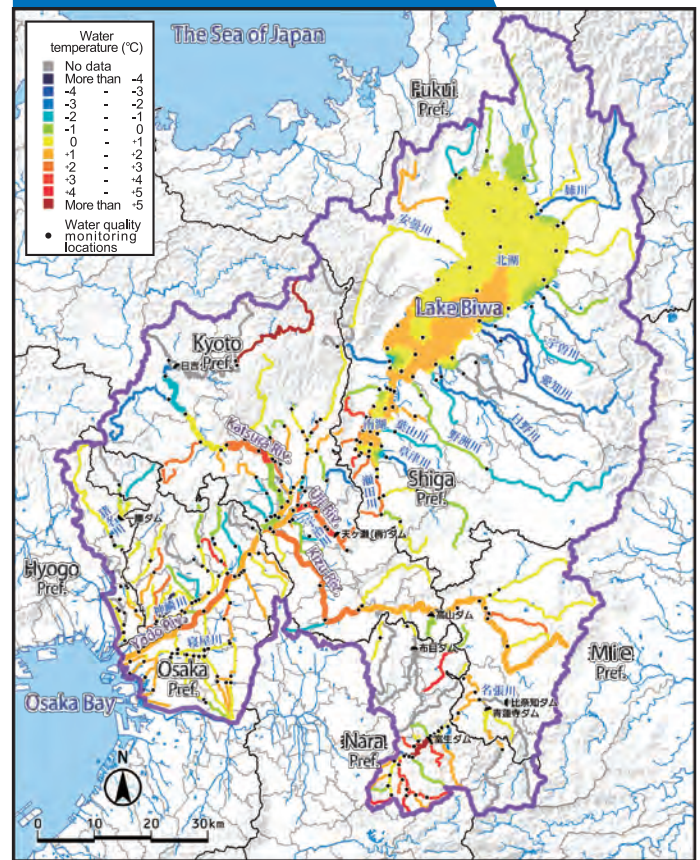
At present, mean water temperature in summer over 25 °C increased to 235 locations. Among these, the highest water temperature was observed at the Tatsumi Bridge on the Kanzaki River, at 32.8 °C.

Water temperatures have increased at 212 locations (71.6 % of the total) over the past 20 years. A difference in water temperature of more than 3 °C was observed in 18 locations, mainly which occurred in 10 locations in the Kizu River basin.

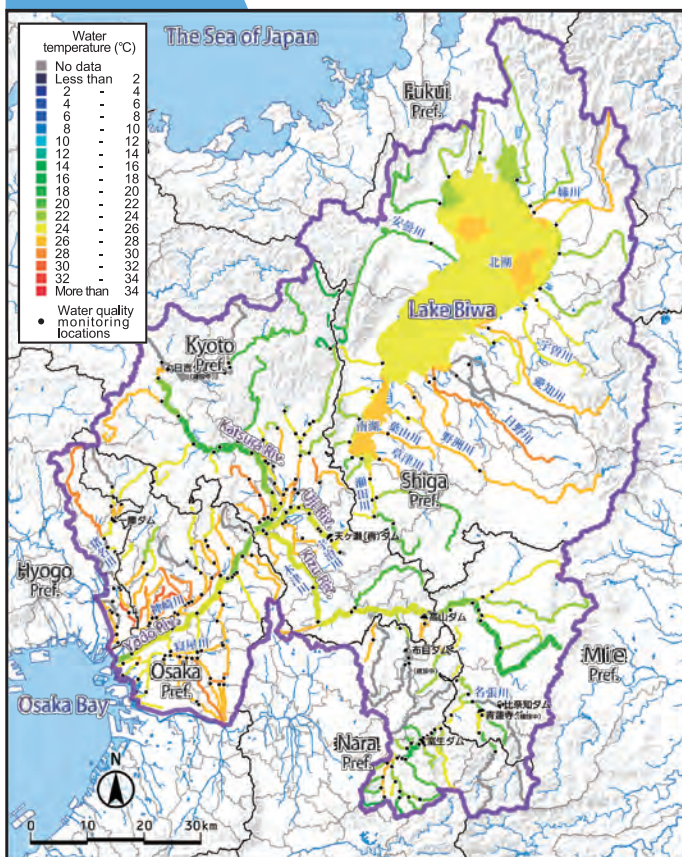
Of all the locations, the largest temperature difference over the past 20 years was observed at the log boom area of the Muro Dam, at 8.2 °C.

[Data Source] Values published by Environmental Geographic Information Systems (GIS), National Institute for Environmental Studies, Ministry of Land, Infrastructure, Transport and Tourism, Prefectures Concerned, and the Japan Water Agency

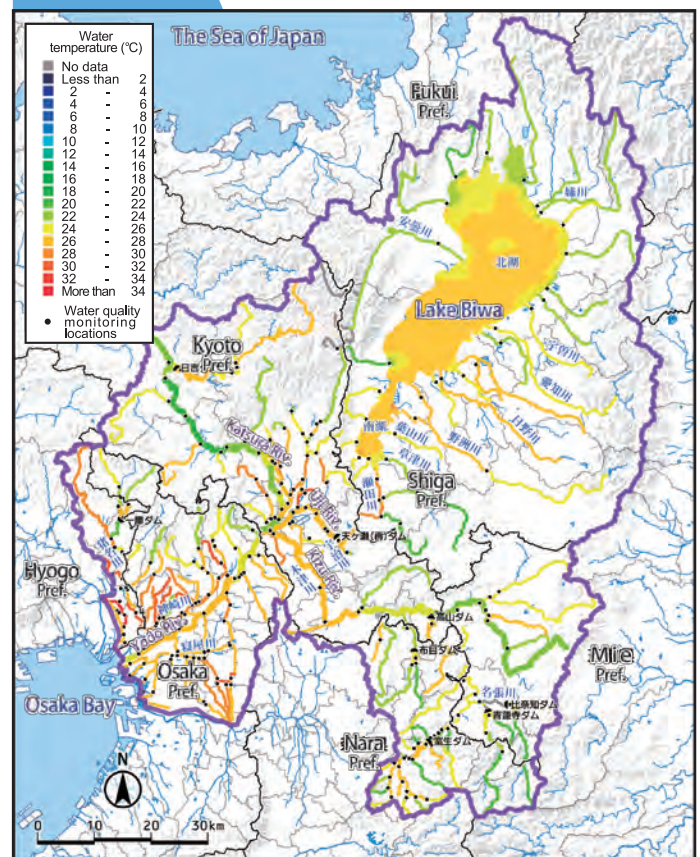
Change over the past 20 years



20 years ago



Present



Water temperature in summer/highest

Twenty years ago, the highest water temperature in summer over 30 °C was observed at 143 locations. Water temperatures increased mainly on the Yodo River and rivers within Osaka City. The highest water temperature of 37.3 °C was observed downstream of the Saimyoji River, a tributary of the Ina River.

Recently, the number of locations with a highest water temperature in summer over 30 °C slightly decreased to 122 locations. The highest water temperature of 37.0 °C was observed at the Kanaoka drainage canal in the lower Yodo River basin, at the border between the Itami and Amagasaki Cities.

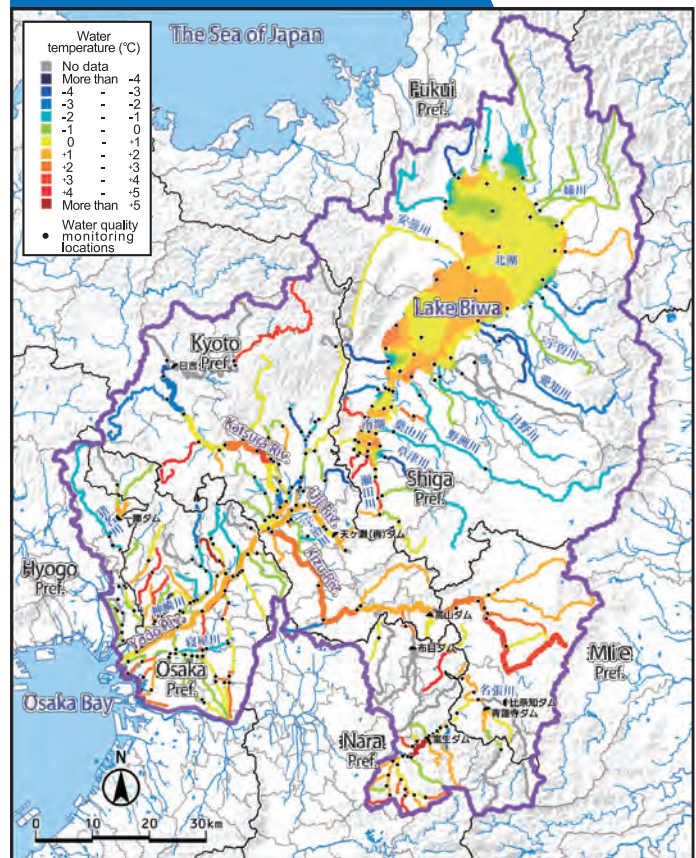
Water temperatures increased at 135 locations (45.6 % of the total) over the past 20 years.

On the other hand, a difference of water temperature greater than 3 °C was observed in 17 locations, with the majority of 9 locations in the Kizu River basin.

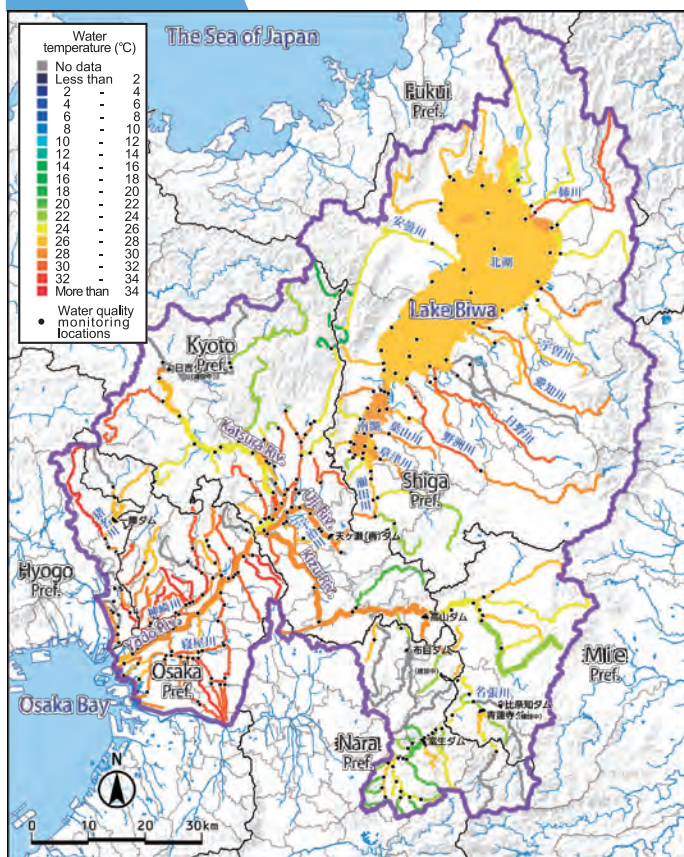
Of all the locations, the largest temperature difference over the past 20 years was observed at the Kanaoka drainage canal in the lower Yodo River basin, at the border between the Itami and Amagasaki cities, at 5.5 °C.

[Data Source] Values published by Environmental Geographic Information Systems (GIS), National Institute for Environmental Studies, Ministry of Land, Infrastructure, Transport and Tourism, Prefectures Concerned, and the Japan Water Agency

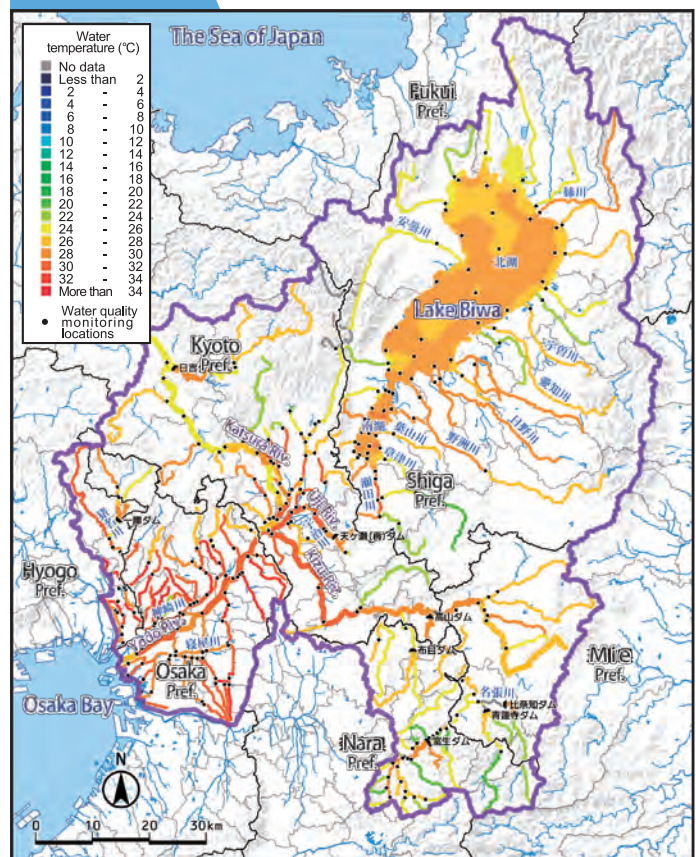
Change over the past 20 years



20 years ago



Present



V. Change in Water Quality (Water Temperature in Winter)

Water temperature in winter/mean

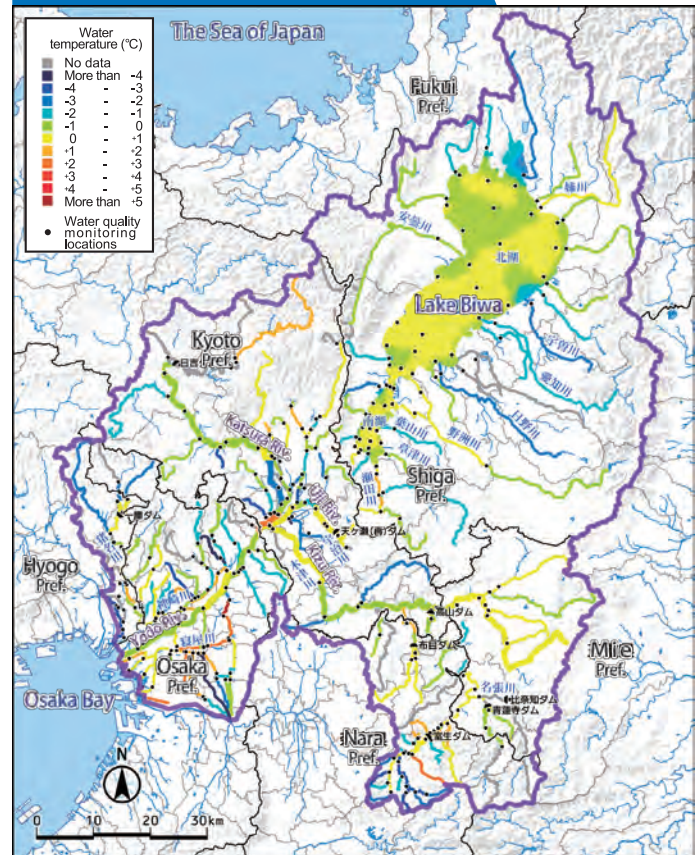
20 years ago, a mean water temperature in winter over 10 °C was observed at 56 locations. Among these, the highest water temperature was observed at the Tenjin Bridge downstream of the Kamo River in the Katsura River basin, at 15.7 °C.

At present, mean water temperature in winter over 10 °C decreased to 36 locations over the past 20 years. Among these, the highest water temperature was observed at the mouth of the Shojaku River, where it joins the Ai River, at 16.6 °C.

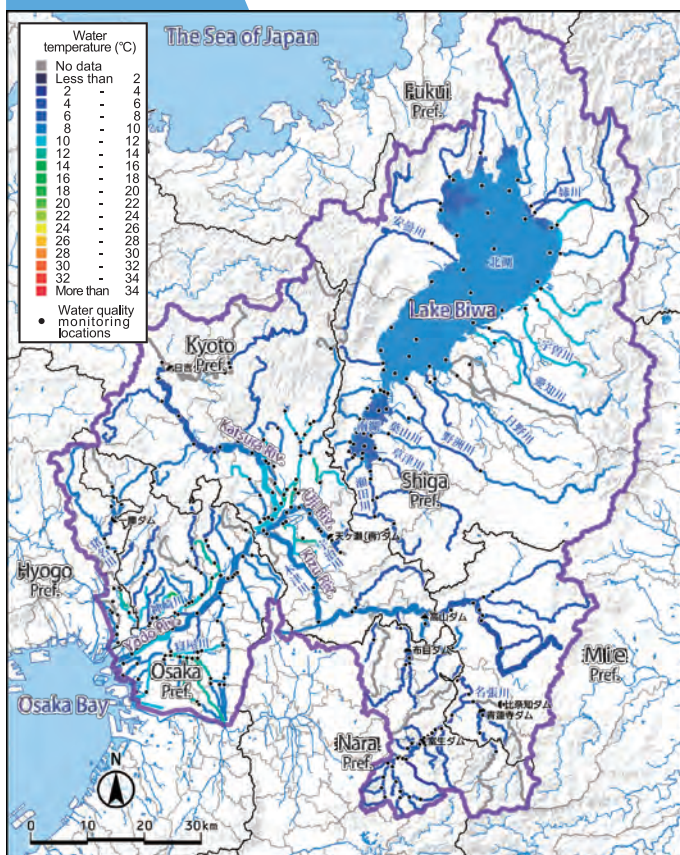
Water temperature increased at many locations in the upper Kizu River basin, the Ina River basin and rivers within Osaka City over the past 20 years. A change in water temperature over 3 °C was observed at 2 locations. Among these, the greatest change of 6.1 °C was observed at the Kayashima Bridge on the Neya River.

[Data Source] Values published by Environmental Geographic Information Systems (GIS), National Institute for Environmental Studies, Ministry of Land, Infrastructure, Transport and Tourism, Prefectures Concerned, and the Japan Water Agency

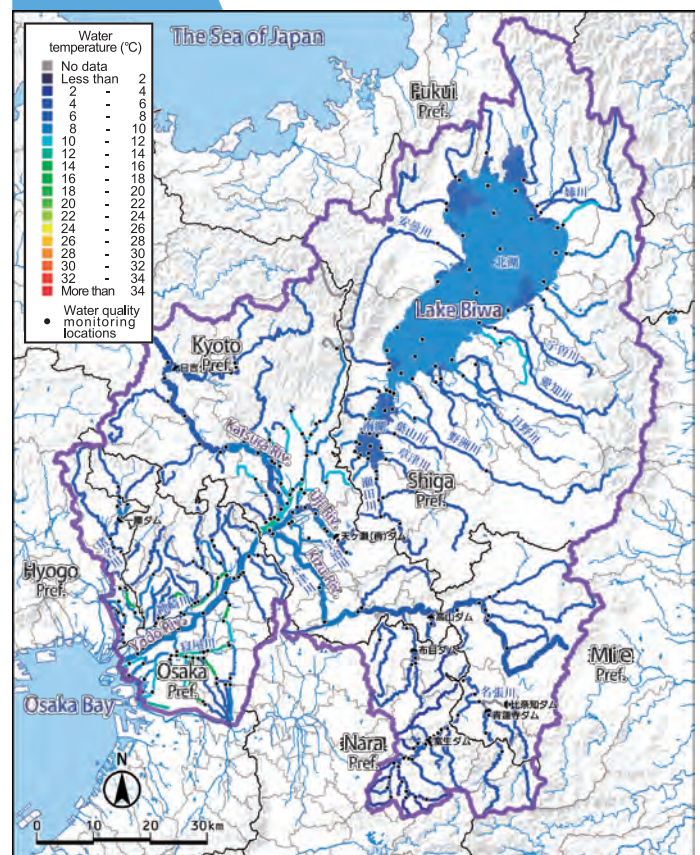
Change over the past 20 years



20 years ago



Present



Water temperature in winter/lowest

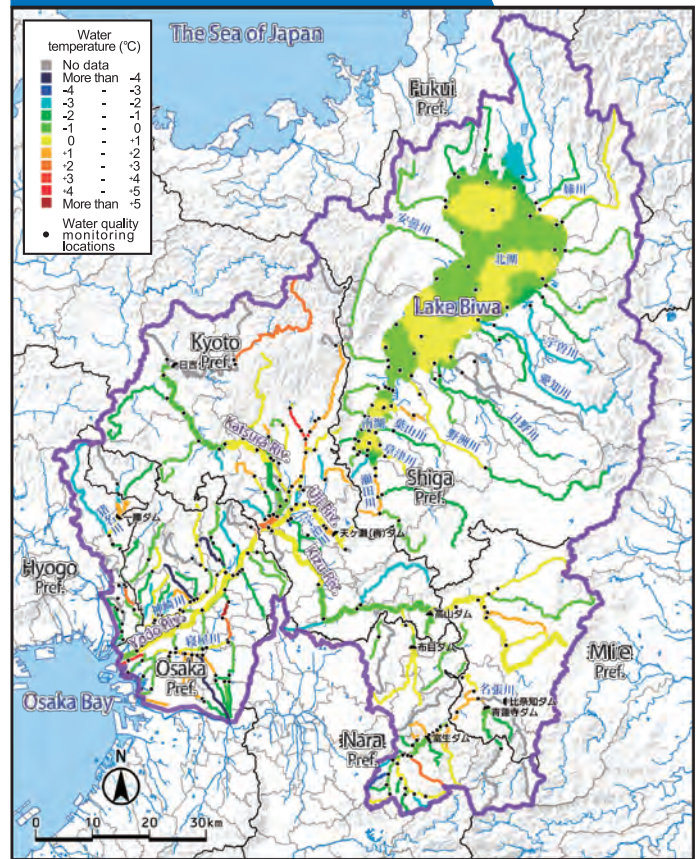
20 years ago, the lowest water temperature in winter over 10 °C was observed at 11 locations. Among these, the highest water temperature was observed at the mouth of the Shojaku River, where it joins the Ai River, at 14.3 °C.

In recent years, lowest water temperatures in winter over 10 °C slightly decreased to 9 locations compared to the past 20 years. Among these, the highest water temperature was observed at the mouth of the Shojaku River, where it joins the Ai River at 16.5 °C.

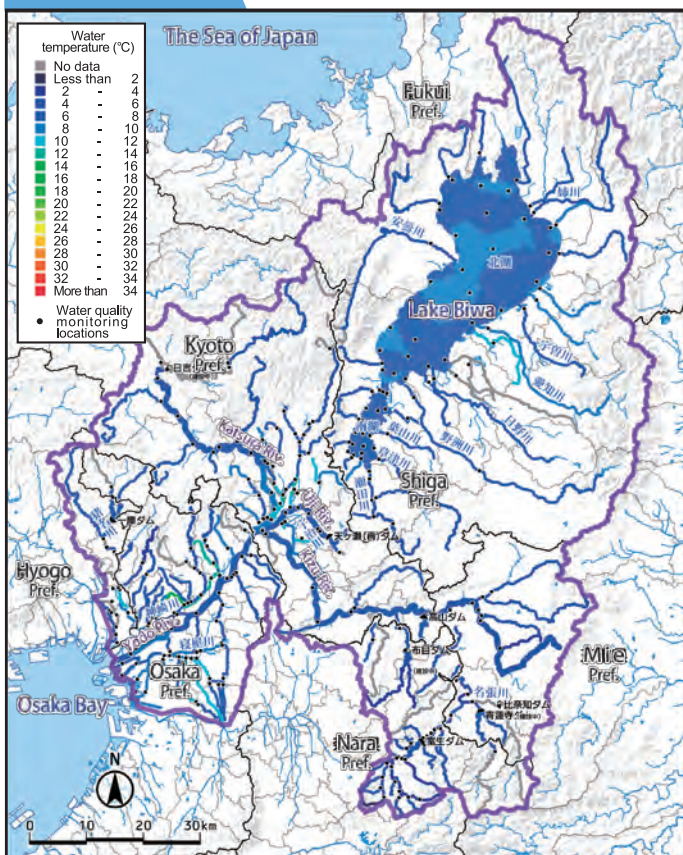
Water temperature increased at many locations in the upper Kizu River basin, the Katsura River basin and rivers within Osaka City over the past 20 years. A change in water temperature over 3 °C was observed at 10 locations. Among these, the greatest change was observed at the Kayashima Bridge on the Neyo River, at 6.2 °C.

[Data Source] Values published by Environmental Geographic Information Systems (GIS), National Institute for Environmental Studies, Ministry of Land, Infrastructure, Transport and Tourism, Prefectures Concerned, and the Japan Water Agency

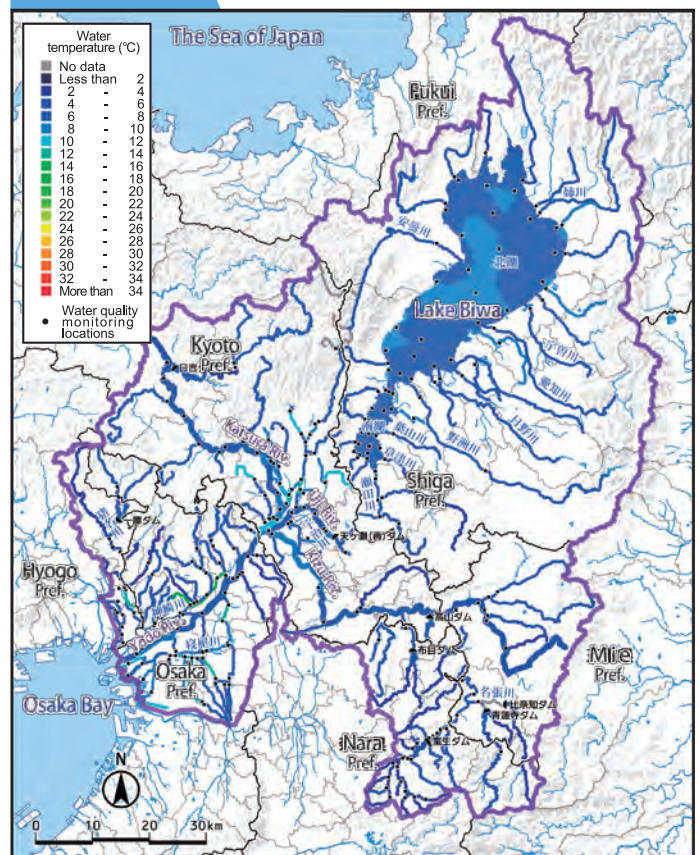
Change over the past 20 years



20 years ago



Present



V. Change in Water Quality (pH)

Annual mean pH values

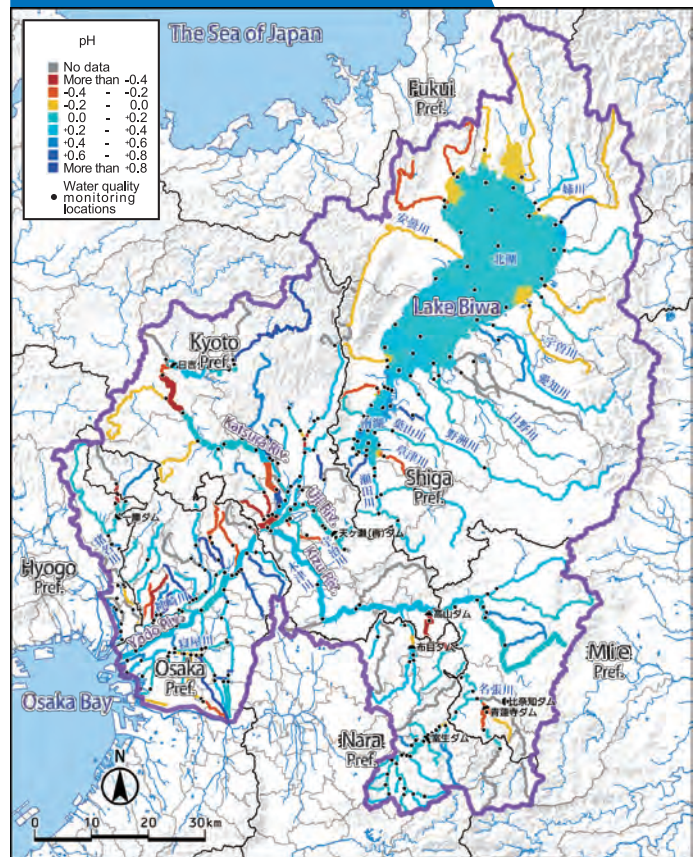
20 years ago, pH values greater than 8 were obtained at 30 locations. Among these, the highest value was 9.4 at the Sengen region of the Hitokura Dam.

At present, pH values have increased in almost all river basin areas. The number of locations with pH values greater than 8 significantly increased to 110. The highest values were obtained in the Kanaoka drainage canal in the lower Yodo River basin and the lower Kamo River basin area of the Katsura River basin. pH values were 9.4 at both locations.

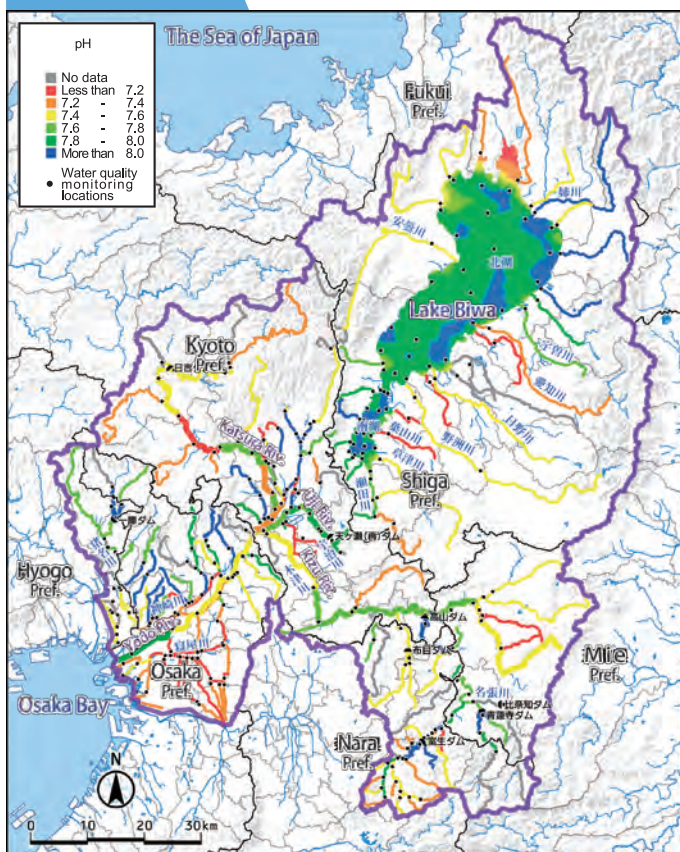
In the past 20 years, annual mean pH values increased by 0.6 and over at 31 locations. Within these, the largest increase of 2.1 was observed at the Umezu Shinbashi Bridge on the Arisu River in the Katsura River basin.

[Data Source] Values published by Environmental Geographic Information Systems (GIS), National Institute for Environmental Studies, Ministry of Land, Infrastructure, Transport and Tourism, Prefectures Concerned, and the Japan Water Agency

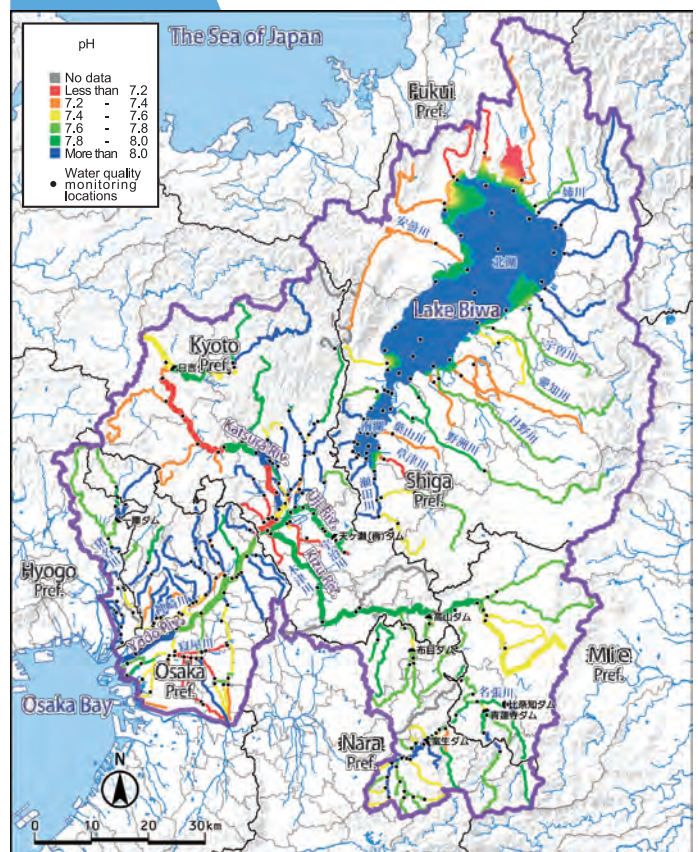
Change over the past 20 years



20 years ago



Present



Average seasonal pH values in summer

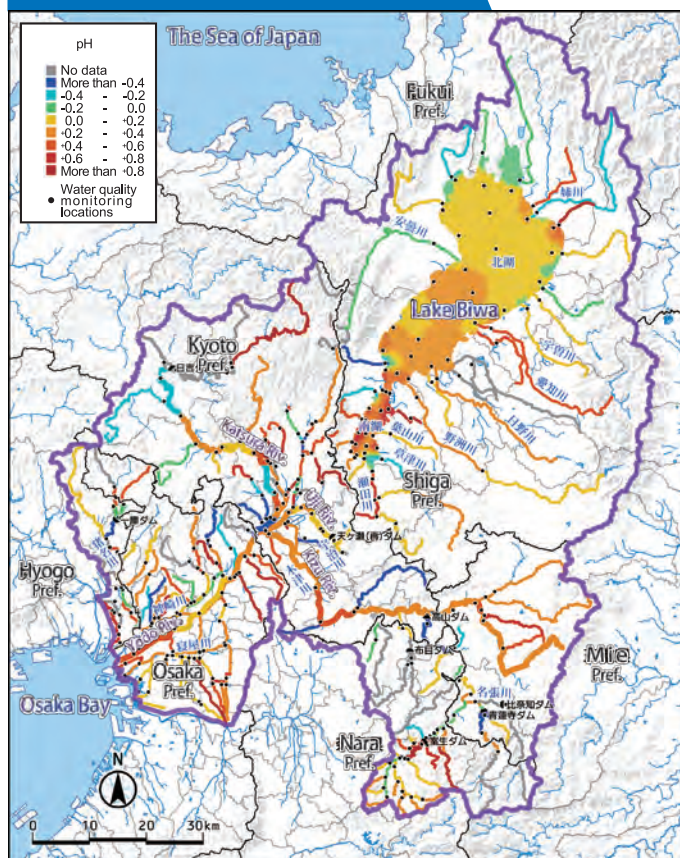
20 years ago, seasonal pH values in summer over 8 were obtained at 93 locations. Among these, the highest value was 10.0 at the log boom area on the Takayama Dam.

At present, seasonal pH values in summer increased in almost all river basin areas. The number of locations with pH values greater than 8 significantly increased to 123. The highest value was obtained at 3 locations, including the Kanaoka drainage canal in the lower Yodo River basin, at the border between Itami and Amagasaki Cities, and the Toba Ohashi Bridge in the Katsura River basin, at 9.8.

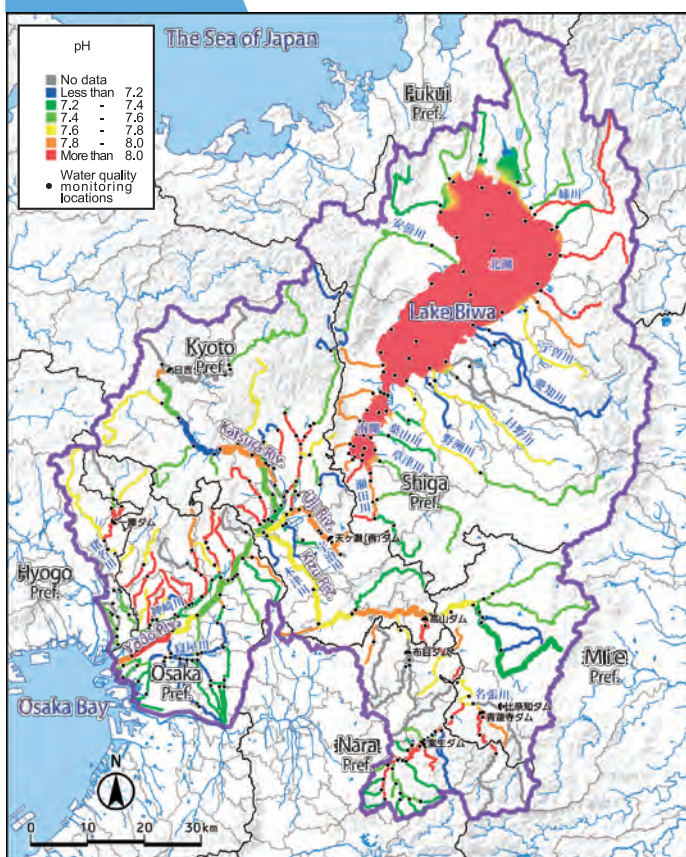
Over the past 20 years, seasonal pH values in summer increased by 0.6 and over at 44 locations. Within these, the largest increase was observed at the Kanaoka drainage canal in the lower Yodo River basin, at the border between Itami and Amagasaki cities and the mouth of the Itoda River, the lower Yodo River basin, where it confluent to the Kanzaki River, at 1.8.

[Data Source] Values published by Environmental Geographic Information Systems (GIS), National Institute for Environmental Studies, Ministry of Land, Infrastructure, Transport and Tourism, Prefectures Concerned, and the Japan Water Agency

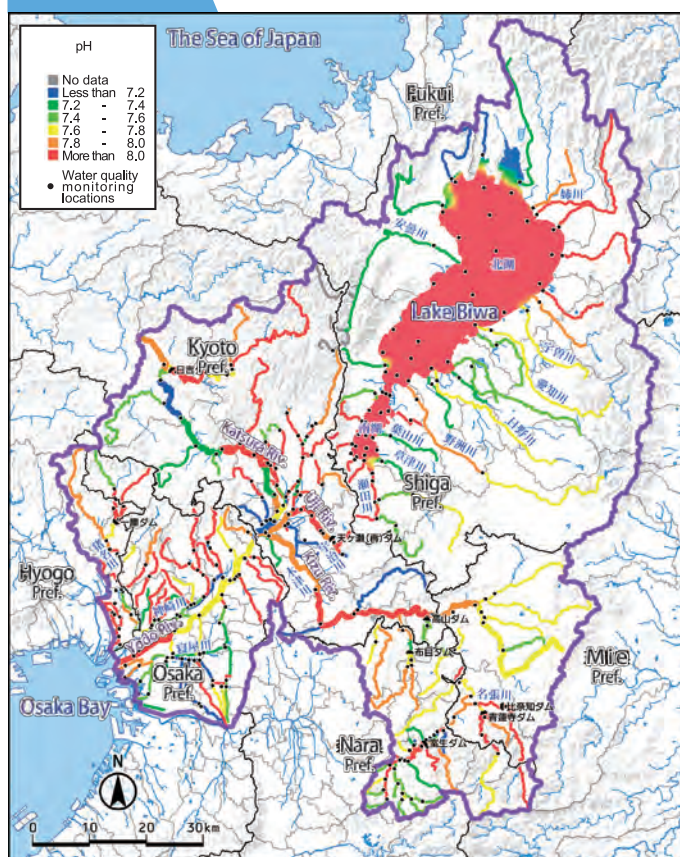
Change over the past 20 years



20 years ago



Present



V. Change in Water Quality (DO, SS)

Annual mean DO

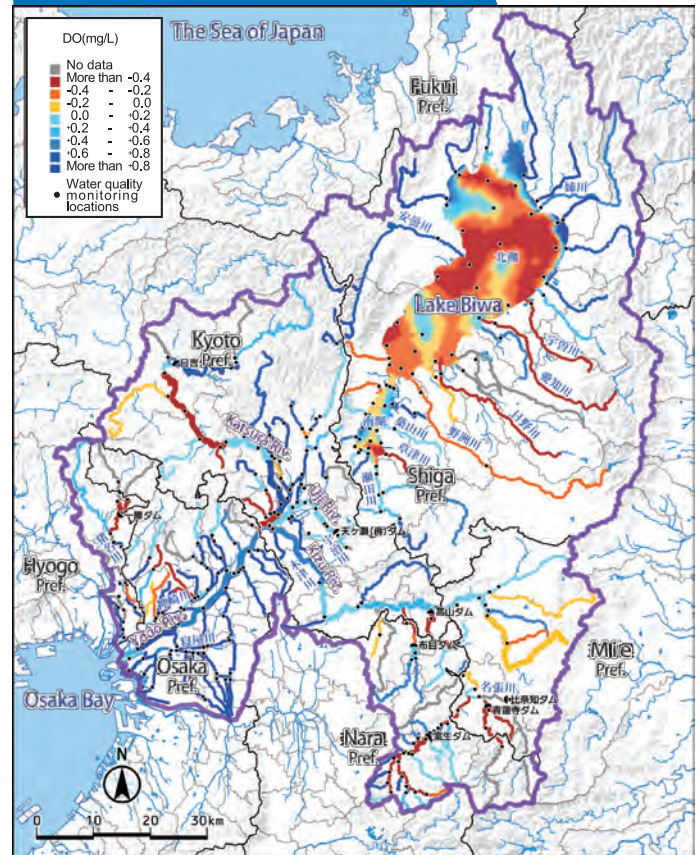
20 years ago, DO concentration were greater than 6 mg/L at 260 locations. Among these, the highest value was 12.7 mg/L at the mouth of the Tenjiku River at the Yodo River basin, where it combines with the Kanzaki River.

At present, the number of locations with DO concentration greater than 6 mg/L significantly increased to 321. Among these, the highest value was 14.3 mg/L at the Tendo Bridge on the Nyoze River in the Yodo River basin.

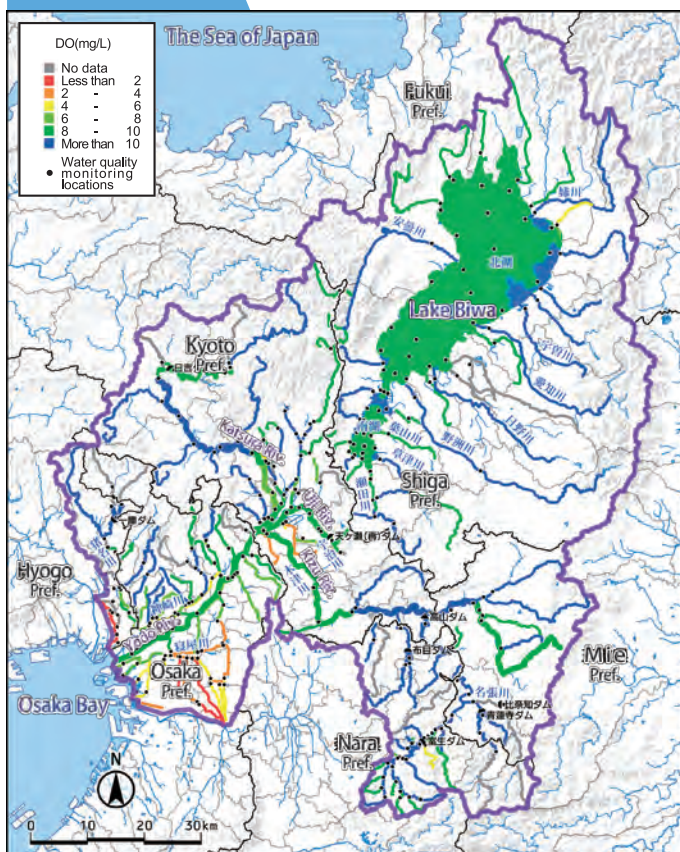
Over the past 20 years, DO concentration increased by 0.8 mg/L and over at 106 locations. Among these, a significant increase was observed at the mouth of the Fujimoto River, where it meets the Yodo River, at 10.5 mg/L.

[Data Source] Values published by Environmental Geographic Information Systems (GIS), National Institute for Environmental Studies, Ministry of Land, Infrastructure, Transport and Tourism, Prefectures Concerned, and the Japan Water Agency

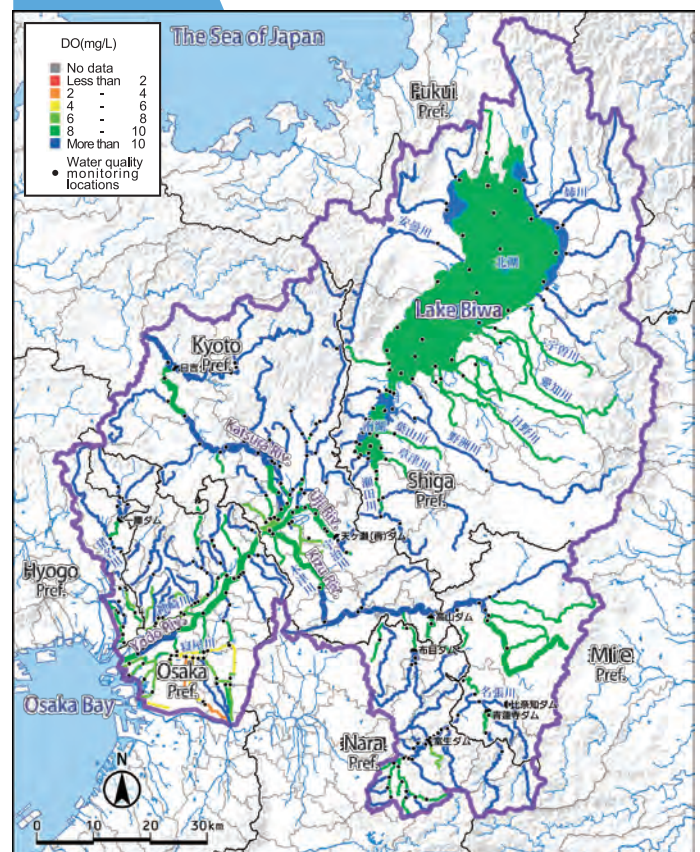
Change over the past 20 years



20 years ago



Present



Annual mean SS

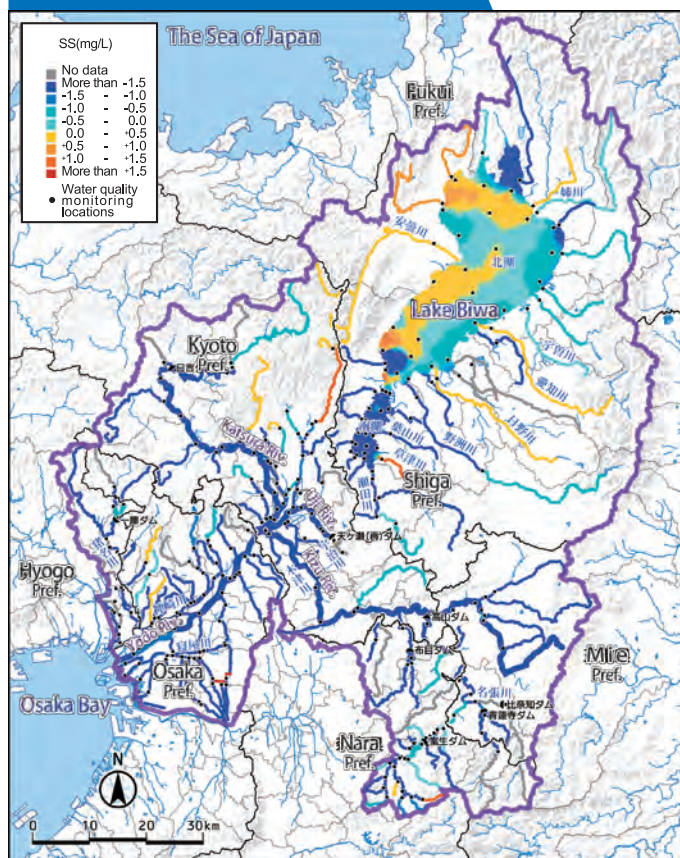
20 years ago, SS concentration less than 10 mg/L were obtained at 206 locations. Among these, the minimum values of 1.0 mg/L were obtained in 19 locations such as Lake Biwa and its inflowing rivers.

At present, the number of locations with SS concentration of less than 10 mg/L significantly increased to 314. Among these, the lowest value was obtained in 30 locations such as Lake Biwa and the Katsura River basin, at 1.0 mg/L.

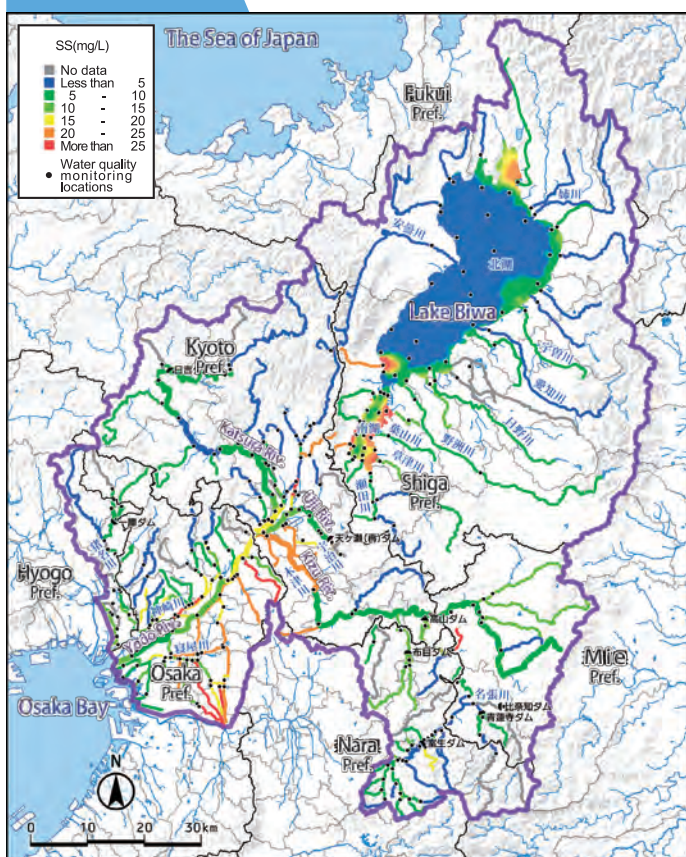
As described above, SS concentration decreased in almost all river basin areas over the past 20 years. SS concentration significantly decreased by 1.0 mg/L and over at 235 locations.

[Data Source] Values published by Environmental Geographic Information Systems (GIS), National Institute for Environmental Studies, Ministry of Land, Infrastructure, Transport and Tourism, Prefectures Concerned, and the Japan Water Agency

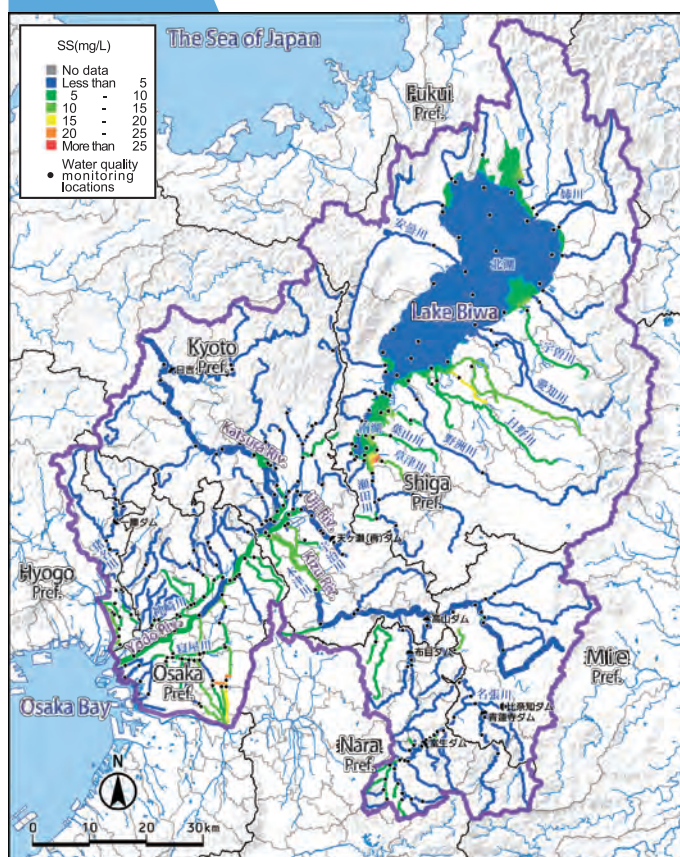
Change over the past 20 years



20 years ago



Present



V. Change in Water Quality (BOD, COD)

Annual mean BOD

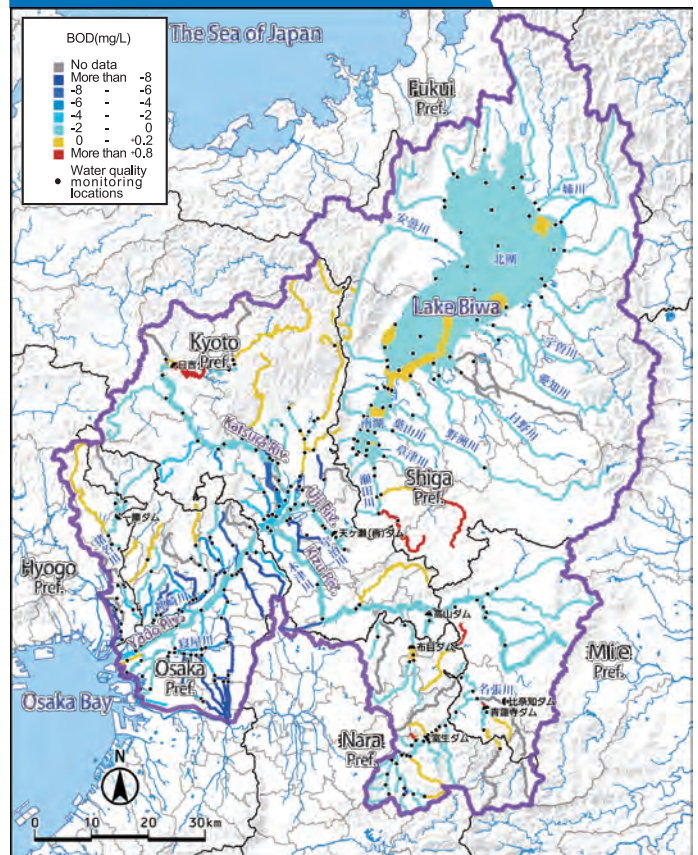
20 years ago, BOD concentration less than 3 mg/L was obtained at 204 locations. Among these, a minimum value of 0.5 mg/L was obtained in 5 locations such as the water intake point in Minoh City on the Ina River basin and the Ochiai Bridge of the Kiyotaki River, a tributary of the Katsura River.

At present, 20 years later, the number of locations with BOD concentration less than 3 mg/L significantly increased to 296. Among these, the lowest value of 0.5 mg/L was obtained at 11 locations within Lake Biwa.

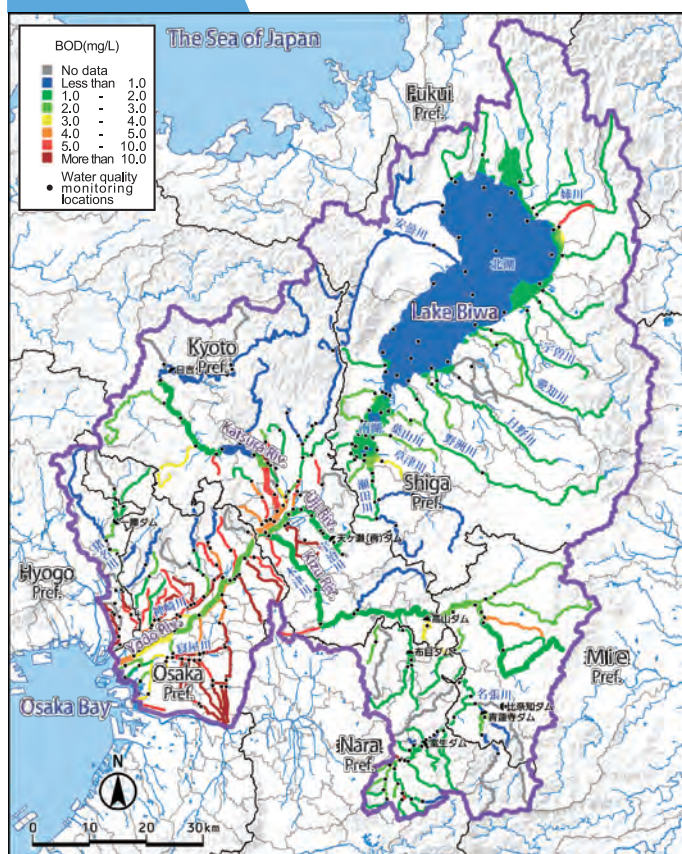
BOD concentration decreased at almost all river basin areas over the past 20 years, and significantly decreased by 2.0 mg/L and over at 89 locations.

[Data Source] Values published by Environmental Geographic Information Systems (GIS), National Institute for Environmental Studies, Ministry of Land, Infrastructure, Transport and Tourism, Prefectures Concerned, and the Japan Water Agency

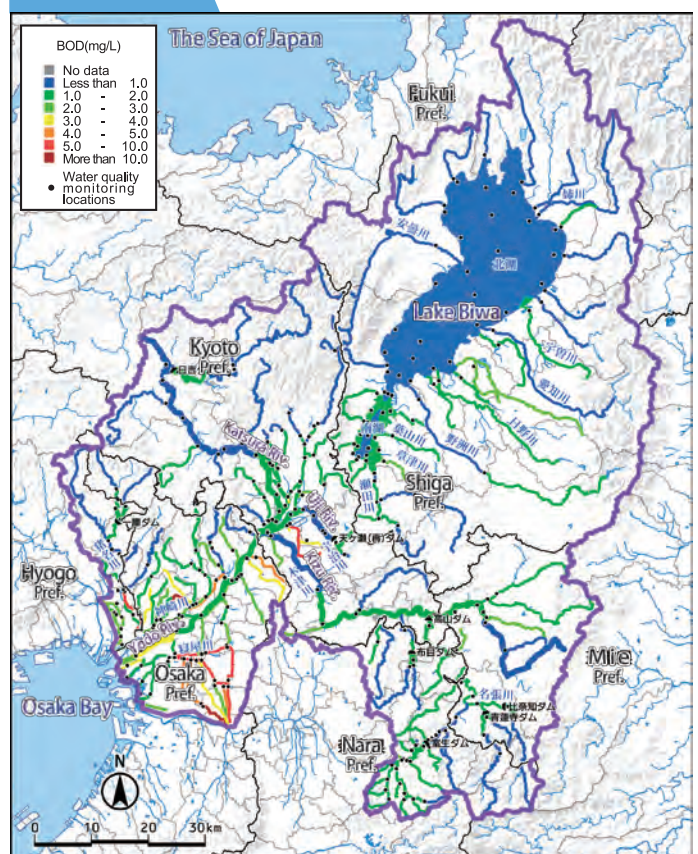
Change over the past 20 years



20 years ago



Present



Annual mean COD

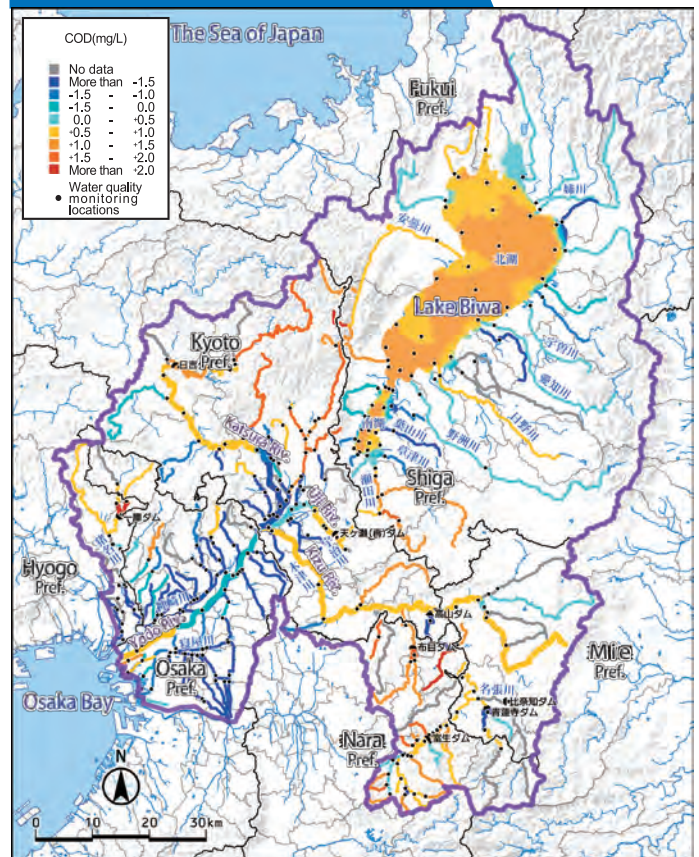
20 years ago, COD concentration was less than 5 mg/L at 199 locations. Among these, the minimum value of 0.6 mg/L was measured at 5 locations such as the Yachiyo Bridge upstream of the Katsura River and the Ochiai Bridge of the Kiyotaki River, a tributary of the Katsura River.

At present, 20 years later, the number of locations with COD concentration less than 5 mg/L significantly increased to 259. Among these, the lowest value of 1.1 mg/L was measured at 2 locations, the Joan Bridge on the Ado River flowing into Lake Biwa, and the Hamabun Bridge on the Ishida River.

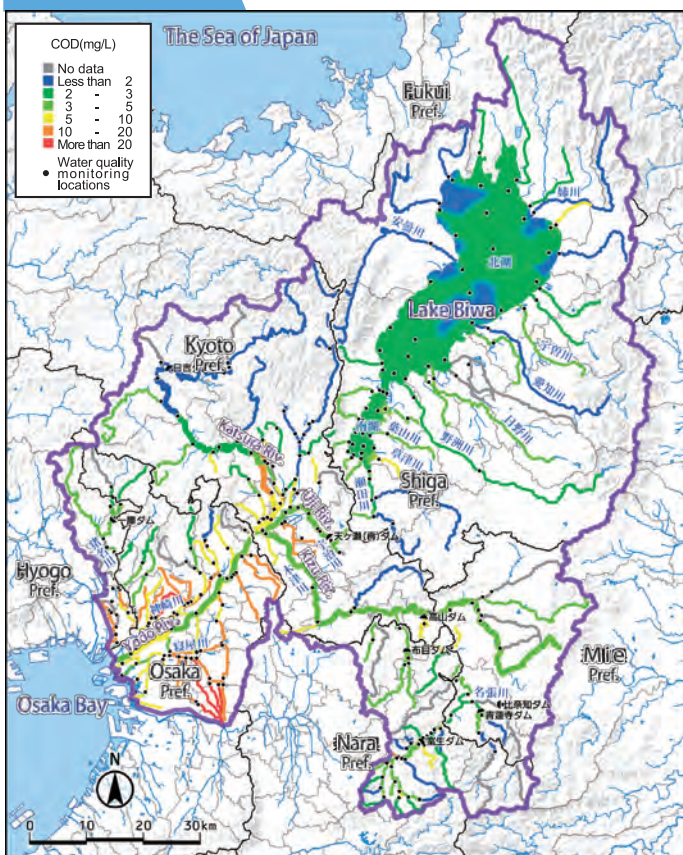
COD concentration decreased at almost all river basin areas over the past 20 years, except for within Lake Biwa. COD concentration significantly decreased by 1.0 mg/L and over at 111 locations.

[Data Source] Values published by Environmental Geographic Information Systems (GIS), National Institute for Environmental Studies, Ministry of Land, Infrastructure, Transport and Tourism, Prefectures Concerned, and the Japan Water Agency

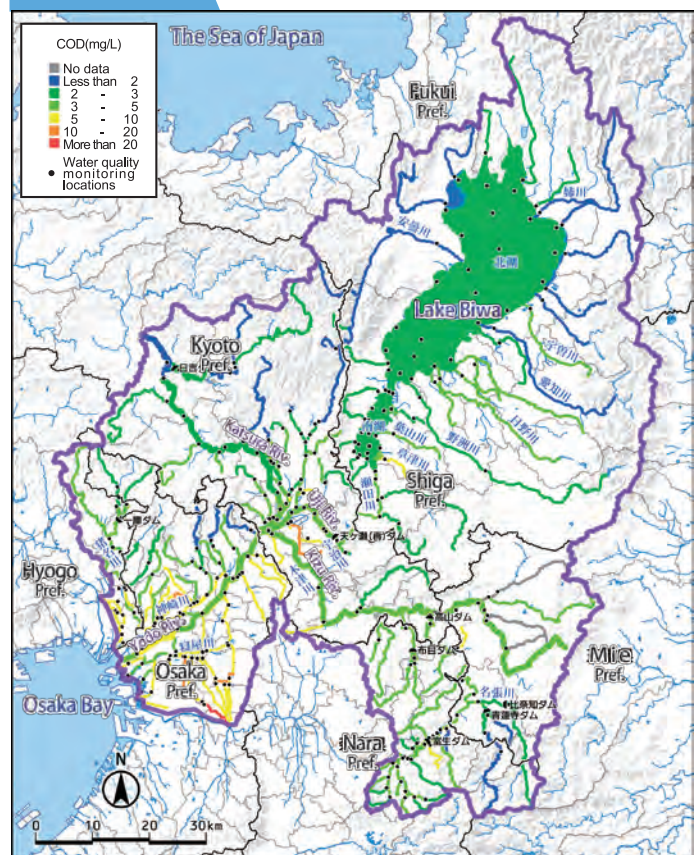
Change over the past 20 years



20 years ago



Present



V. Change in Water Quality (T-N, T-P)

Annual mean T-N

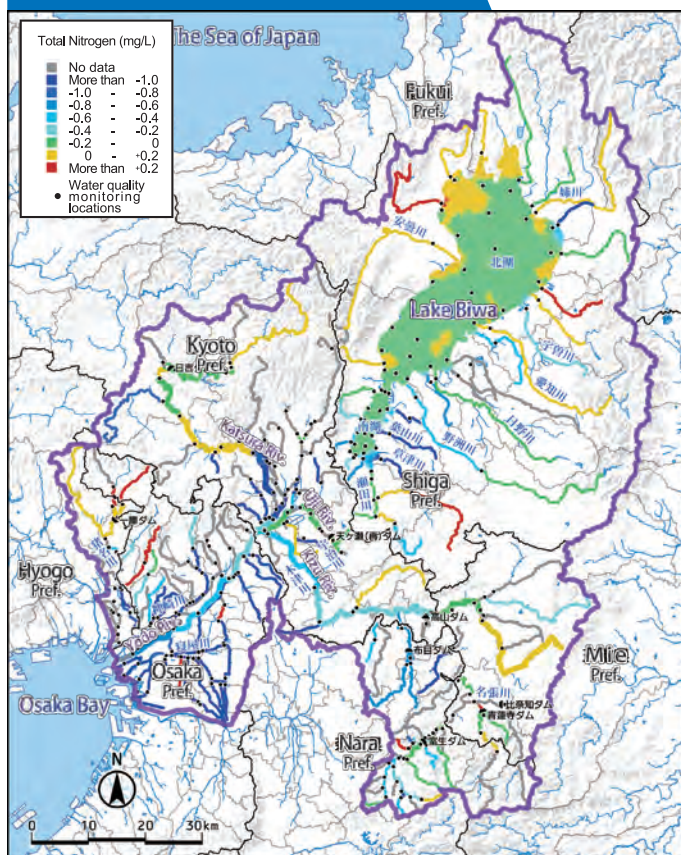
20 years ago, T-N concentration was less than 2 mg/L at 158 locations. Among these, the lowest value of 0.03 mg/L was measured at the dam site and the Shishitobi Bridge of the Amagase Dam.

At present, 20 years later, the number of locations with T-N concentration less than 2 mg/L significantly increased to 261. Among these, the lowest value of 0.02 mg/L was measured at 2 locations, the same as 20 years ago.

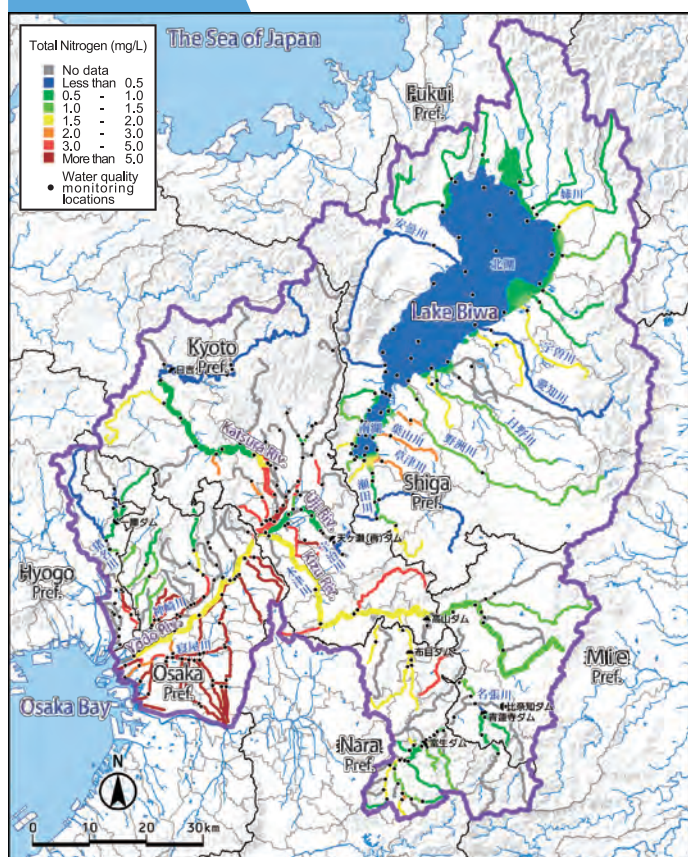
Over the past 20 years, T-N concentration decreased at almost all river basin areas, except for some areas such as Lake Biwa and the upper Ina River basin. T-N concentration decreased by 1.0 mg/L and over in 68 locations. Improvement is clearly seen especially in rivers within Osaka City.

[Data Source] Values published by Environmental Geographic Information Systems (GIS), National Institute for Environmental Studies, Ministry of Land, Infrastructure, Transport and Tourism, Prefectures Concerned, and the Japan Water Agency

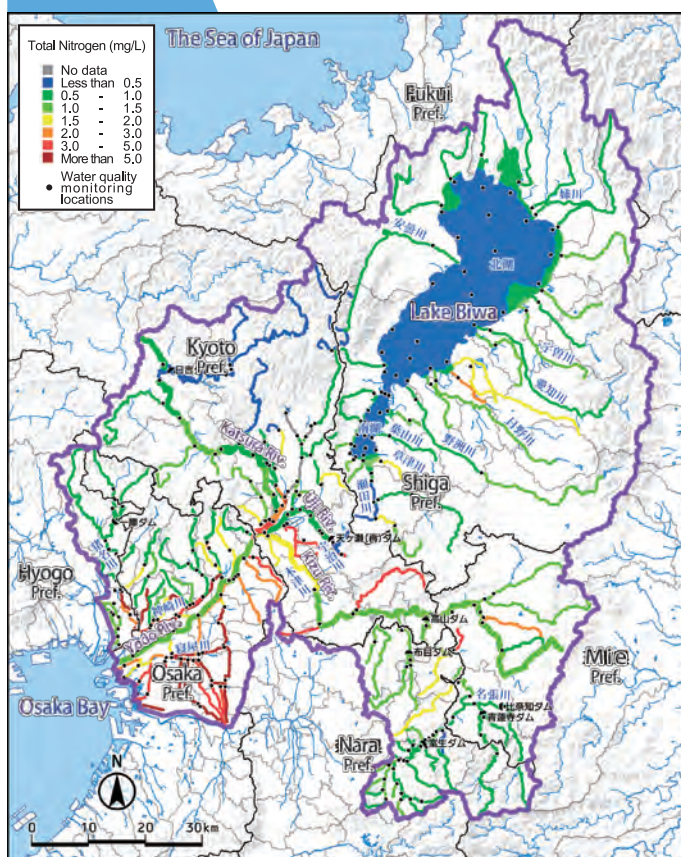
Change over the past 20 years



20 years ago



Present



Annual mean T-P

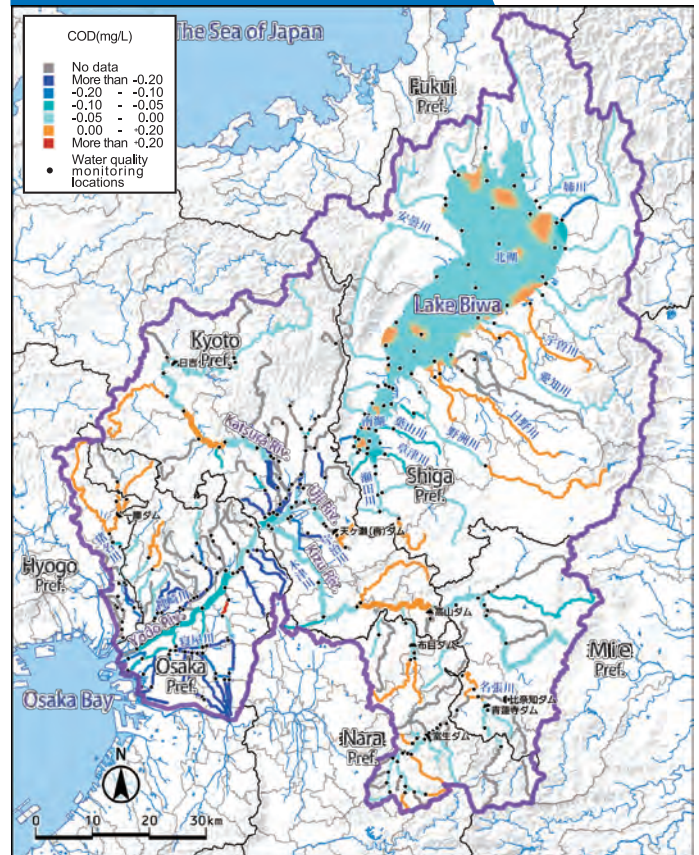
20 years ago, T-P concentration was less than 0.2 mg/L at 164 locations. Among these, the lowest value of 0.005 mg/L was measured downstream of the Fukutani River at the Kizu River basin.

At present, 20 years later, the number of locations with T-P concentration less than 0.2 mg/L significantly increased to 275. Among these, the lowest value of 0.006 mg/L was measured at 7 locations within Lake Biwa.

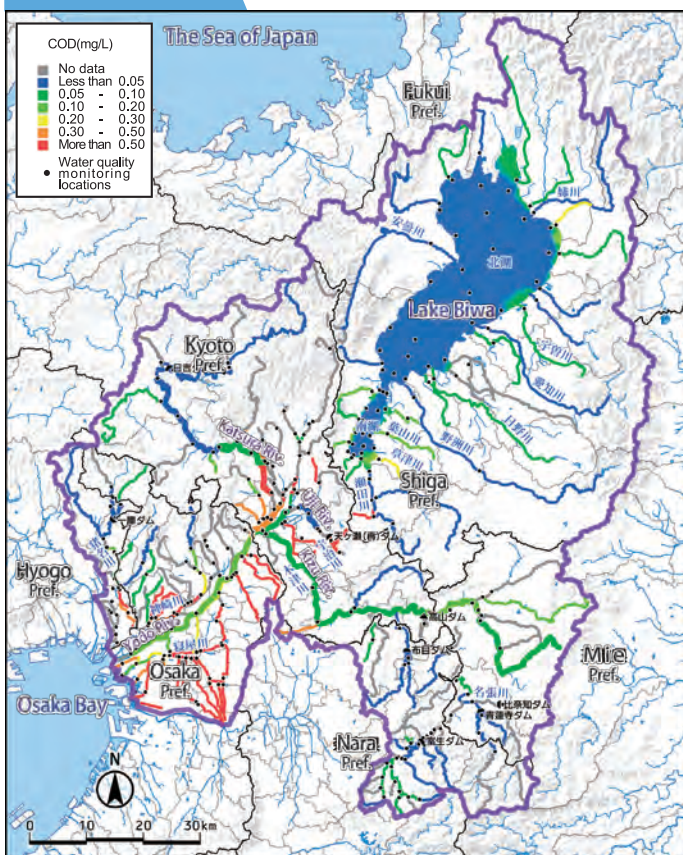
Over the past 20 years, T-P concentration decreased in the Yodo River, rivers in Osaka City and other areas including lower basins, except for Lake Biwa, Ina River, and some rivers upstream of the Kizu River. T-P concentration significantly decreased by 0.05 mg/L and over at 84 locations.

[Data Source] Values published by Environmental Geographic Information Systems (GIS), National Institute for Environmental Studies, Ministry of Land, Infrastructure, Transport and Tourism, Prefectures Concerned, and the Japan Water Agency

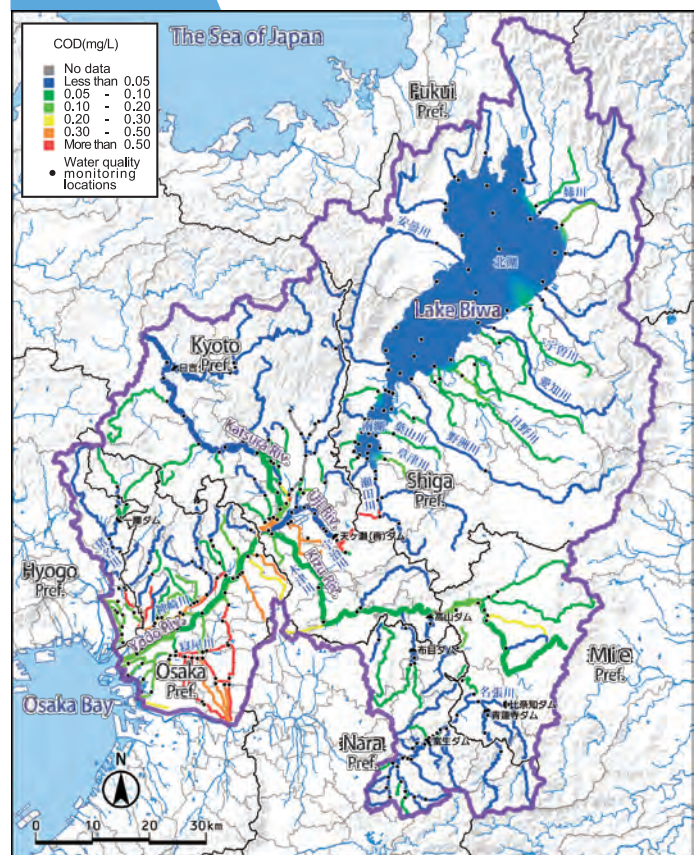
Change over the past 20 years



20 years ago



Present



VI. Change in Water Quality and Wastewater Treatment

20 years ago (1990)

In 1990, a coverage rate by sewerage systems increased in the midstream basin areas such as Otsu City and Kyoto City, the Ina River basin and the lower Yodo River basin.

10 years ago (2000)

In 2000, along with the construction of wastewater treatment facilities on the east shore of Lake Biwa, the coverage rate by sewerage systems increased in the upstream and downstream basins at the confluence of the Yodo River, where three rivers join.

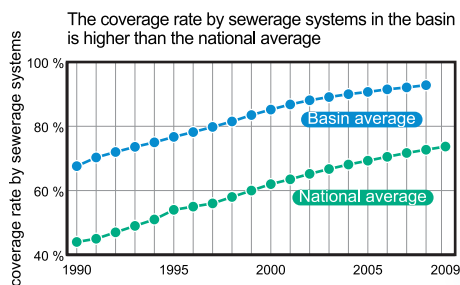
Present (2010)

In 2010, the coverage rate by sewerage systems significantly increased throughout sections of the Lake Biwa basin. Also, the rate increased by more than 80% in Otsu City and the east shore of South Lake Biwa.

Change in data over the past 20 years

Over the past 20 years, the coverage rate by sewerage systems in the entire basin increased by approx. 20%. In 2009, the rate reached over 90%.

In particular, the coverage rate by sewerage systems increased by more than 40% on the east shore of Lake Biwa and the downstream basin at the confluence of the Yodo River, where three rivers join.



Source: Material 5-33 in BYQ Water Environment Report, "coverage rate by sewerage systems in Prefectures in the Basin"

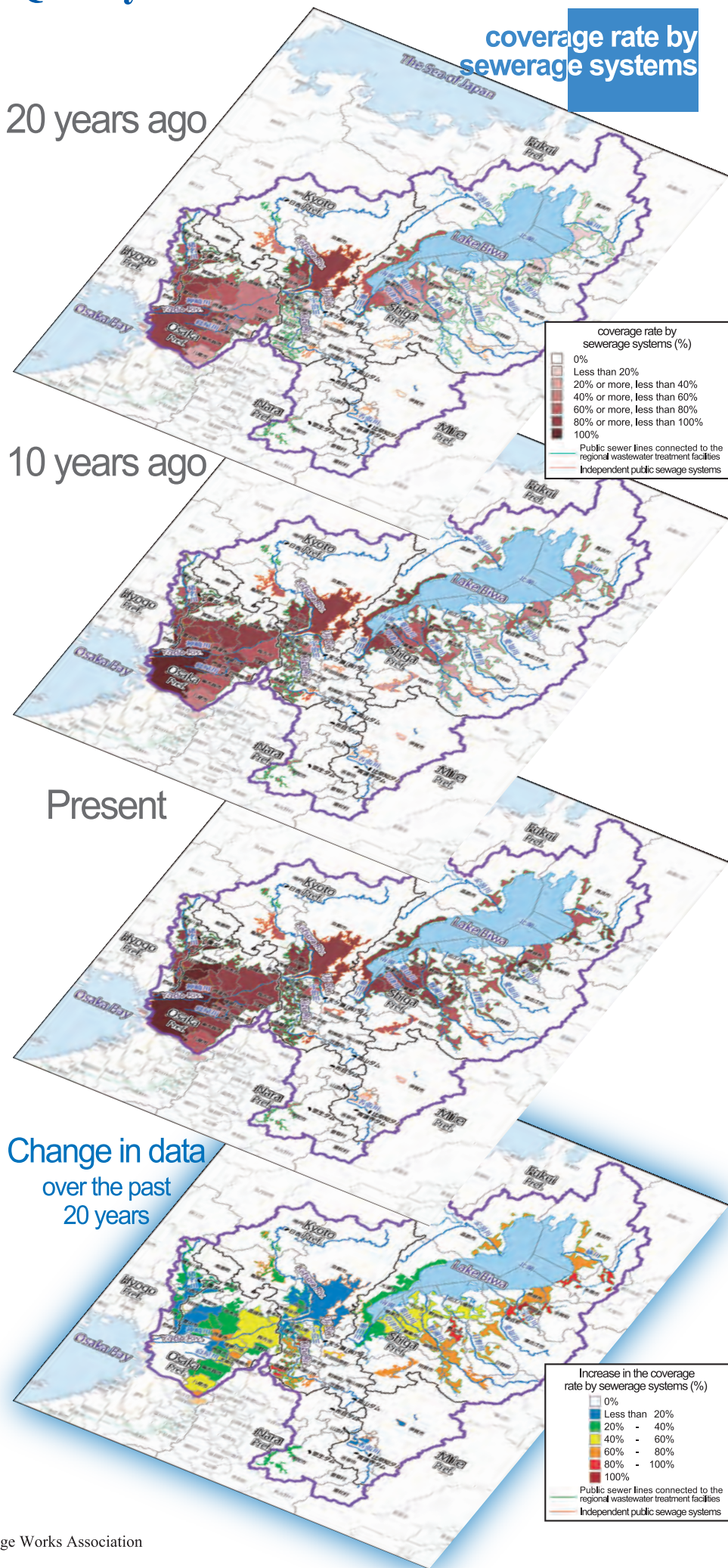
20 years ago

10 years ago

Present

Change in data over the past 20 years

coverage rate by sewerage systems

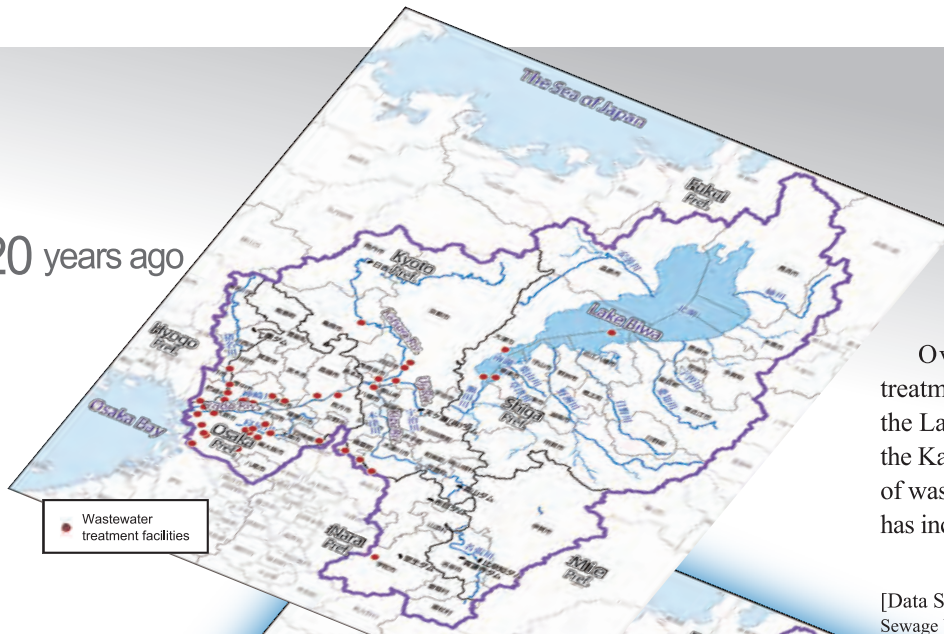


Wastewater Treatment Facilities

Over the past 20 years, wastewater treatment facilities have been constructed in the Lake Biwa basin and upstream basins of the Katsura and the Kizu Rivers. The number of wastewater treatment facilities in the basin has increased from 43 to 70.

[Data Source]
Sewage Works Statistics by Japan Sewage Works Association

20 years ago



Change in data
over the past
20 years



Rainwater storage facilities

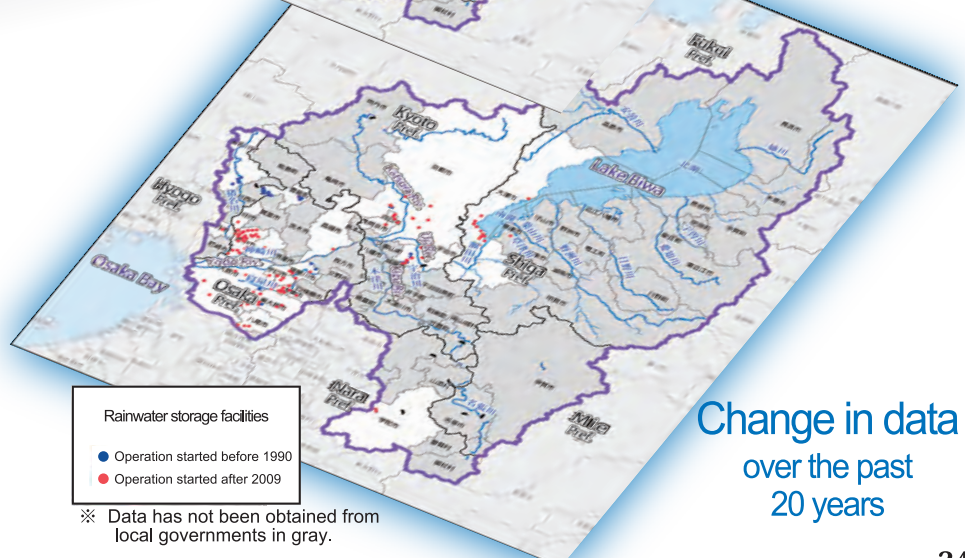
Although data has not been obtained from all local governments at this time, a strong tendency over the past 20 years toward the increase of rainwater storage facilities in locations with large low flat lands such as the Neyu River basin, the Yodo River basin at the confluence of three rivers, and the west shore of South Lake Biwa, has been observed. The number of the facilities in the entire basin area increased from 30 to 142.

[Data Source]
Sewage Works Statistics by Japan Sewage Works Association
Results of interviews with Osaka City, Osaka Prefecture, Kyoto Prefecture, Shiga Prefecture and Toyonaka City

20 years ago



Change in data
over the past
20 years



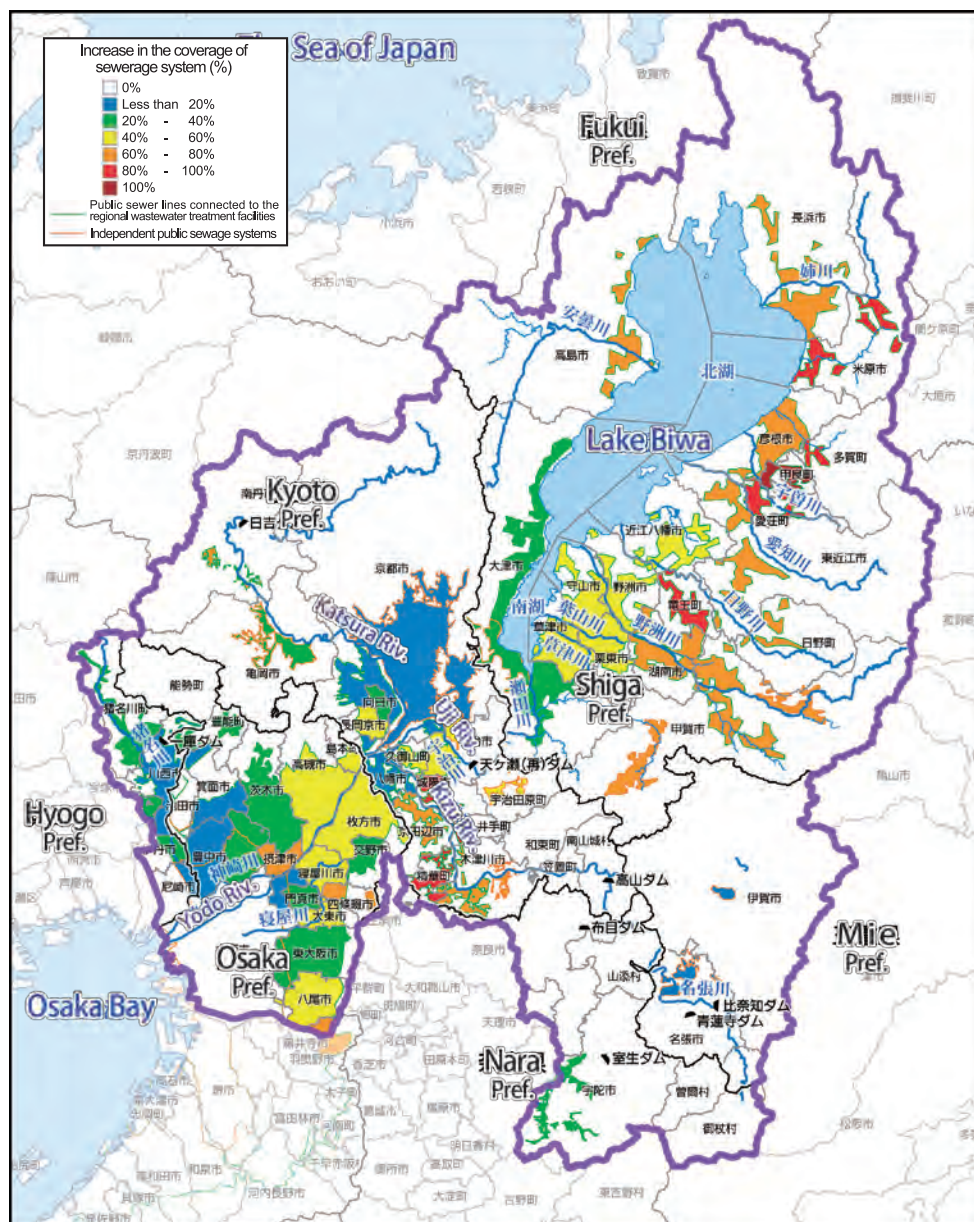
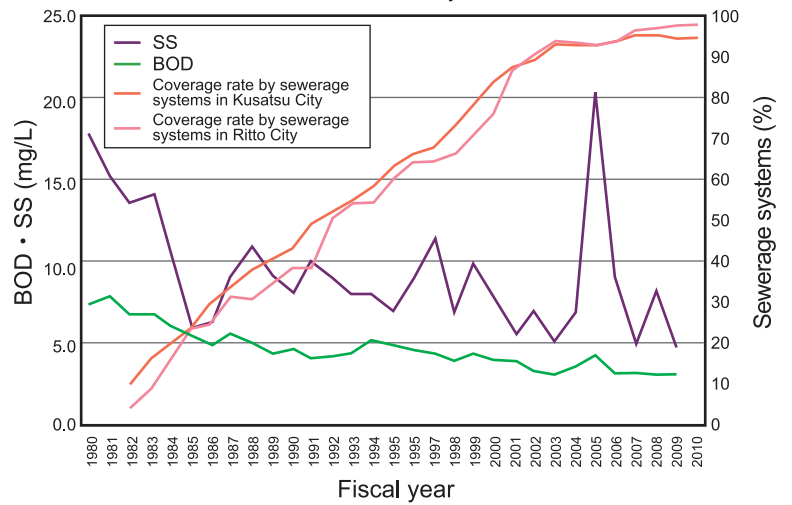
VI. Change in Water Quality and Wastewater Treatment

Regarding changes in the coverage of sewerage system and BOD concentration, BOD concentration improved at 69 locations out of a total of 74 from the confluence of three rivers up to the downstream in the Yodo River basin (within Osaka Prefecture), where the coverage of sewerage system increased by more than 20 % over the past 20 years.

Among these, an improvement rate* more than 50 % was observed at 46 locations. Also, BOD concentration improved at 5 locations among all monitoring locations in the eastern shore basin of South Lake Biwa (Moriyama River, Juzenji River, Yasu River and Hayama River), where the coverage of sewerage system increased. Among these, improvement rate increased by more than 50 % at 3 locations.

$$* \text{Improvement rate} = \frac{\text{Decrease in concentration over the past 20 years}}{\text{Average concentration from 1988 to 1990}}$$

Hayama River:
Junction to Prefectural Road Otsu Moriyma Omi Hachiman Line

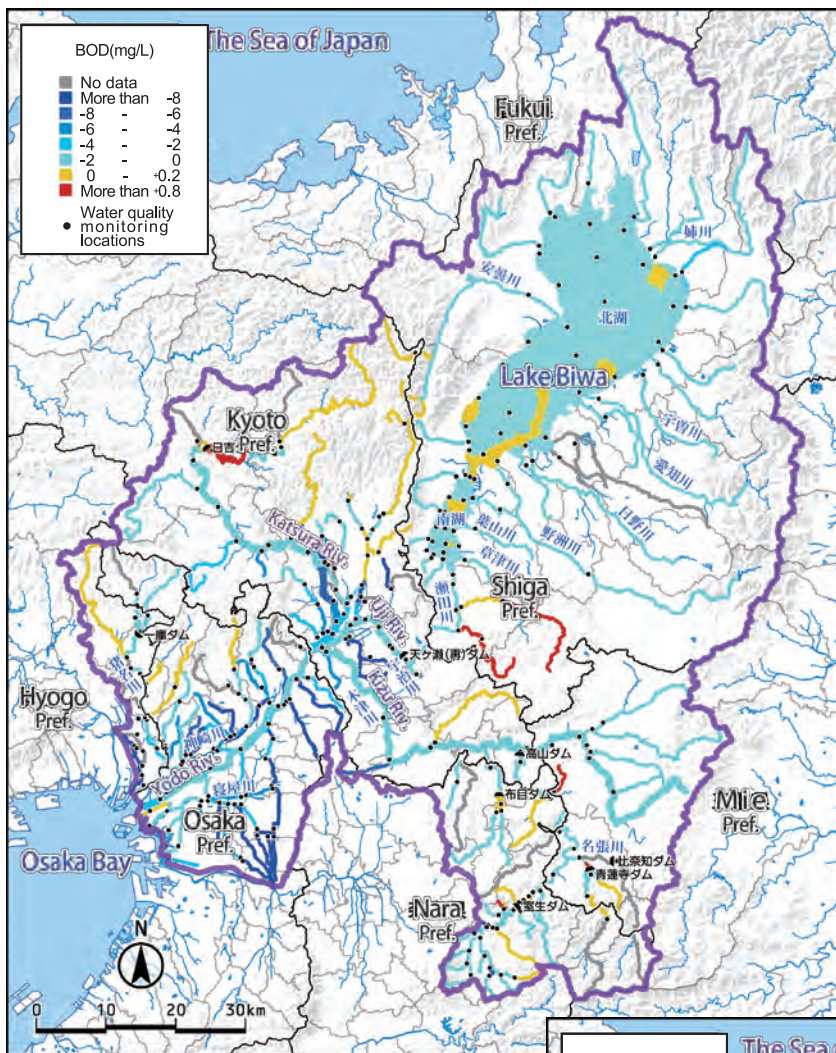


Coverage of
sewerage system

Increase in the coverage of
sewerage system from
1990 to 2010

Coverage of sewerage system

[Data Source]
Sewage Works Statistics by Japan
Sewage Works Association



BOD

Change over the past 20 years

BOD decreased in areas with a high.

[Data Source]

Values published by Environmental Geographic Information Systems (GIS), National Institute for Environmental Studies, Ministry of Land, Infrastructure, Transport and Tourism, Prefectures Concerned, and the Japan Water Agency

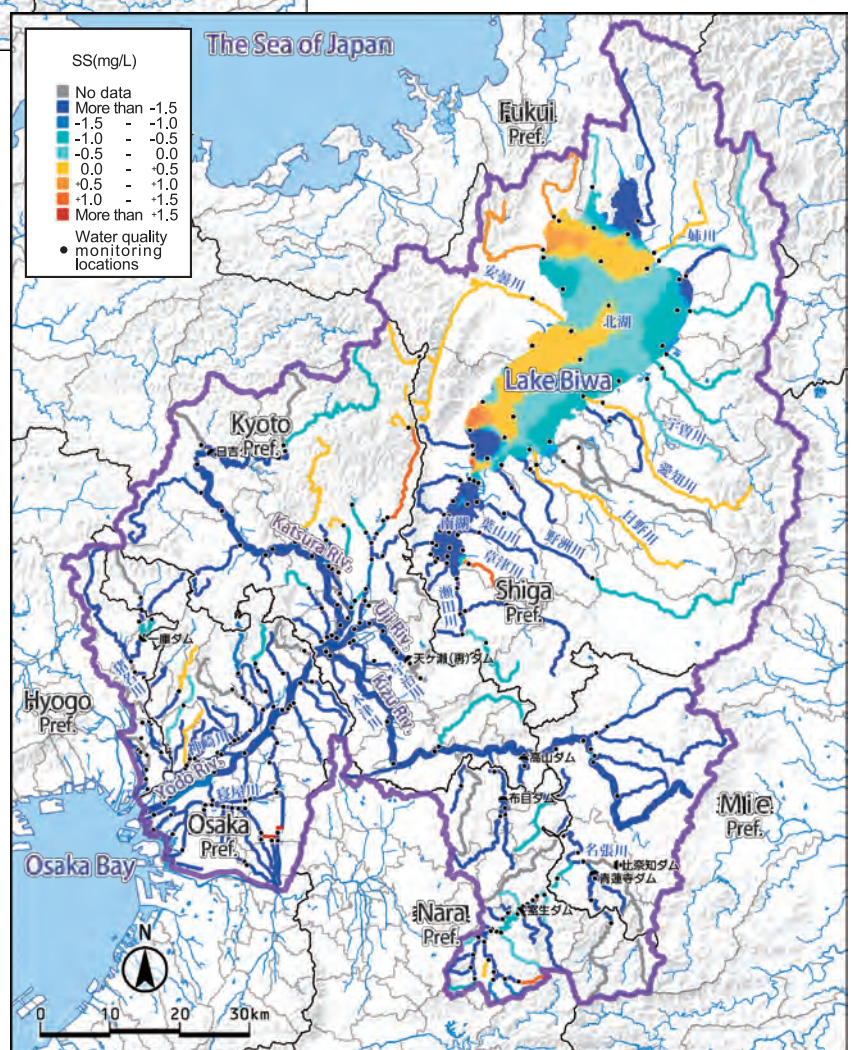
SS

Change over the past 20 years

SS decreased in the entire basin area.

[Data Source]

Values published by Environmental Geographic Information Systems (GIS), National Institute for Environmental Studies, Ministry of Land, Infrastructure, Transport and Tourism, Prefectures Concerned, and the Japan Water Agency



Change in the River Environment of Lake Biwa-Yodo River Basin

<Implementation of a new analysis tool to view the whole basin as a panorama>

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