

Water Utilization of Tone River

TONE RIVER

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Tone River is called
"Bando Taro".

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"Bando" was the popular
name of Kanto Region in the
past, and "Taro" means
eldest son.

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In other words, the Tone is the
largest river in the Kanto
Region, and is the
representative river in Japan.

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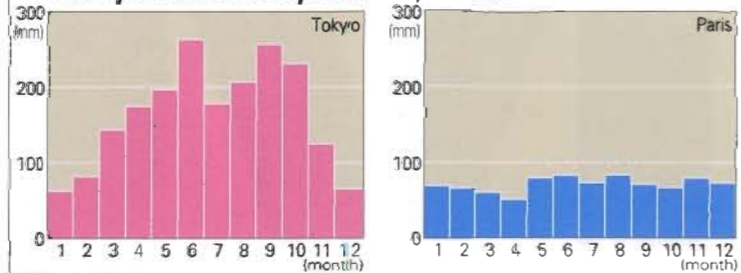
Photographs "Four Seasons in Tone River"

Rivers in Japan

Climate and Nature Features in Japan

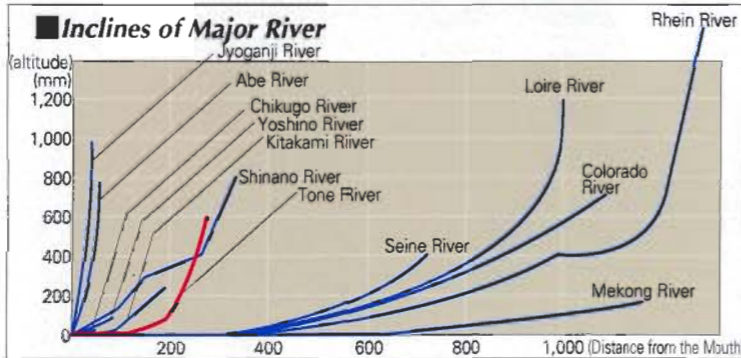
Japan is located at the Asian Monsoon area, and its yearly average precipitation reaches approximately 1,750mm, equivalent to almost double the world's average volume. But, Japan has huge population within its narrow territory, and the yearly precipitation per person is approximately 5,500m³, or about one-fifth of world's average. So, it cannot be said that Japan's precipitation is much more than others. In particular, in the Tokyo metropolitan area, yearly precipitation

Comparison of Precipitation by Month

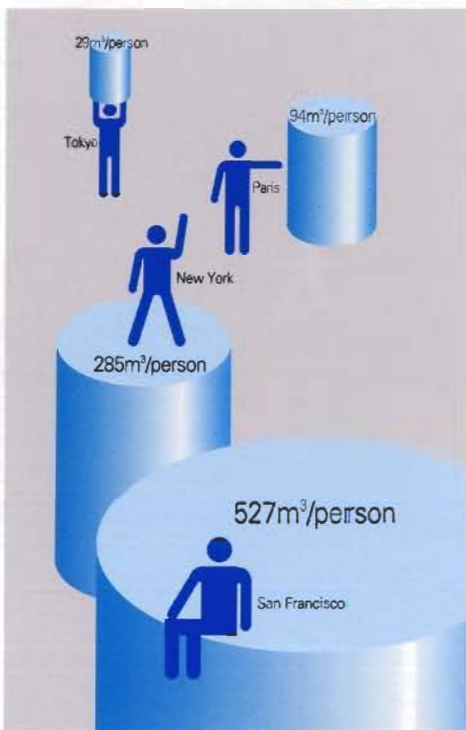


Features of Rivers in Japan

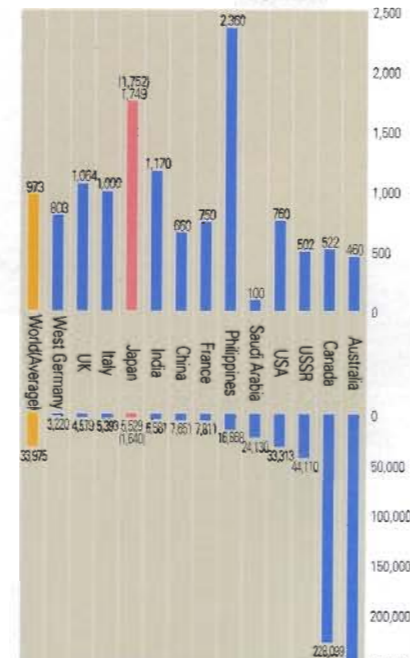
Rivers flow in Japan, when compared with rivers in other countries, have sharp inclines with short routes and narrow basin areas. So the river water flows out into the sea within a short period of time. Due to this feature, in accordance with variations of precipitation, the flowing volume of river water changes greatly, bringing about water disasters when there is flooding, or difficulty in water intake when there is water shortage. These disasters frequently cause serious damage to the society. To prevent water disaster and water shortage, completion of facilities such as dams, retarding basins and water channels to control the flowing volume of river water has been actively promoted.



Comparison of Dam Reservoir Water per Person



Comparison of Precipitation in Each Country (mm/Year)



Comparison of Yearly Precipitation per Person (mm/Year)

Tone River: Japan's Typical Water System



Tone River Has Japan's Largest Basin

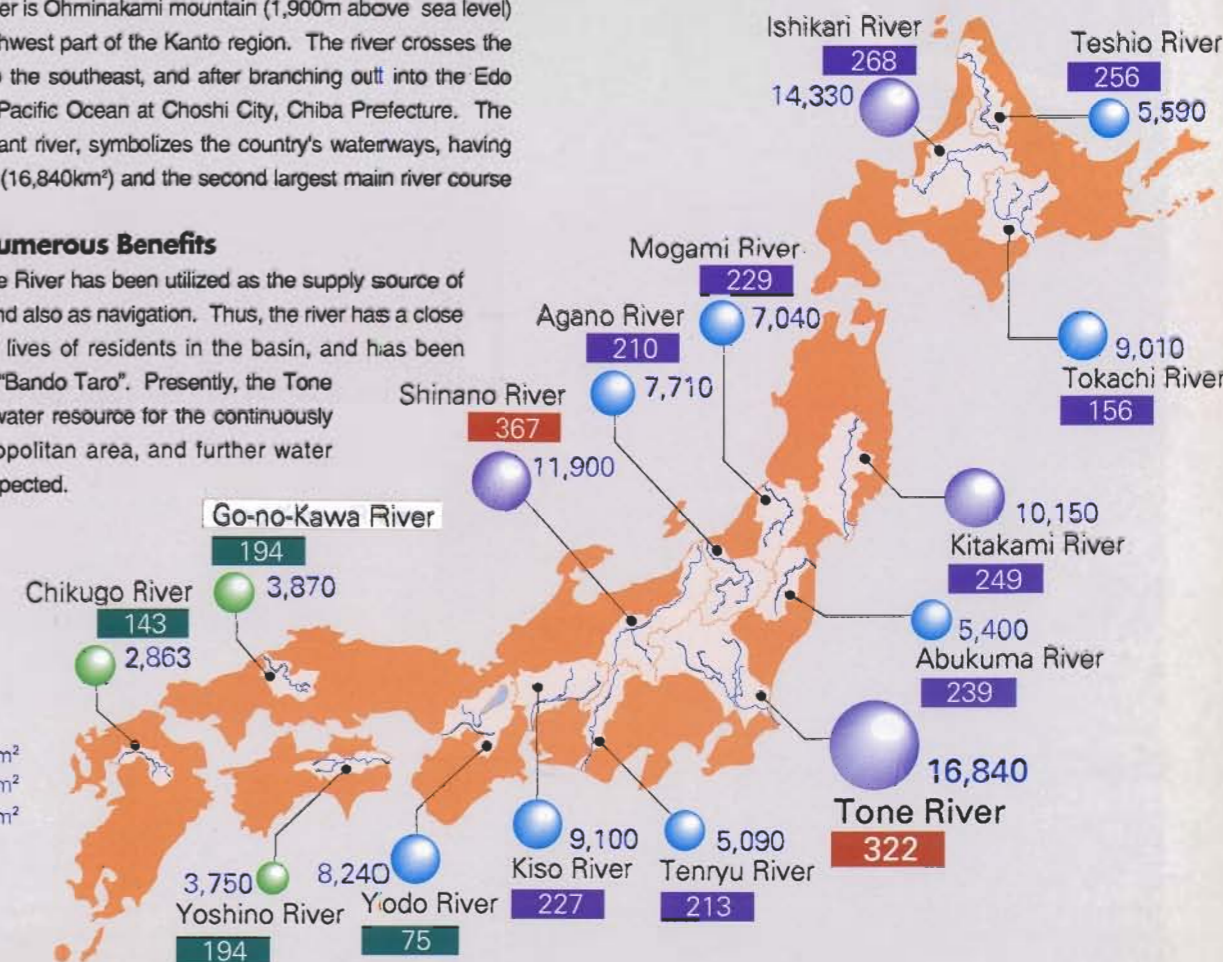
The source of the Tone River is Ohminakami mountain (1,900m above sea level) which is located at the northwest part of the Kanto region. The river crosses the Tokyo metropolitan area to the southeast, and after branching out into the Edo River, it flows out into the Pacific Ocean at Choshi City, Chiba Prefecture. The Tone, Japan's most important river, symbolizes the country's waterways, having the largest catchment area (16,840km²) and the second largest main river course (322km) in Japan.

Tone River Brings Numerous Benefits

Since olden times, the Tone River has been utilized as the supply source of water for irrigation, lining and also as navigation. Thus, the river has a close relationship with the daily lives of residents in the basin, and has been familiarized with the name "Bando Taro". Presently, the Tone River is still an important water resource for the continuously progressing Tokyo metropolitan area, and further water resource development is expected.

Major Rivers in Japan

- Basin (km²)
 - More than 10,000km²
 - More than 5,000km²
 - Less than 5,000km²
- Length (km)
 - More than 300km
 - More than 200km
 - Less than 200km



Outline of the Basin Area

Increased Population within the Basin

The Tone River basin area equals approximately 4.5% of Japan's total land space, with about 10.88 million people (in FY1985), or about 1/10th of Japan's total population. Many of the residents are concentrated on the downstream area of the Tone River.

Along with high economic growth in Japan since 1955, inflow of population from other areas into the Tone River basin has progressed, and within these 30 years, the population has increased by 1.7 times. As a result of increased population, there are observed various influences in limited resources such as water and land.

Various Integrated Functions

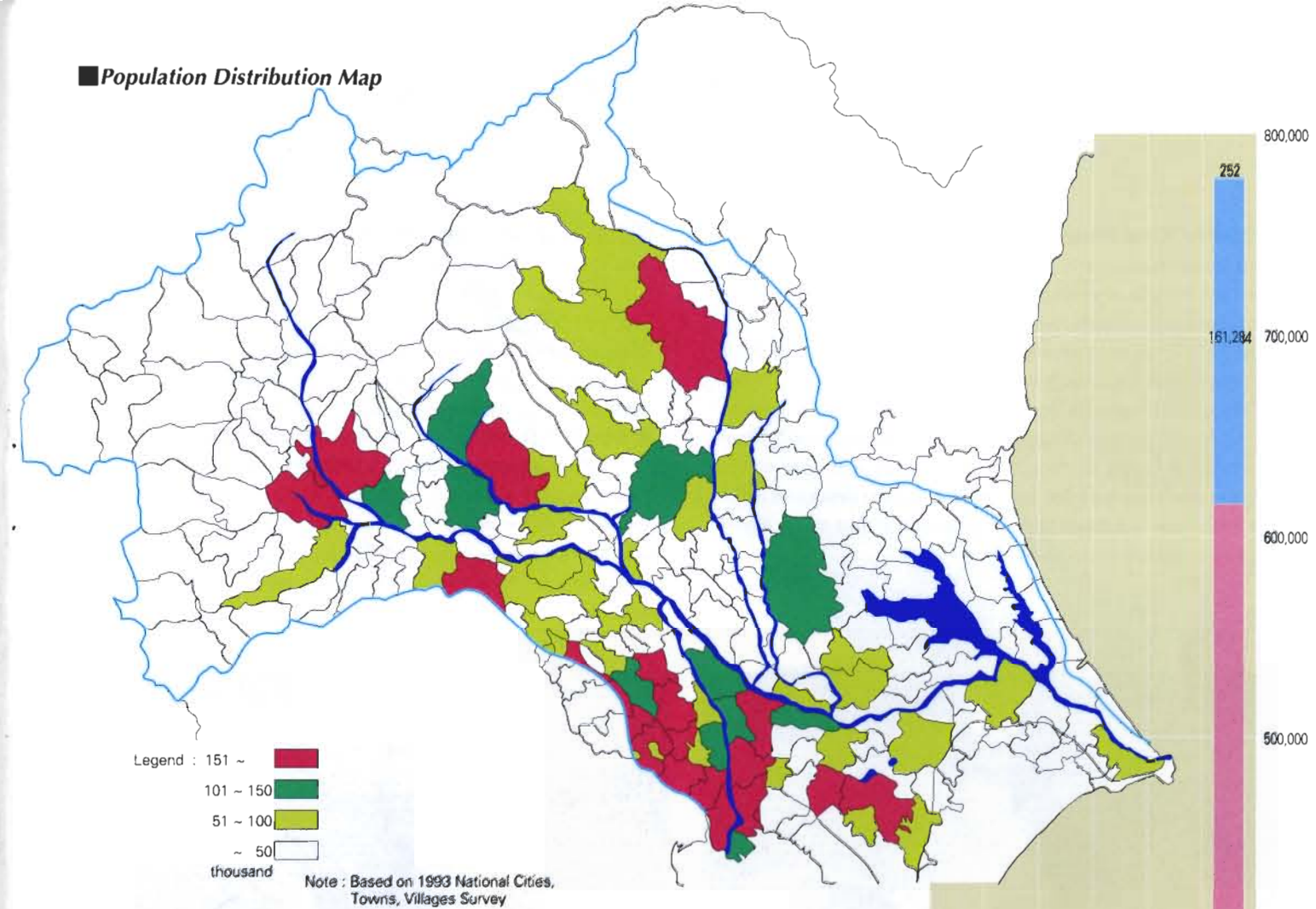
Industrial activities in the Tone River basin area also showed remarkable development in accordance with the high economic growth of Japan, and integration of various functions which support social economic activities has progressed.

Under such circumstances, the industrial structure has also greatly changed. Recently, the position of the primary industries has fallen and been replaced by remarkably growing secondary and tertiary industries.

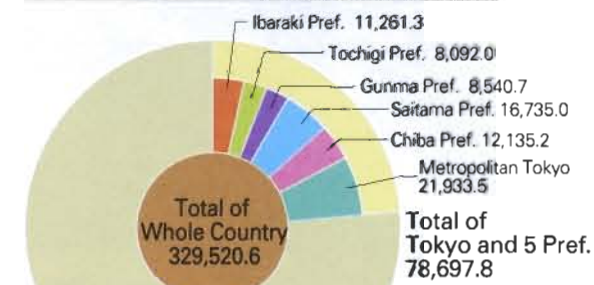
Growth of Population in the Tone River Basin



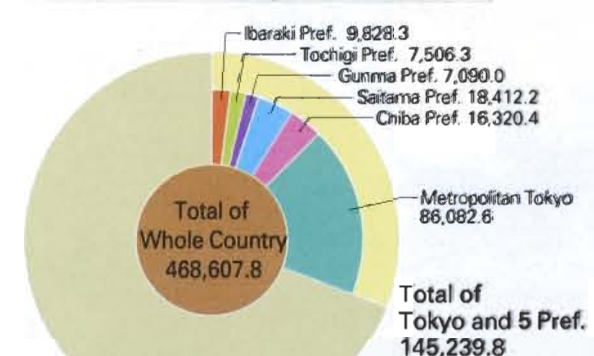
Population Distribution Map



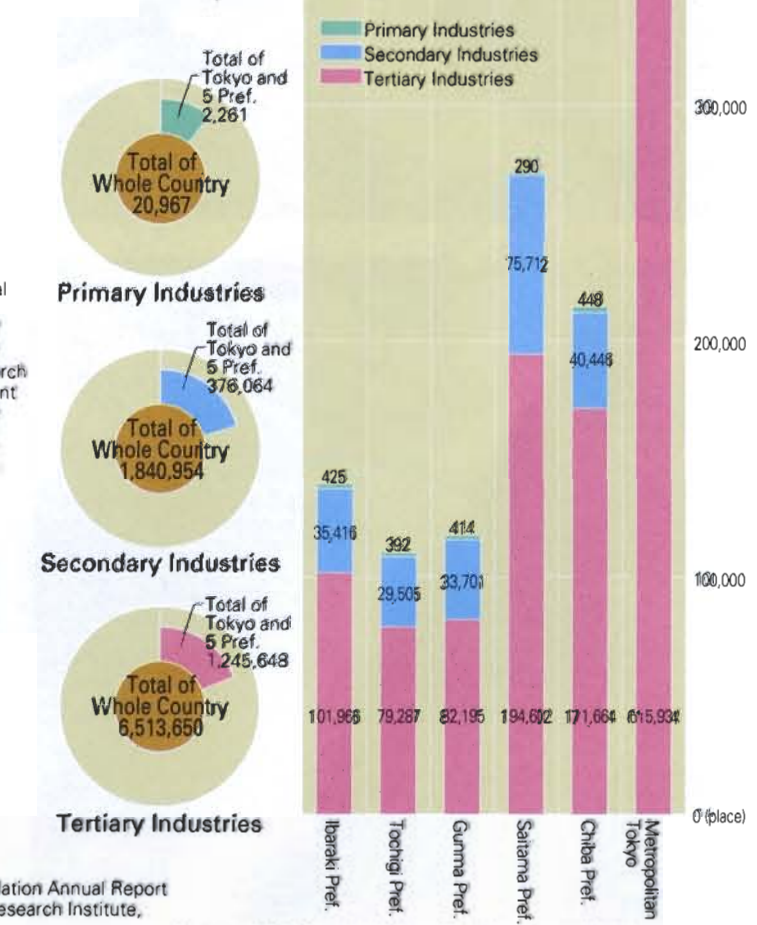
Industrial Shipping Amount by Each Pref. (Unit : Billion Yen)



Gross Production within Pref. (Unit : Billion Yen)



Number of Business Offices by Each Industry



Source : Pref. Residents Economic Calculation Annual Report FY 1994 edited by Economic Research Institute, Economic Planning Agency

Source : 1991 Business Office Statistical Research Report General Affairs Agency (Published in October 1992)

Water Utilization of Tone River

Water of Tone River is Effectively Utilized

Since the upstream area of the Tone River is snowfall area, river flow of the Tone River is comparatively stable, and water utilization in the broad plain area has been active since olden times.

Since 1955, for more effective utilization of water of the Tone River, a water resource development project was begun, and presently many large-scale water resource development facilities such as dams in upstream mountains, water-utilization retarding basins and water conveyance channels at the middlestream area, and river mouth barrage in downstream section are provided and the developed water of the Tone River is supplied to Tokyo metropolitan area as city water, agricultural water and industrial-use water.

Drinking Water for about 30 Million Residents

As drinking water, the intake from the Tone and Ara Rivers reaches to 12 million m³ per day, and the population of the area the water is supplied to is about 30 million.

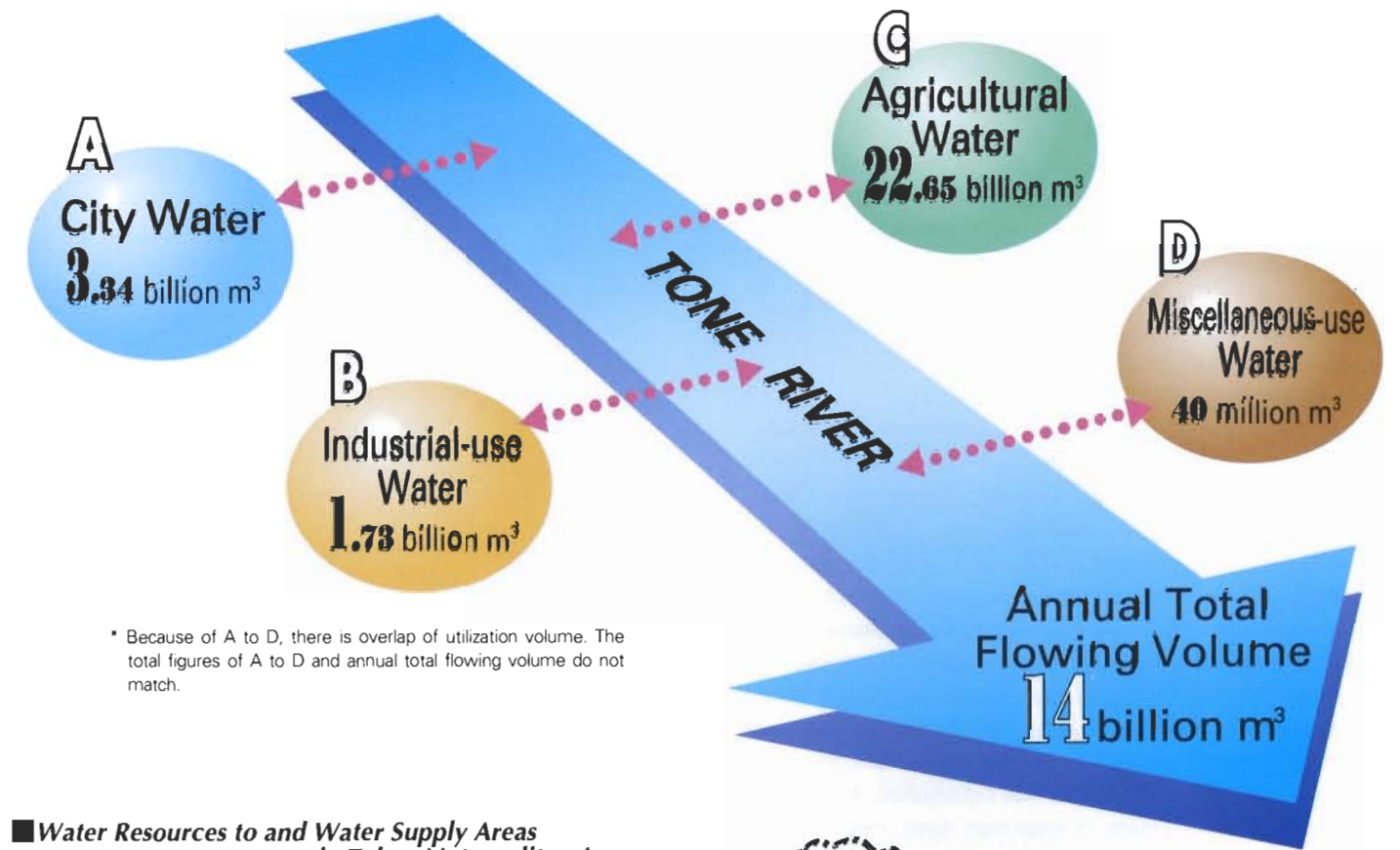
Agricultural Water for 360,000ha

Agricultural water which is inleted from the Tone River reaches to 62 million m³ per day for an irrigation area of 360,000ha.

Water is Supplied to an Area that Produces Approx. 1/4th of Japan's Gross Industrial Shipping Amount

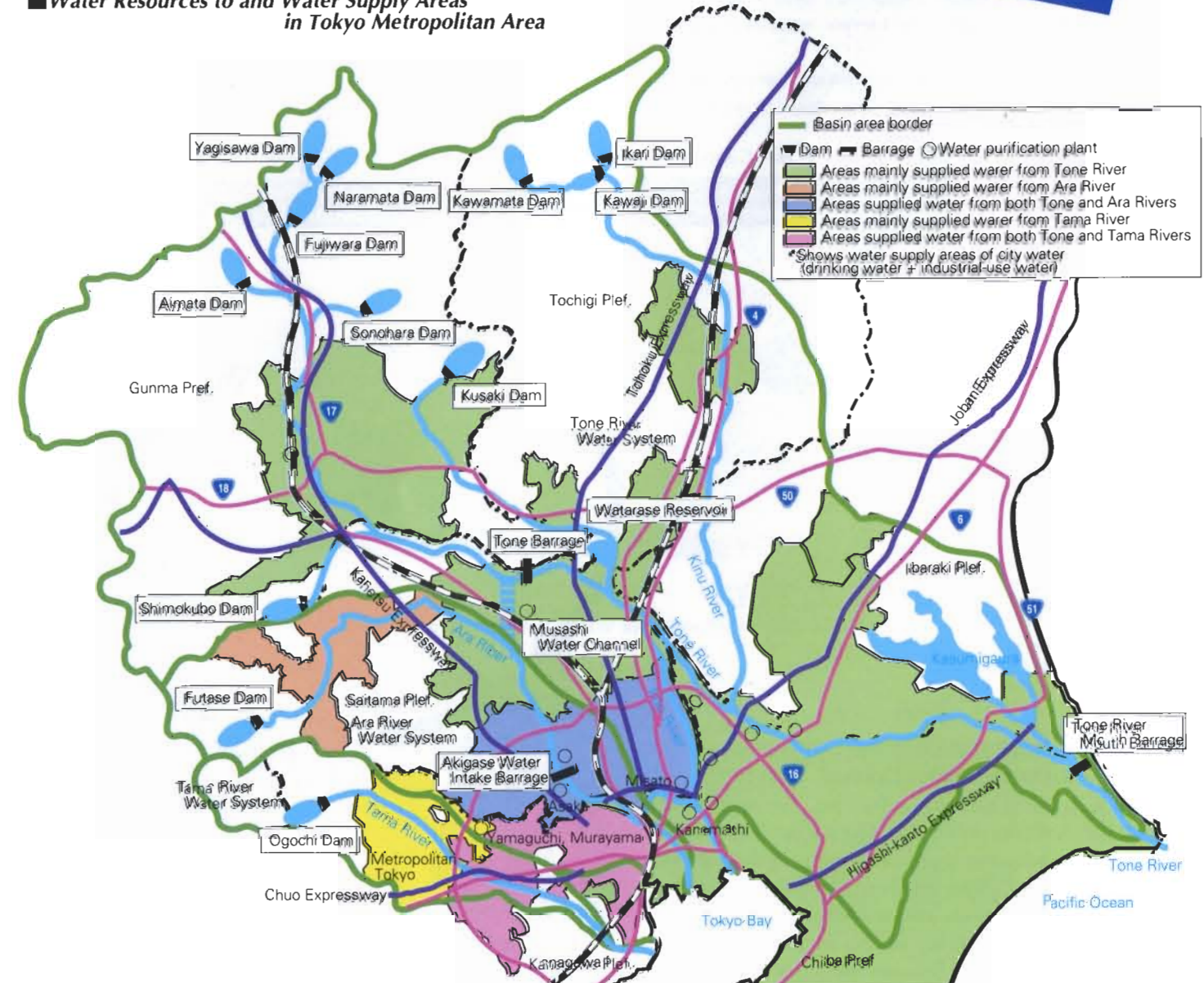
Industrial-use water which is inleted from the Tone River reaches to approx. 4.7 million m³ per day. The industrial shipping amount of the area where the water is supplied reaches 51.300 trillion yen (FY1988), accounting for approx. 1/4th of Japan's gross industrial shipping amount.

Annual Water Utilization of Tone River



* Because of A to D, there is overlap of utilization volume. The total figures of A to D and annual total flowing volume do not match.

Water Resources to and Water Supply Areas in Tokyo Metropolitan Area



Features of '94 Water Shortage

In the summer of 1994, the Japan Islands were covered with the Pacific Ocean high atmospheric pressure, and recorded fierce heat with slight rain continuing in every place. Due to this extraordinary weather, Japan was suffered from a nationwide water shortage, excepting a part of Hokkaido and Okinawa. In the Tone River basin, the lowest precipitation from June to August during past 47 years was recorded with 63% of annual average amount. Due to this, the Tone River water system suffered from water shortage for its fourth year since 1990, and water intake reduction reached 30% (seventh year since 1987), bringing a variety of unfavorable influences to the society.

On May 19, the dams at the upstream of Tone River recorded the year's highest level of 449.98 million m³ (pondage rate of 97%), but entering June, due to the increase in demand for agricultural water, the river flow was reduce, the dams continued to supply water to the Tone River. The low rainfall continued, and to secure the necessary amount for each river, the dam water supply was drained out. Kanto Regional Construction Bureau, Ministry of Construction established Water Shortage Countermeasure Headquarters on July 13, and held water use coordination committee of the Tone River water system, and equal water intake restriction for water users was implemented. At the same time, effectively utilizing supplied water from dams, reservoir, river mouth barrage and water conveyance channels, adequate river flowing volume was secured.

On September 19, the water intake restriction was removed, and the dam water supply volume recorded approximately 410 million m³ for 124 days from May 19 to September 19, the largest supply during the past water shortage.

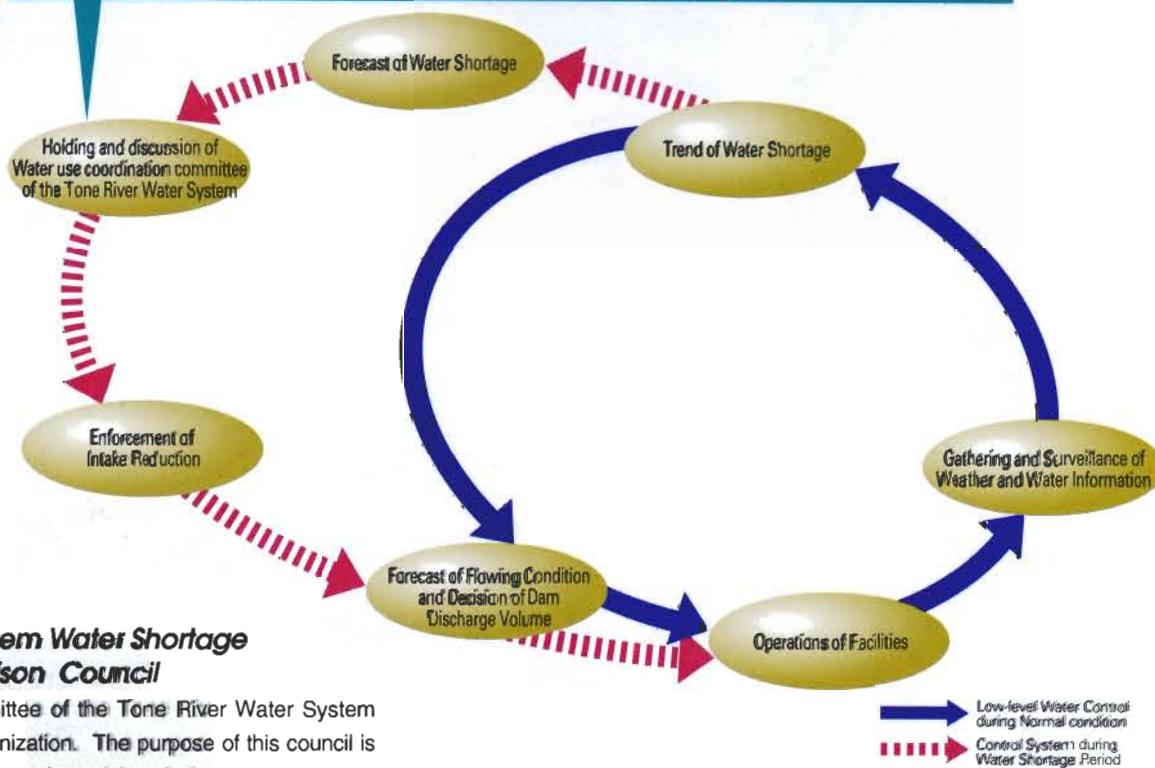
Details of 1994 Water Shortage Countermeasures

| Month Day | Countermeasures | Total pondage volume of 8 dams (million m ³) | Pondage rate (%) |
|-----------|-----------------------------------------------------------------------------------|----------------------------------------------------------|------------------|
| July 13 | Reduction of upstream water intake by Metropolitan Tokyo was confirmed. | 215.14 | 63 (47) |
| July 19 | Enforcement of 10% intake reduction was decided. | 185.87 | 54 (40) |
| July 28 | Enforcement of 20% intake reduction was decided. | 162.61 | 47 (35) |
| Aug. 15 | Enforcement of 30% intake reduction was decided. | 100.33 | 29 (22) |
| Aug. 21 | Intake reduction was temporarily eased. | 74.32 | 22 (16) |
| Aug. 29 | Enforcement of 20% intake reduction was decided. | 95.70 | 18 (21) |
| Sep. 8 | Intake reduction was temporarily eased. | 86.13 | 25 (19) |
| Sep. 19 | Removal of intake reduction was decided. Complete removal of intake reduction. | 111.70 | 33 (23) |

* Total pondage volume of 8 dams is the capacity at 9:00 of corresponding day. The pondage rate shows the rate for the summertime water utilization volume. In () shows pondage rate for constant full pondage volume.

Low-level Water Control System Flow Chart

Ministry of Construction, Metropolitan Tokyo, Chiba Pref., Saitama Pref., Ibaraki Pref., Gunma Pref., Tochigi Pref., Water Resource Development Corporation



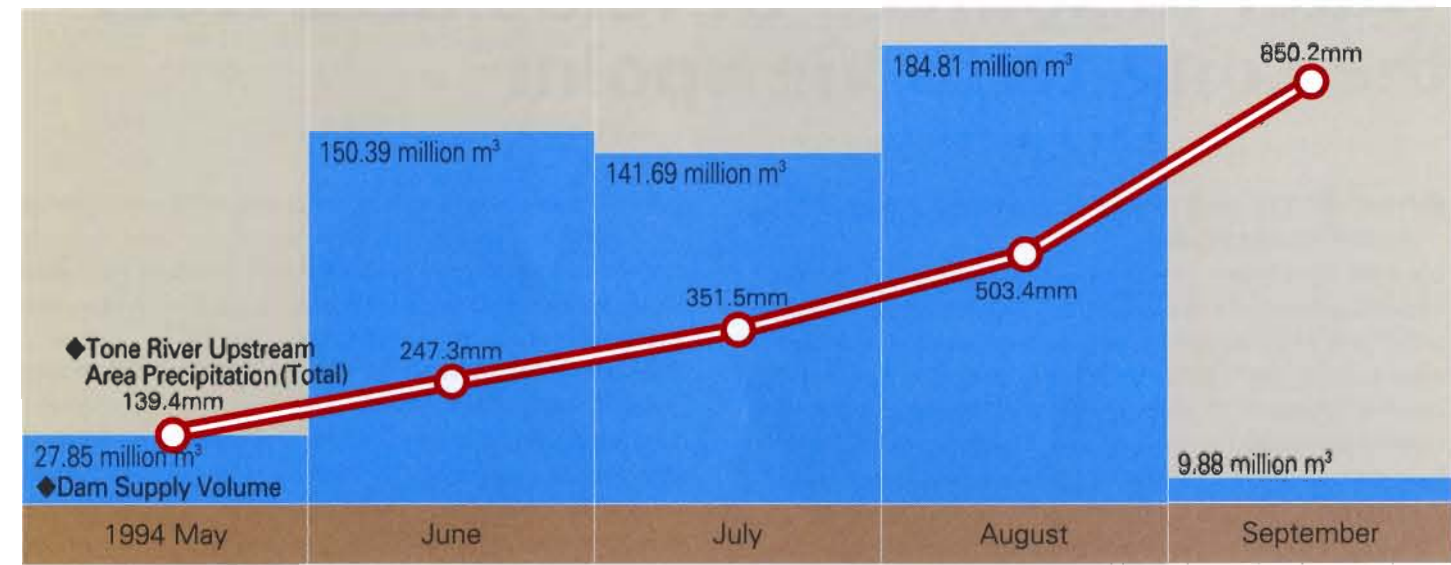
Tone River Water System Water Shortage Countermeasure Liaison Council

Water use coordination committee of the Tone River Water System started in 1974 as regular organization. The purpose of this council is to adjust smooth water supply and receiving during water shortage period of Tone River water system through comprehensive contact with related organizations to promote effective water utilization.

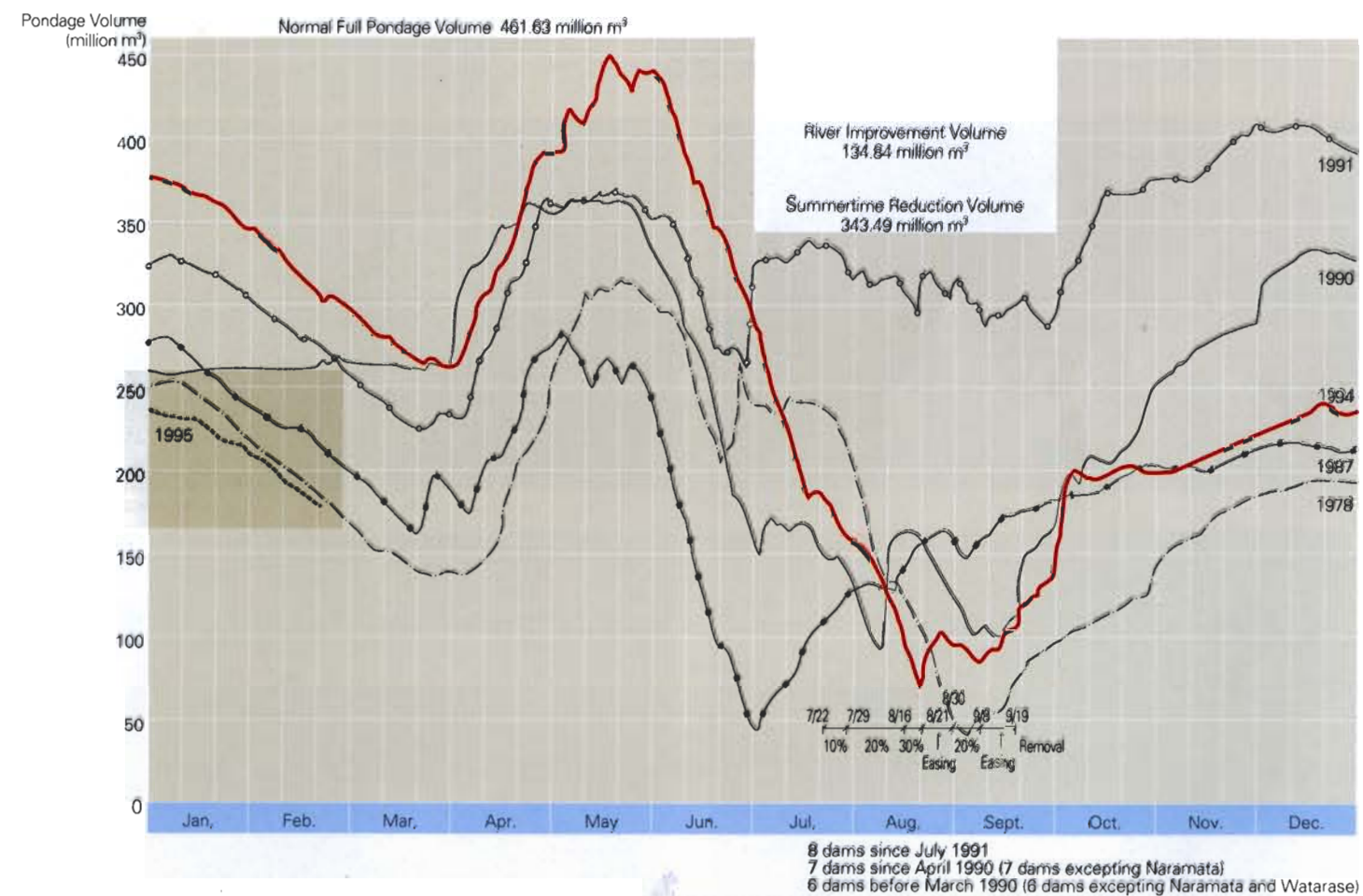
The members of the council are Ministry of Construction, Tokyo Metropolitan, Chiba Prefecture, Saitama Prefecture, Ibaraki Prefecture,

Gunma Prefecture, Tochigi Prefecture and Water Resource Development Corporation. The secretariat is located at Kanto Regional Construction Bureau River Department.

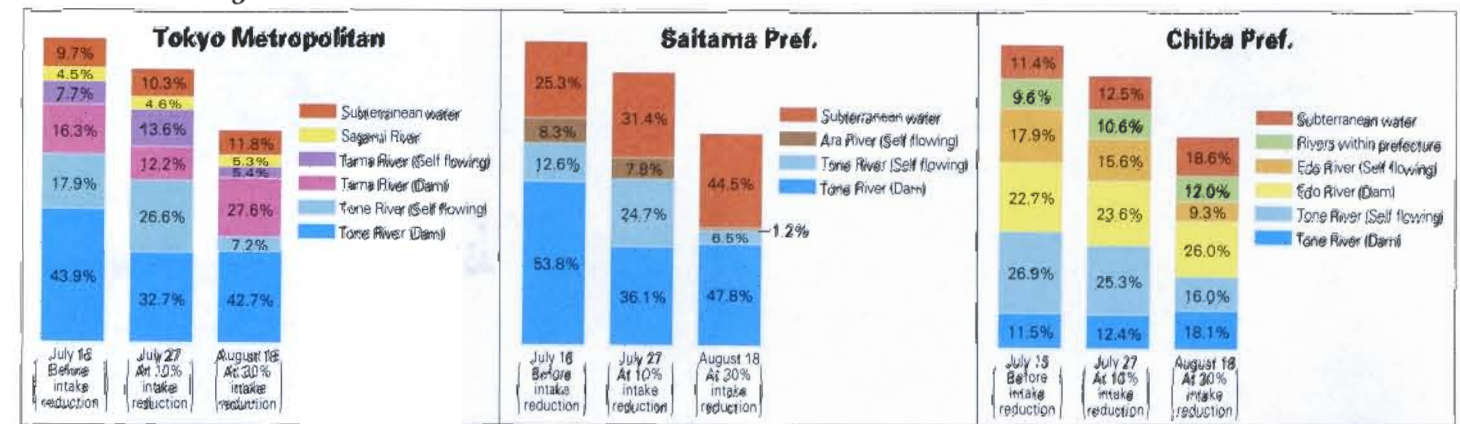
1994 Precipitation and Dam Supply Volume of Tone River Upstream Area



Pondage Volume of 8 Dams at Tone River Upstream



Structural Change of Water Resources for Residential Water in Accordance with Intake Reduction



Dam : Including downstream water resources development facilities

Water Resources Development from the Long-term Viewpoint

Promotion of Water Resources Development is the Most Important Task

Due to the high economic growth since 1950s, remarkable progress of economic activities and increase in urban population have occurred, and in large cities demand for water has tremendously increased. Water resources are fundamental since they are the base for living and economic activities. The development of water resources became an urgent and important task, and Water Resources Development Promotion Law and Water Resources Development Corporation Law were enacted.

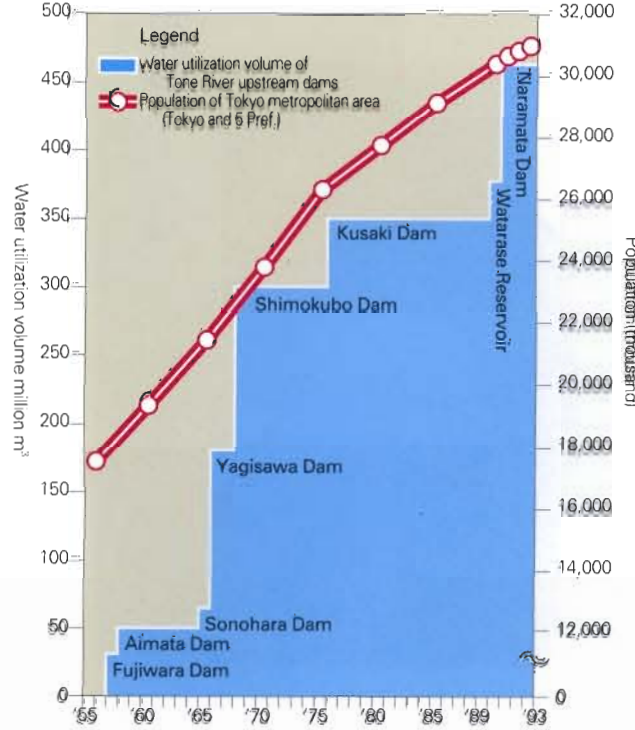
For the areas requiring water in accordance with progress of industries and increase in urban population, when wide-range water countermeasure must be enforced urgently, Water Resources Development Promotion Law can designate the necessary water

systems to secure water supply for the corresponding areas. For the areas related to the designated water system, the water resources development basic plan will be implemented. The Tone River water system was designated in 1962, and planned water resources development has been carried out.

Water Demand and Supply Condition of Tone and Ara River Water Systems

At the end of 1993, 21 projects had been completed. These include 15 projects involving water resources development facilities such as dams, and 6 water conveyance channels projects. If projects under construction and being researched are added, the total reaches 49. The developed water volume from the 21 completed projects accounts for approximately 98m³/s, and it is equivalent to approximately 38% of forecasted demand of 258m³/s.

Water Utilization Volume of Tone River Upstream Dams and Growth of Metropolitan Tokyo's Population



Main Water Resources Development Projects in the Future

| Facility Name | Project Organizer | Pondage Volume, etc. |
|---------------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Kasumigaura Development Project | WRDC* | Effective Water Capacity 27.9 mil. m ³ |
| Boso Water Conveyance Saitama-gouguchi 2nd Stage | WRDC* | Nagara Dam Effective Water Capacity 9.6 mil. m ³ Improvement of agricultural water for average irrigation 4.3m ³ /s |
| Kasumigaura Water Channel | WRDC* | Water Conveyance Channel extension 54km Max. water intake volume 19.4m ³ /s |
| Kita-chiba Water Conveyance | MOC** | Water Conveyance Channel extension 29km Max. water volume 40m ³ /s |
| Yatsuba Dam | MOC** | Effective Water Capacity 90 mil. m ³ |
| Kasumigaura Water Conveyance | MOC** | Connect Naka River, Kasumigaura and Tone River 44km Max. water volume 35m ³ /s |
| Yunishi River Dam | MOC** | Effective Water Capacity 96 mil. m ³ |
| Omori River Development Project | WRDC* | Effective Water Capacity 104.5 mil. m ³ |
| Tokura Dam | WRDC* | Effective Water Capacity 64 mil. m ³ |
| Hirakawa Dam | WRDC* | Effective Water Capacity 44 mil. m ³ |
| Inatoi Retarding Reservoir Integrated Development | MOC** | Effective Water Capacity 8.1 mil. m ³ |
| Edo River Integrated Development | MOC** | Effective Water Capacity 2.4 mil. m ³ |
| Hokuso Central Water Land Improvement | MOA FAF*** | Water Conveyance Channel extension 24km Max. water volume 2.322m ³ /s |
| Kawahuru Dam | MOC** | Effective Water Capacity 65 mil. m ³ |
| Watarase Retarding Basin (2nd Stage) | MOC** | Effective Water Capacity 10.5 mil. m ³ |
| Inbanuma Integrated Development | MOC** | Effective Water Capacity 16.35 mil. m ³ |

| Facility Name | Project Organizer | Pondage Volume, etc. |
|------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------|
| Ara River Integrated Development | MOC** | Effective Water Capacity 19.2 mil. m ³ River purification facility 3m ³ /s |
| Ureyama Dam | MRDC* | Effective Water Capacity 56 mil. m ³ |
| Takizawa Dam | MRDC* | Effective Water Capacity 58 mil. m ³ |
| Ara River 2nd Regulating Reservoir | MOC** | Effective Water Capacity 19 mil. m ³ |

* Water Resource Development Corporation
** Ministry of Construction
*** Ministry of Agriculture, Forestry and Fishery



▲Yagisawa Dam



▲Watarase Reservoir



▲Tone Barrage



▲Kitachiba Water Conveyance Channel



▲Kasumigaura



▲Tone River Mouth Barrage

Tone and Ara River Water Resources Development Project Map



| Facilities | Completed | Under conveyance |
|--------------------------|-----------|------------------|
| Dam | | |
| Barrage | | |
| Water Conveyance Channel | | |
| Basin Border | | |

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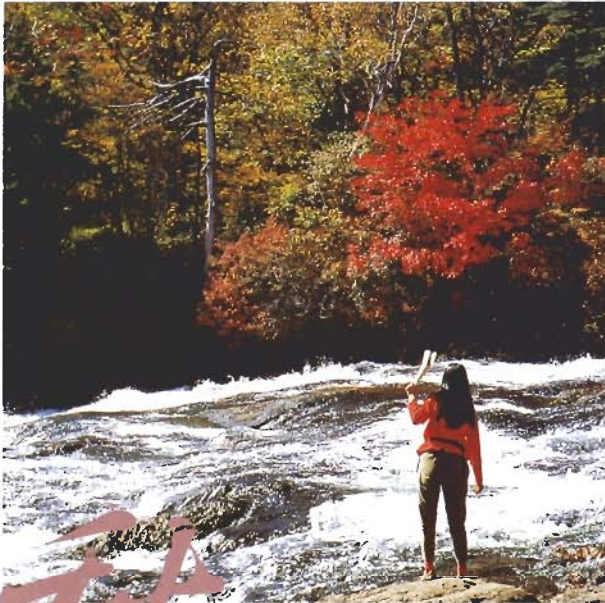


SUMMER

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AUTUMN



秋

WINTER



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Droplets of water from a snowy ravine enjoying warm spring sunshine become the source of Tone River.

Looking for clear, pure water, many people gather along the Tone River in summer.

Rice plants nurtured by the water of the Tone River hang down in yellow ears.

Migratory birds from the north foretell the coming of winter.

On the waters of the Tone River, many water birds stop to rest.

The Tone River, bringing limitless benefits to people and nature, flows ceaselessly throughout the four seasons.

Four Seasons in Tone River

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