

# Introduction to the Tone River Dam Integrated Dam Group Operation Office

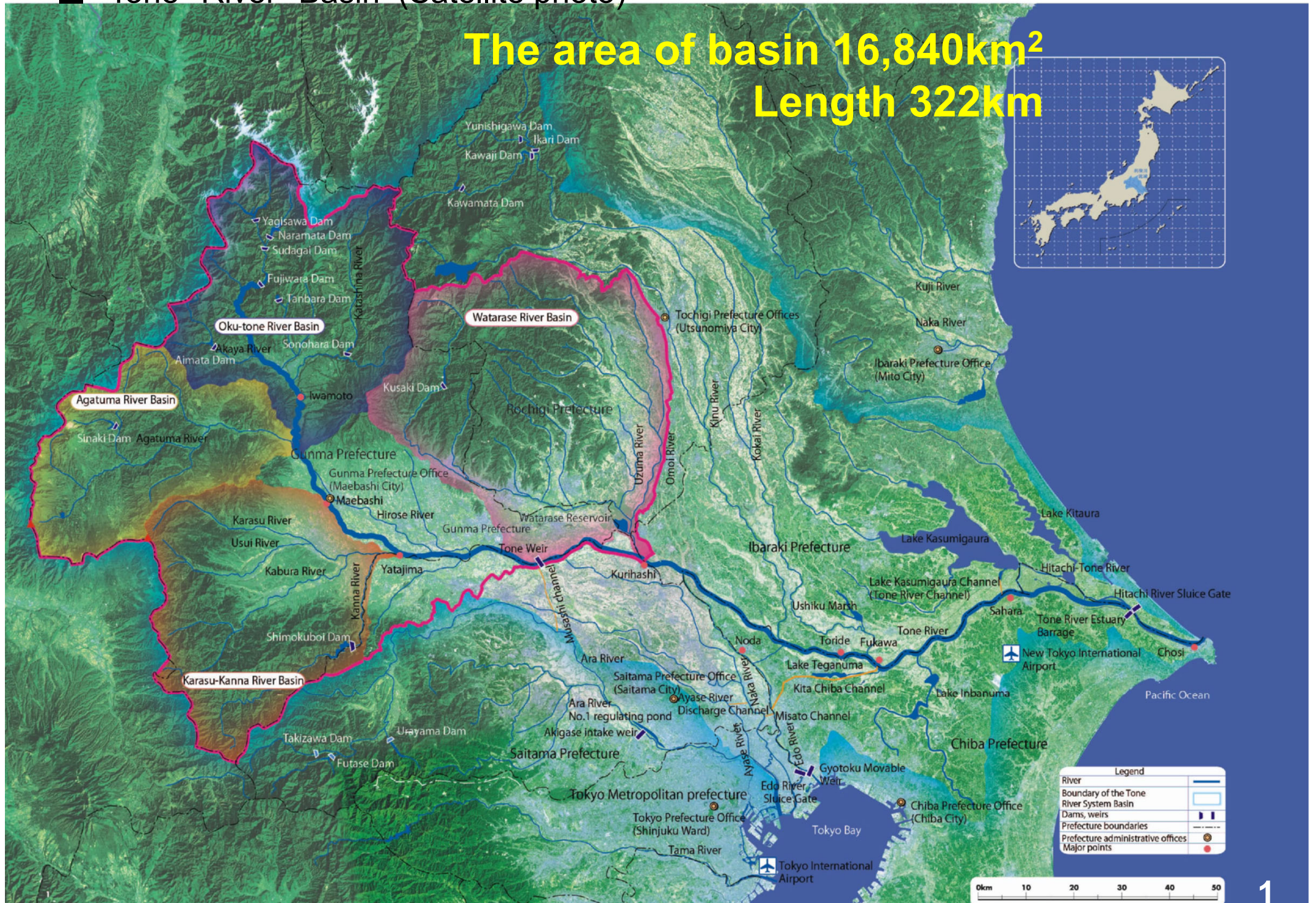


Water Resource Region of the Tone River



# ■ Tone River Basin (Satellite photo)

The area of basin 16,840km<sup>2</sup>  
Length 322km





# The 8 dams upstream on the Tone River



Managed by the Ministry of Land, Infrastructure, Transport and Tourism  
 Managed by Japan Water Agency

Seven dams and 1 reservoir have been completed in the upstream part of the Tone River. Through their integrated management, they make great contributions to flood control, water use, and the environment.

## Eight dams on the upstream Tone River

### Ministry of Land, Infrastructure, Transport and Tourism

Tone River Dam Integrated Dam Group Operation Office  
Fujiwara Dam, Aimata Dam, Sonohara Dam

Tone River Upstream Work Office  
Watarase Reservoir

### Japan Water Agency

Numata Dams Integrated Operation and Maintenance Office  
Yagisawa Dam, Naramata Dam

Shimokubo Dam Management Office  
Shimokubo Dam

Kusaki Dam Management Office  
Kusaki Dam



# **Eight dams on the upstream Tone River (4 dams managed by the Ministry of Land, Infrastructure, Transport and Tourism)**

## **Tone River Dam Integrated Dam Group Operation Office**



## **Tone River Upstream Work Office**





# Eight dams on the upstream Tone River

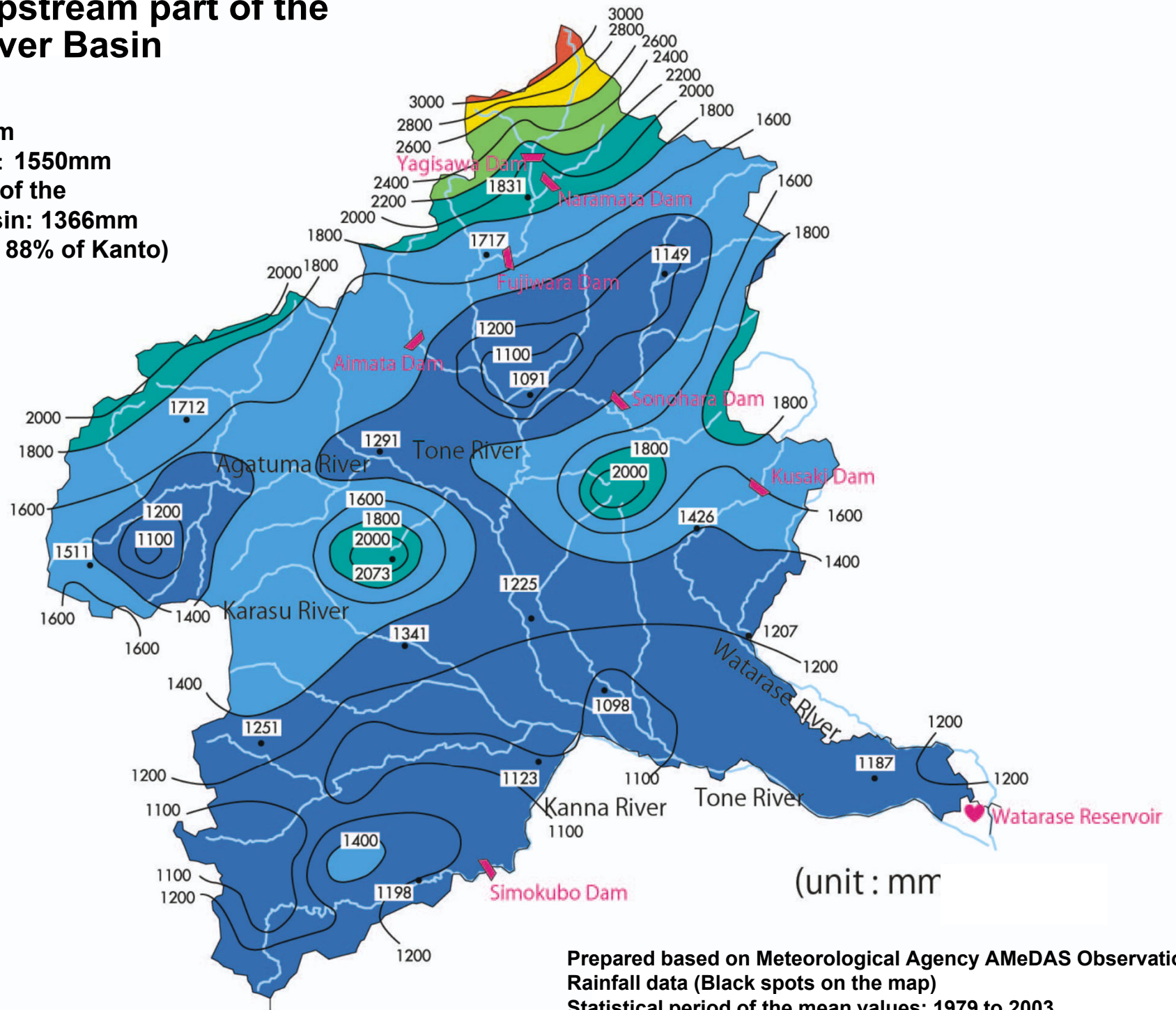
(4 dams managed by the Japan Water Agency)





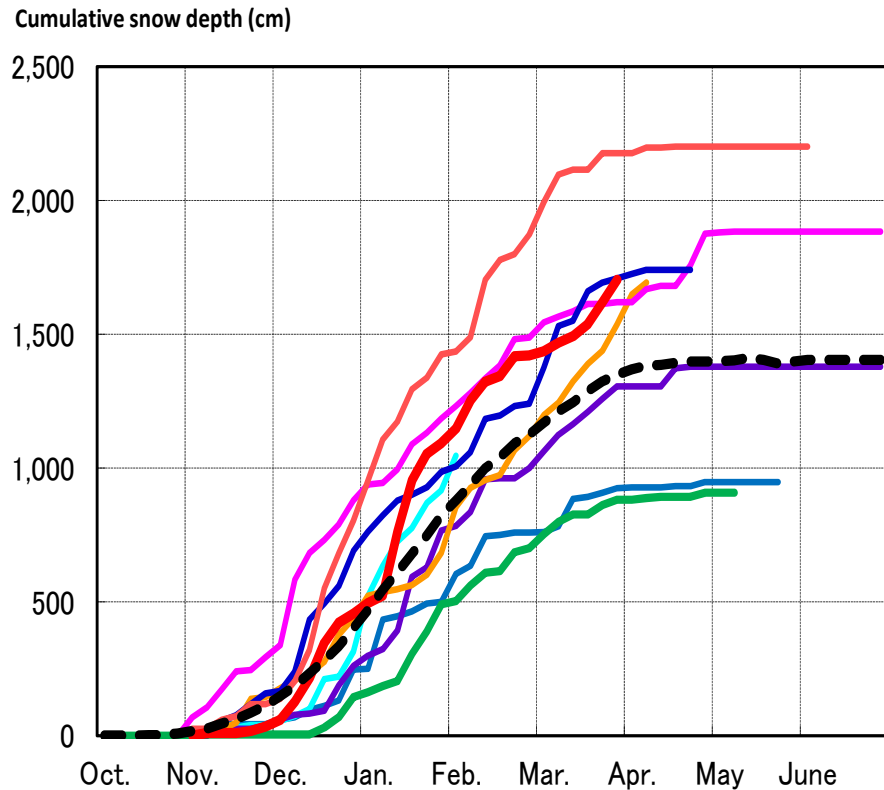
# Annual rainfall distribution in the upstream part of the Tone River Basin

Japan: 1700mm  
Kanto district: 1550mm  
Upstream part of the  
Tone River Basin: 1366mm  
(80% of Japan. 88% of Kanto)

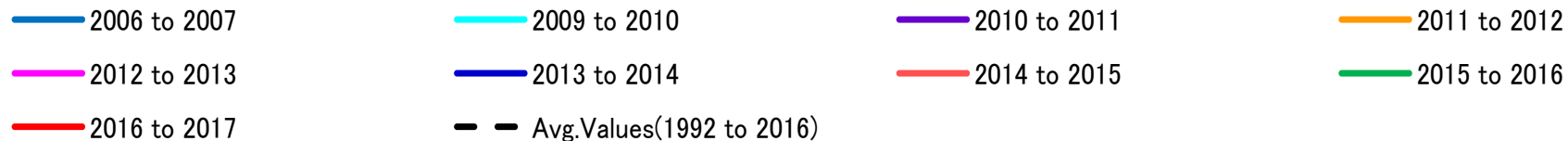
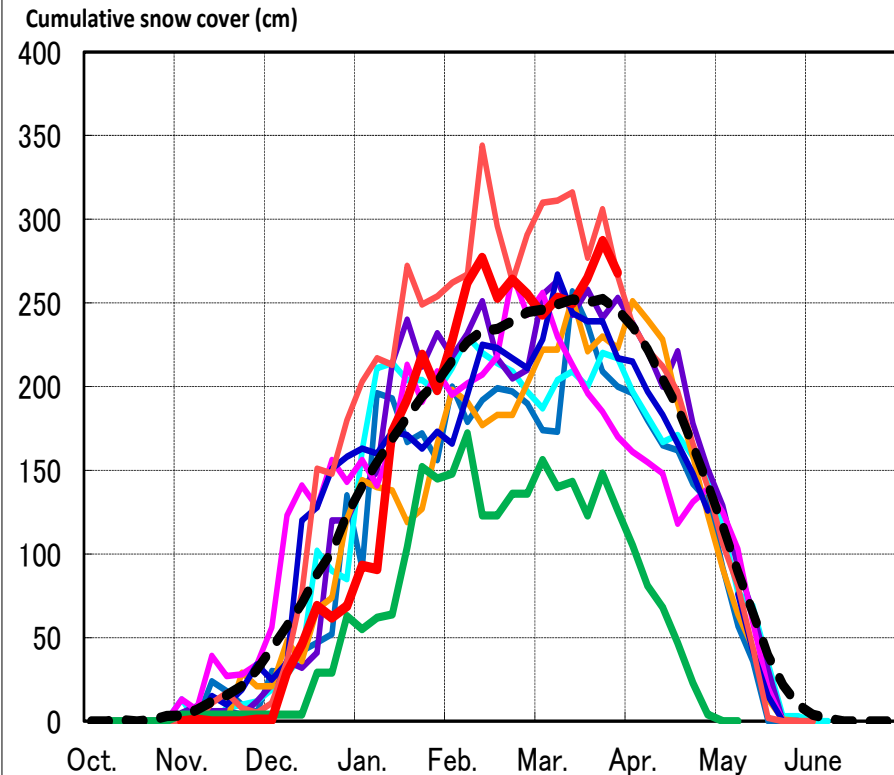


# Cumulative snowfall and snow cover thickness at the Lake Oze

Chart of average cumulative snowfall at the Lake Oze

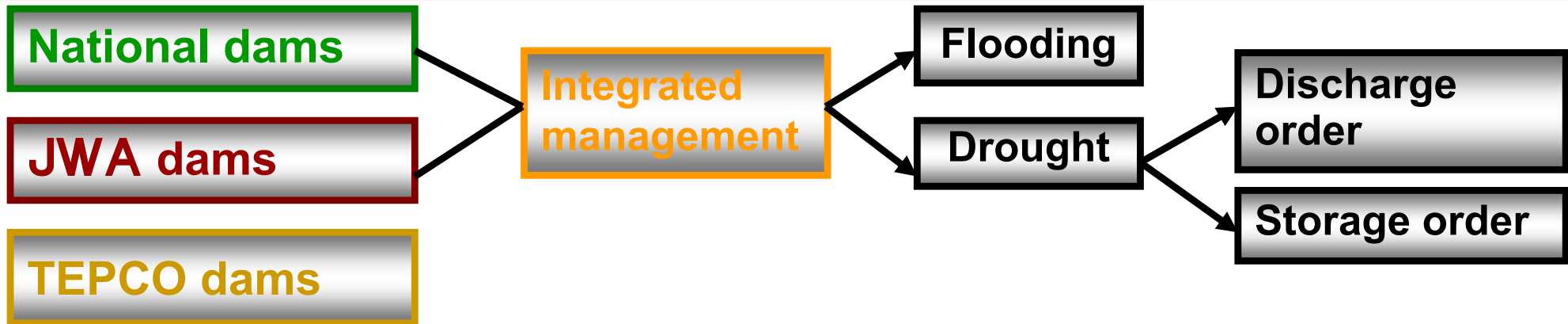


Average snow cover thickness at the Lake Oze

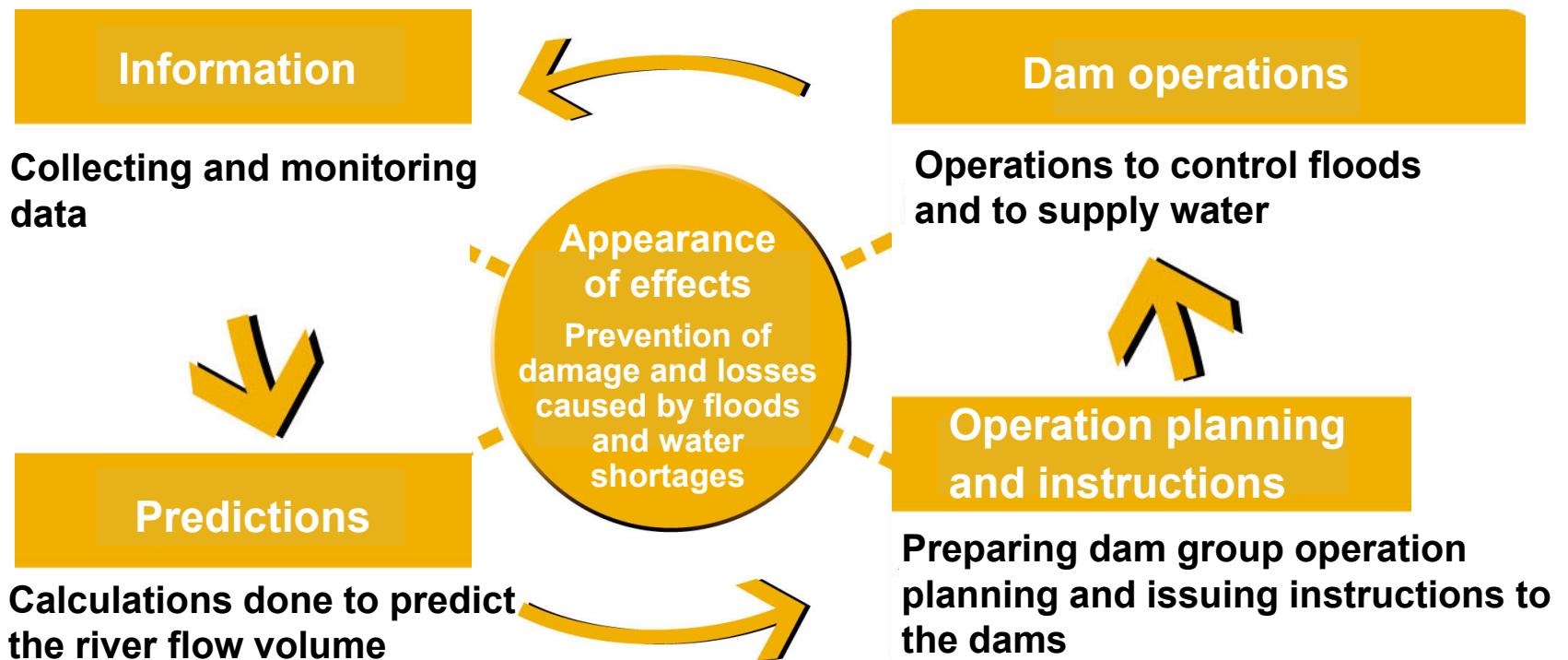


# What is the Tone River Dam Integrated Dam Group Operation Office?

## Integrated dam management



**Integrated management** of dams includes four major tasks that are continually repeated to appropriately manage the dams.

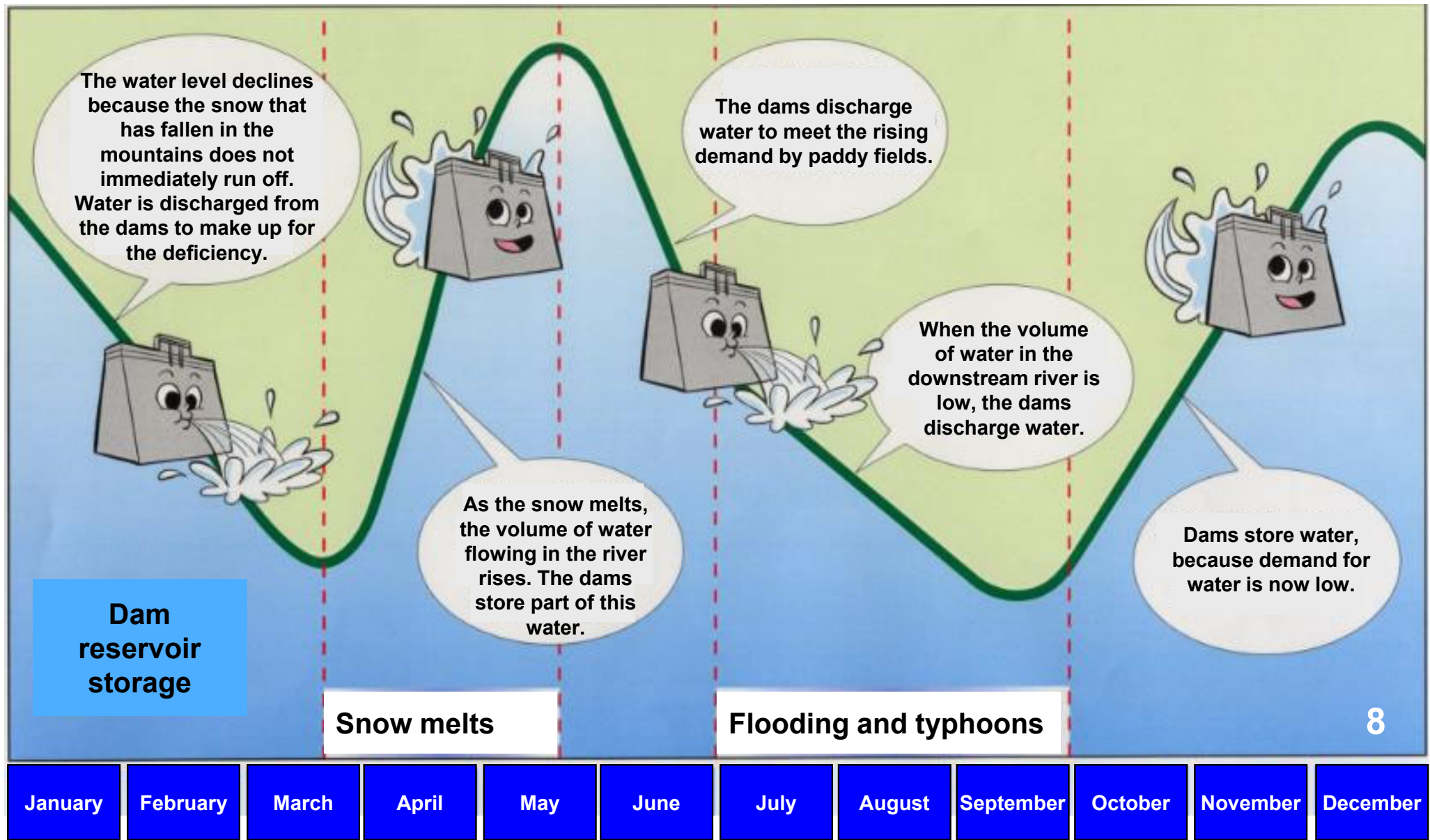




# Effects of the dams

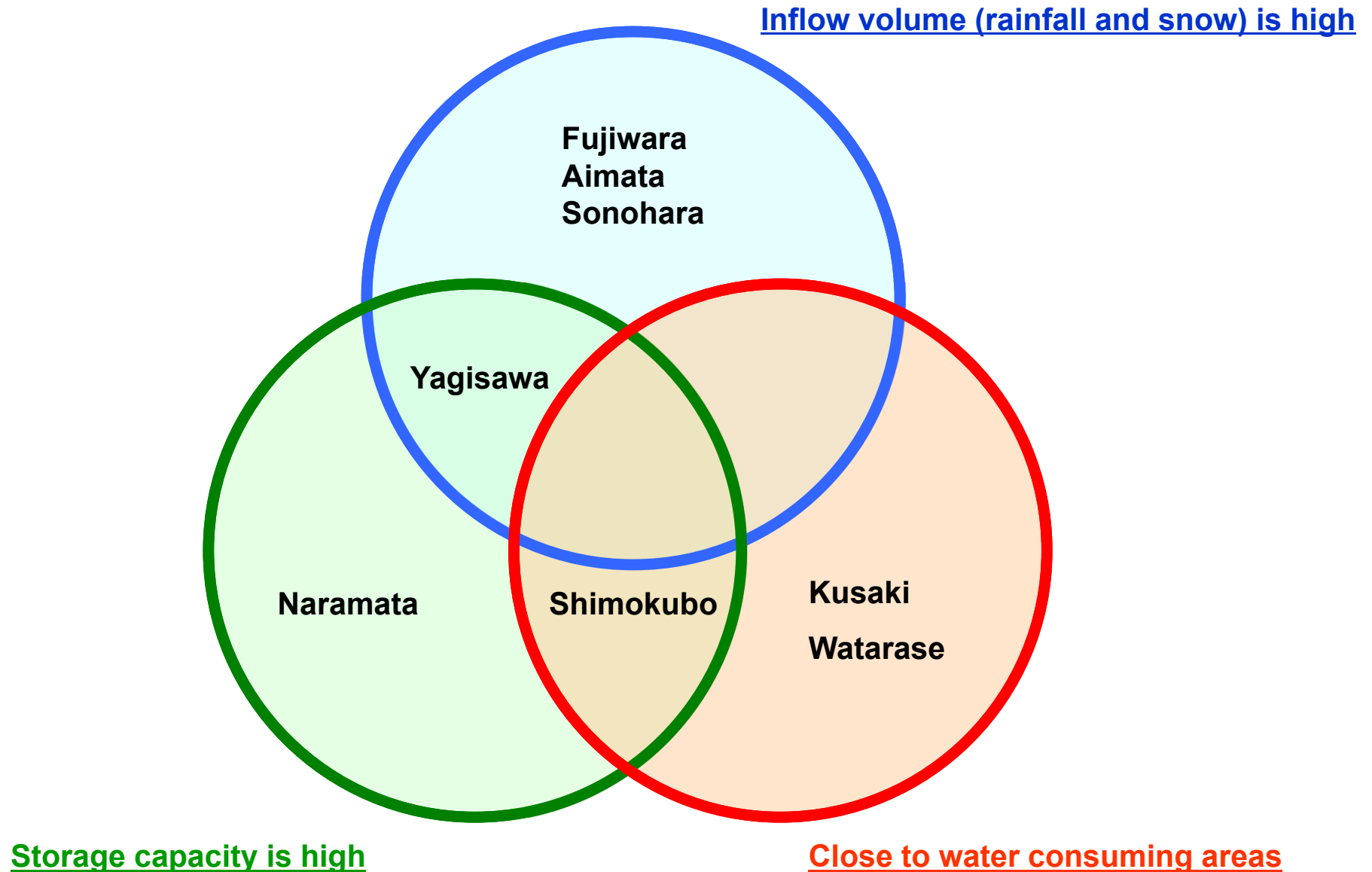
## ~Fluctuation of the storage capacity of the dams~

### Chart of annual fluctuation of the dam storage capacity



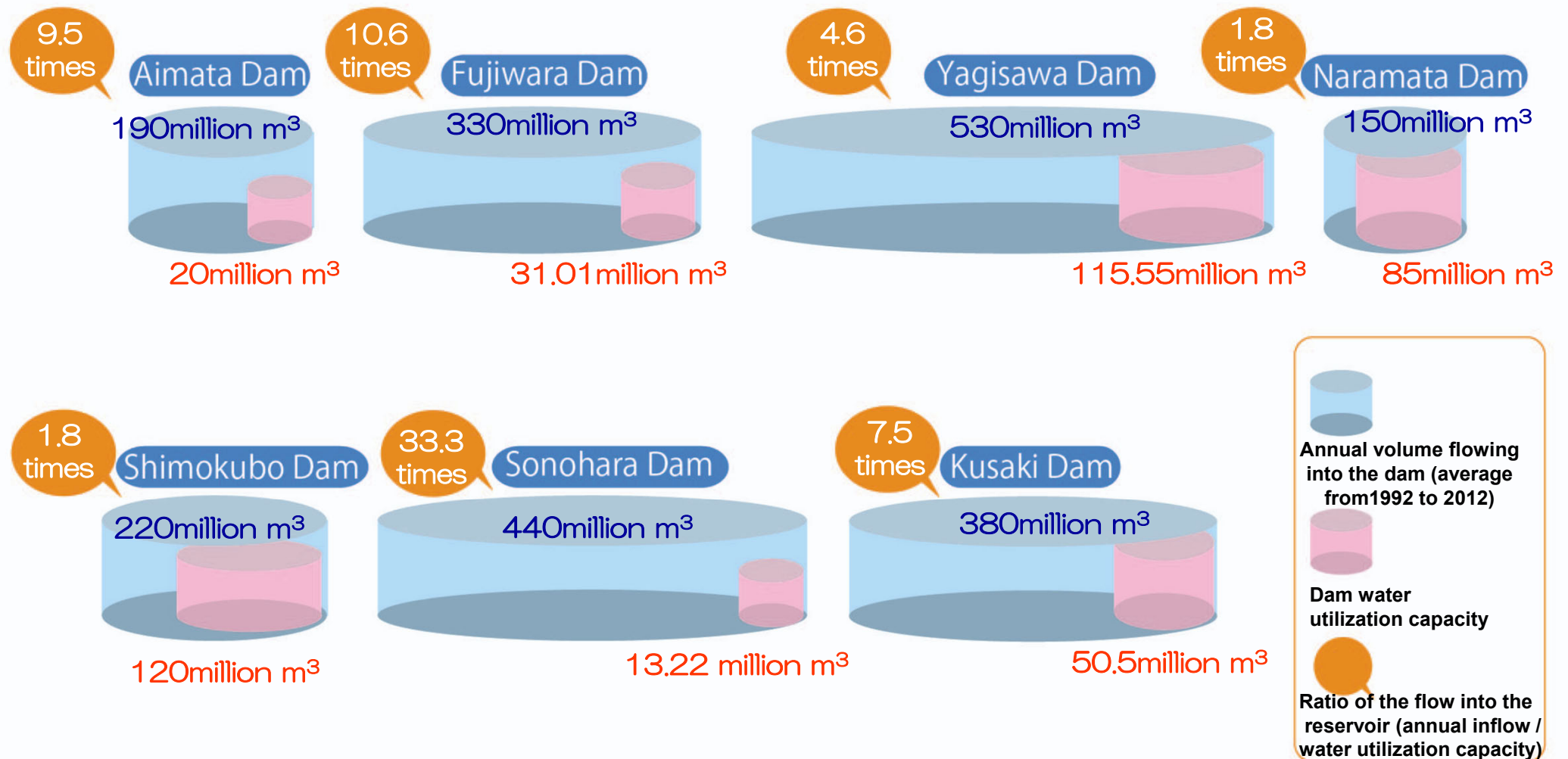


## ■ Characteristics of the dams (strong points)





# The dam group is made up of reservoirs with various characteristics

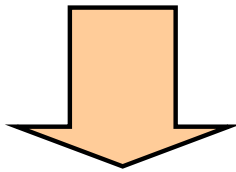




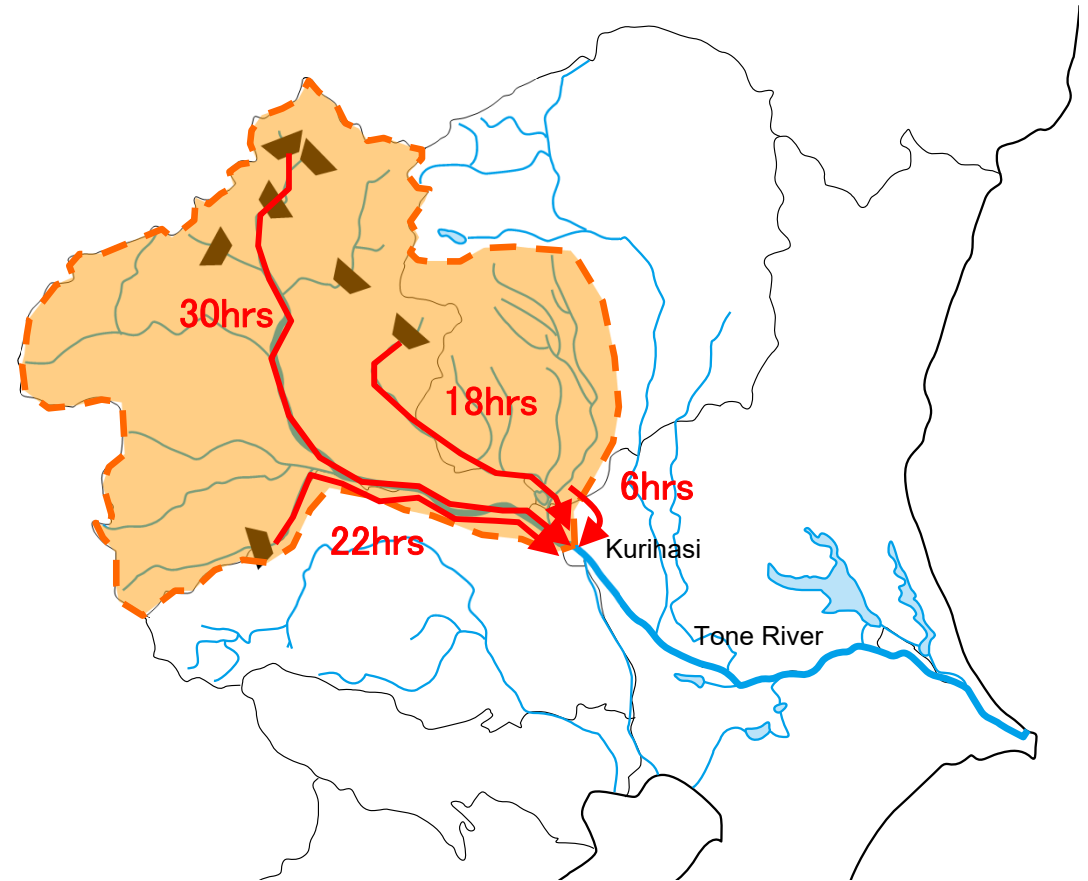
# Time until Tone River Reference Point (Kurihashi)

Time to Tone River reference point (Kurihashi) From upriver dam: 30 hrs.  
From Watarase Reservoir: 6 hrs.

Watarase Reservoir has a large catchment area  
→ Can even accumulate water of the middle basins



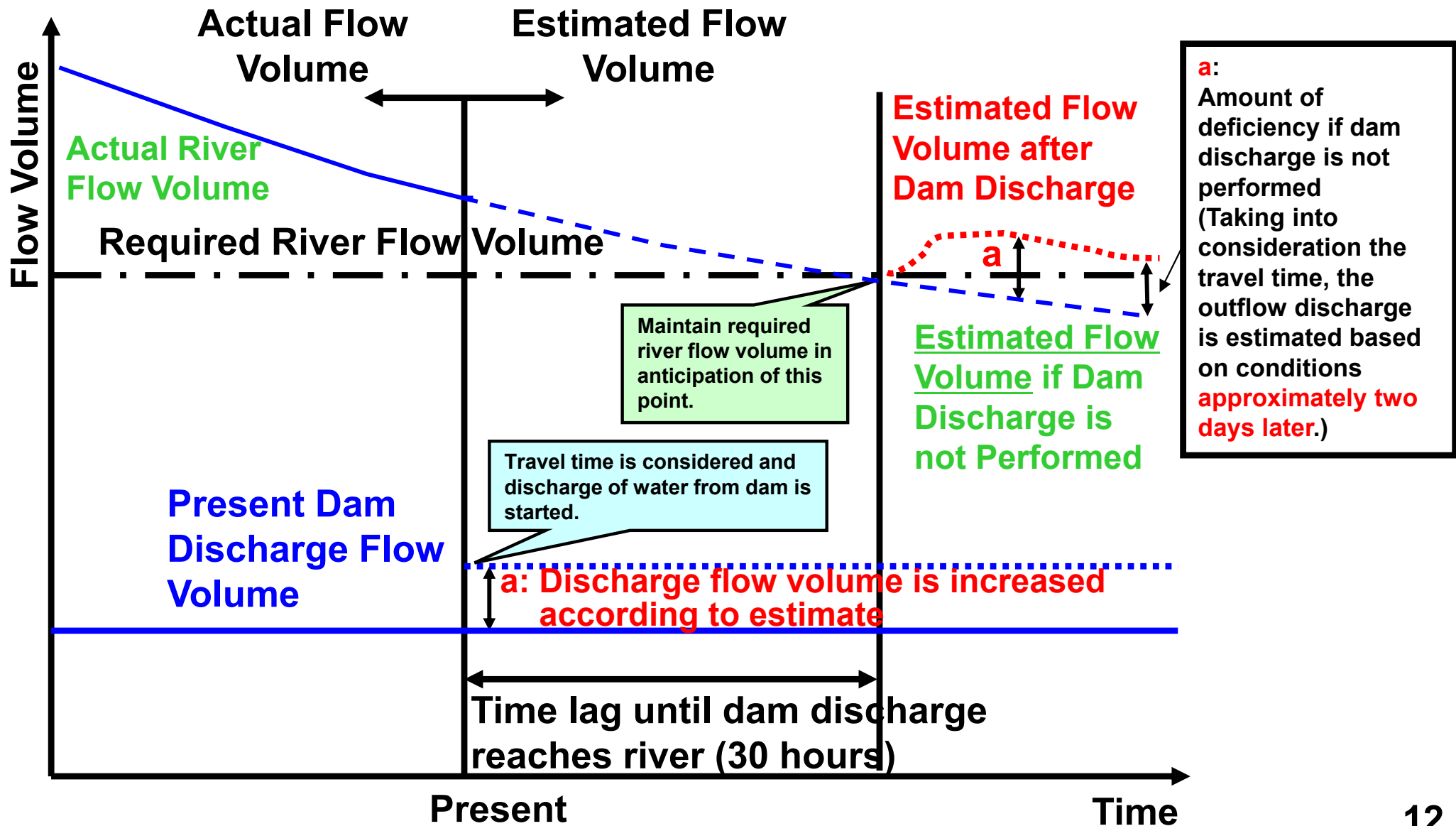
Integrated operation enables linkage of the five Okutone dams to supply water by utilizing the geographical conditions of the Watarase reservoir as the most downstream dam near the reference point.



**Kurihashi Upstream  
Catchment Area  
8,588 km<sup>2</sup>**

# Flow Volume Estimation (At Kurihashi)

The future flow volume at a reference point is estimated in order to determine, on a daily basis (using data from 08:00 and 14:00), if it is necessary to supply water from the dam in order to maintain the required flow volume.

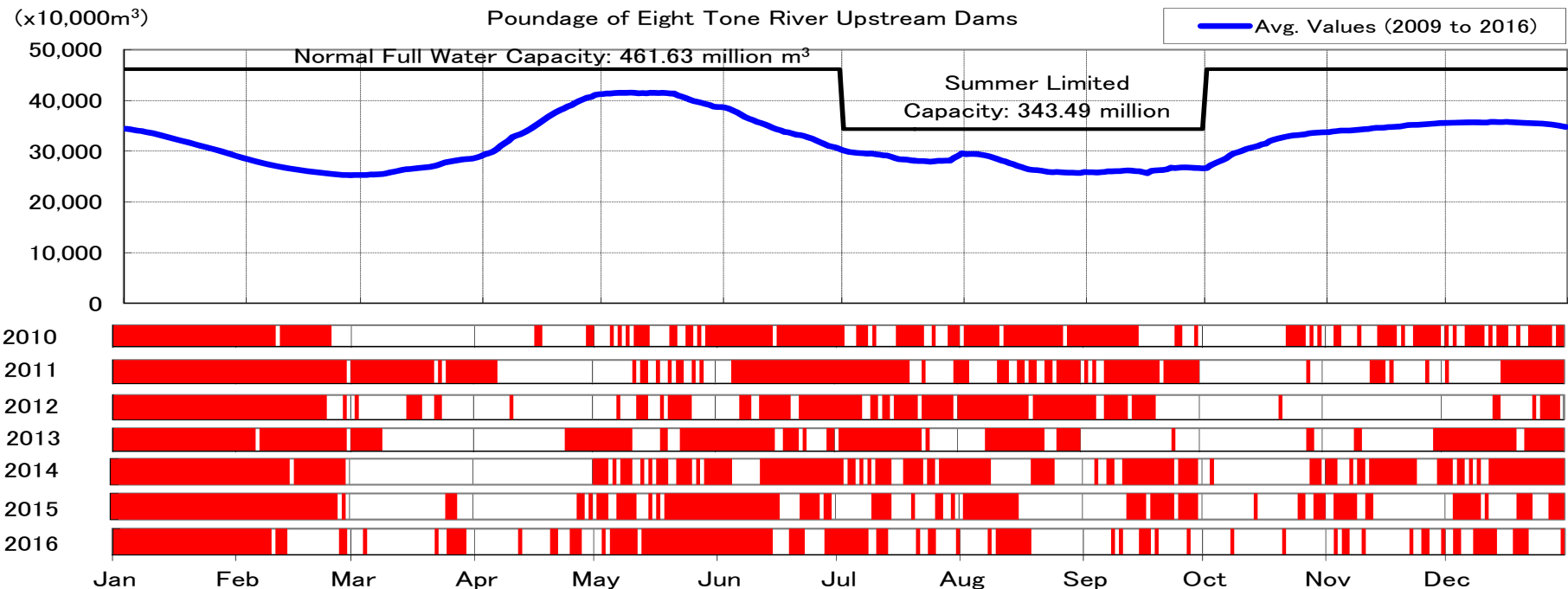




# Dam Water Supply

Upstream dams of the Tone River are used to control river flow volume by supplying water for about 200 days a year so that rivers have the required volume.

| Amount of Days Water was Supplied |      |      |      |      |      |      |      |
|-----------------------------------|------|------|------|------|------|------|------|
| Year                              | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Period(Days)                      | 207  | 217  | 174  | 195  | 208  | 179  | 161  |



**Jan. to March: Water Supplied**

Due to the low level of rainfall from Jan. to March and snowfall in the mountains resulting in a reduced flow volume of rivers, water is supplied from the dams so that sufficient water is supplied for urban areas and for other uses.

**April/May: Accumulation**  
Water from melting snow and rainfall of the rainy season is accumulated in April and May.

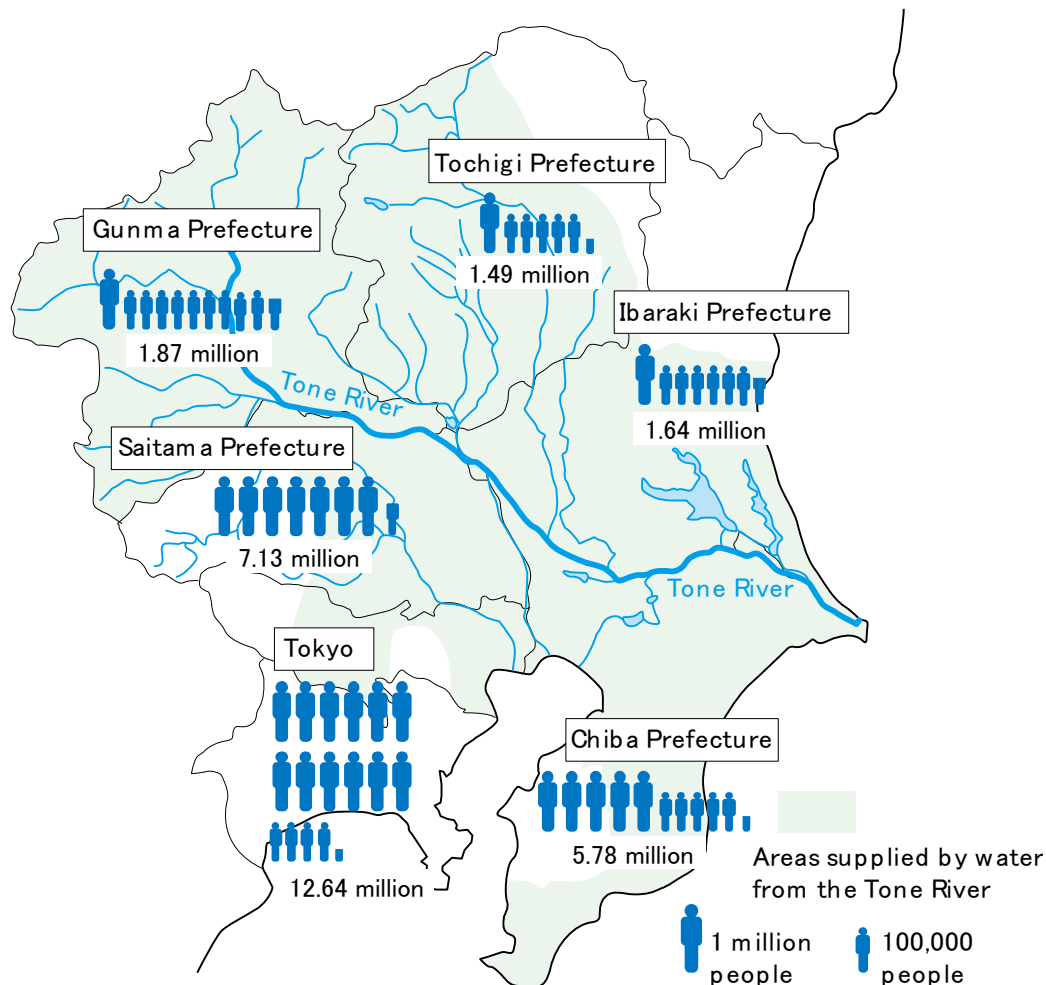
**June to Sept.:**  
The amount of days in which water is supplied increases due to the increase of water used by urban areas and for irrigation from Jun. to Sep.

**Oct. to Dec.: Accumulation**  
Water is accumulated due to the reduced demand as there is no irrigation from Oct. to Dec.

# Water conditions on the Tone River

The Tone River helps supply drinking water to approximately 30 million people in the Tokyo area.

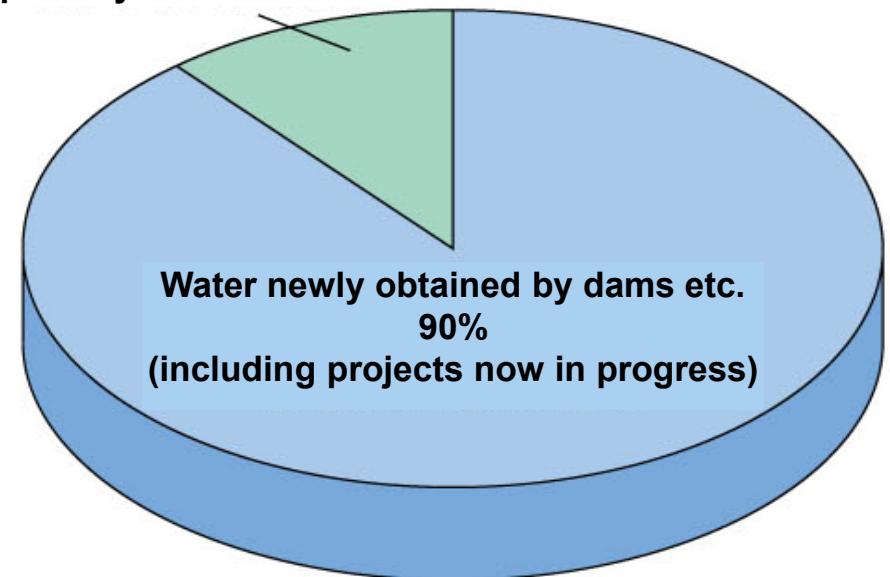
■ Number of people supplied with water by public water supply systems dependent on the Tone River System. (Based on water supply system statistics for 2009)



About 90% of all the water supplied to public water systems from rivers is developed by newly constructed dams etc., and this water supply is highly dependent on the dams and other water resource development facilities.

■ Percentage of water from public water supply systems dependent on dams  
(breakdown of water rights of 110m<sup>3</sup>/s from the Tone River for the use of the public water supply )  
(August 2001 survey by the Ministry of Land, Infrastructure, Transport and Tourism)

Amount of water originally supplied by the Tone River 10%

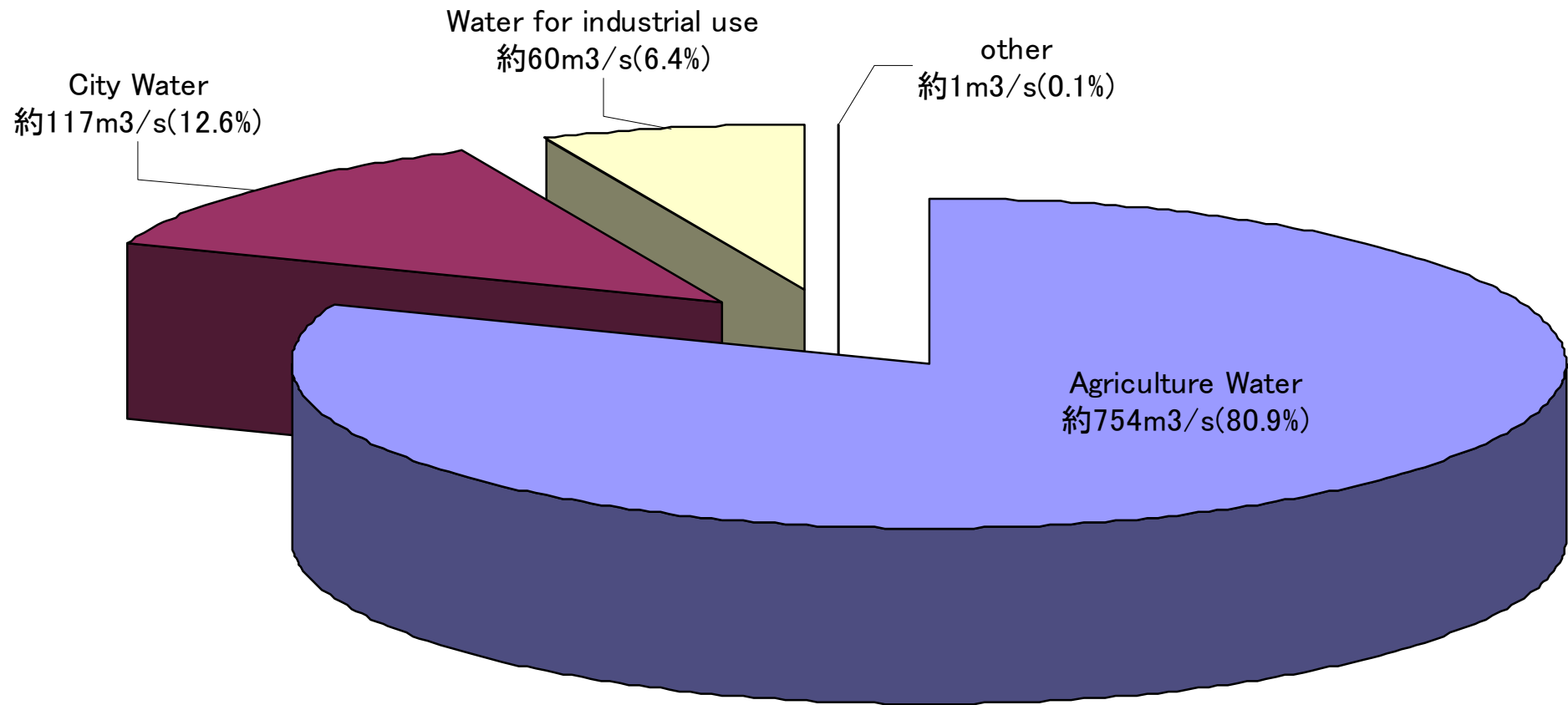




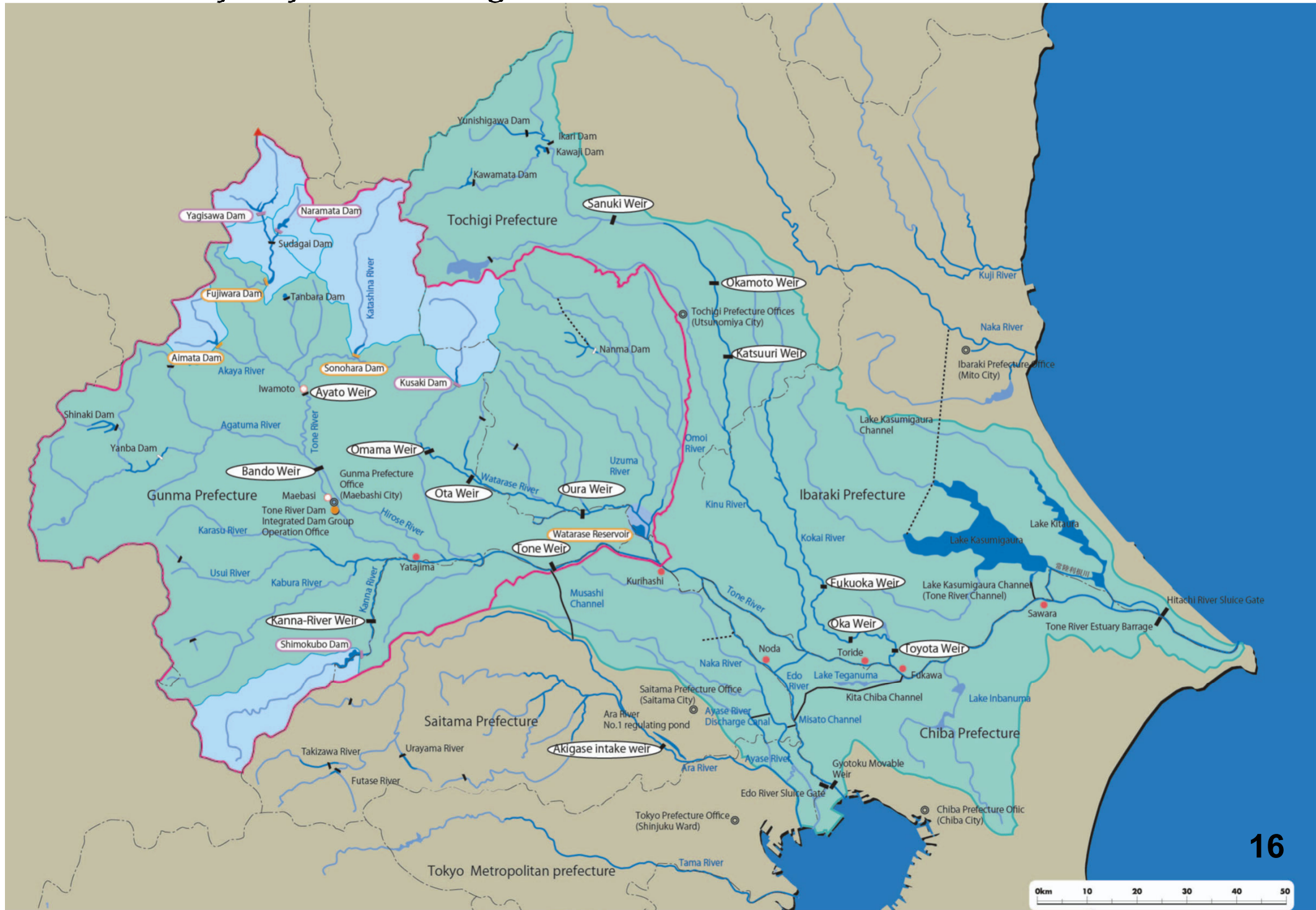
# Maximum water intake from the Tone River according to use

Supply Water rights of  $932\text{m}^3/\text{s}$  from Tone River

※Water power station  $2,674\text{m}^3/\text{s}$



# ■ Facility layout drawing of the Tone River





# Frequent water shortages

In the Tone River Basin, water shortages occur once every two to three years.

Water shortages in the Tone River during the past 40 years

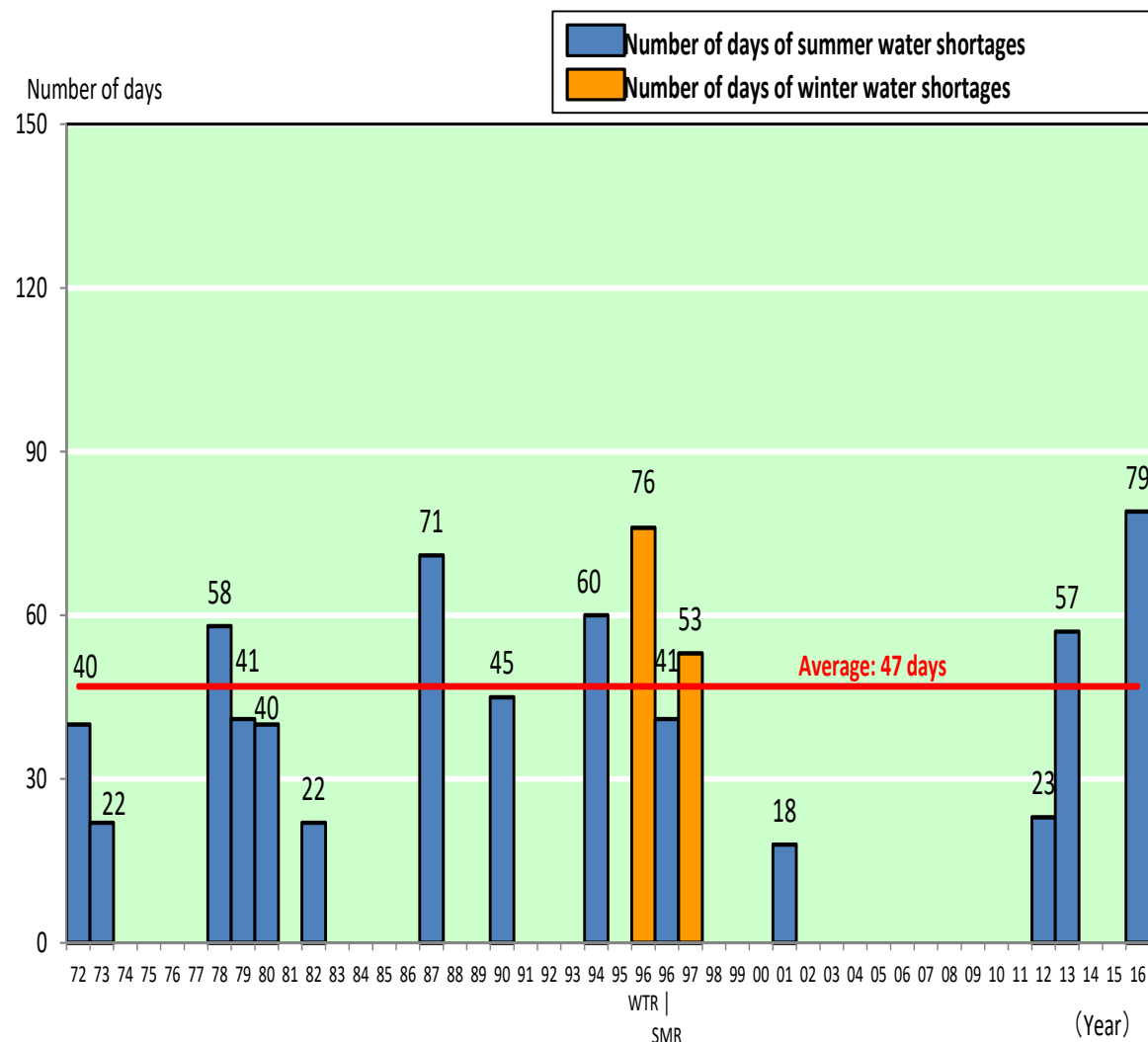
| Year    | Period of restricted water use | Days | Max. water intake restriction rate (%) |
|---------|--------------------------------|------|----------------------------------------|
| 1972    | 6/6— 7/15                      | 40   | 15                                     |
| 1973    | 8/16— 9/6                      | 22   | 20                                     |
| 1978    | 8/10— 10/6                     | 58   | 20                                     |
| 1979    | 7/9— 8/18                      | 41   | 10                                     |
| 1980    | 7/5— 8/13                      | 40   | 10                                     |
| 1982    | 7/20— 8/10                     | 22   | 10                                     |
| 1987    | 6/16— 8/25                     | 71   | 30                                     |
| 1990    | 7/23— 9/5                      | 45   | 20                                     |
| 1994    | 7/22— 9/19                     | 60   | 30                                     |
| 1996    | 1/12— 3/27                     | 76   | 10                                     |
|         | 8/16— 9/25                     | 41   | 30                                     |
| 1997    | 2/1— 3/25                      | 53   | 10                                     |
| 2001    | 8/10— 8/27                     | 18   | 10                                     |
| 2012    | 9/11— 10/3                     | 23   | 10                                     |
| 2013    | 7/24— 9/18                     | 57   | 10                                     |
| 2016    | 6/16— 9/2                      | 79   | 10                                     |
| Average | —                              | 47   | —                                      |

Water shortage: A lack of rain lowers the quantity of water in rivers, and water intake is restricted.

The period of restricted water use includes periods when the restrictions were temporarily relaxed.

Periods of water intake restrictions during water shortages often last for more than one month, with severe tangible and intangible negative impacts on social life and economic activities.

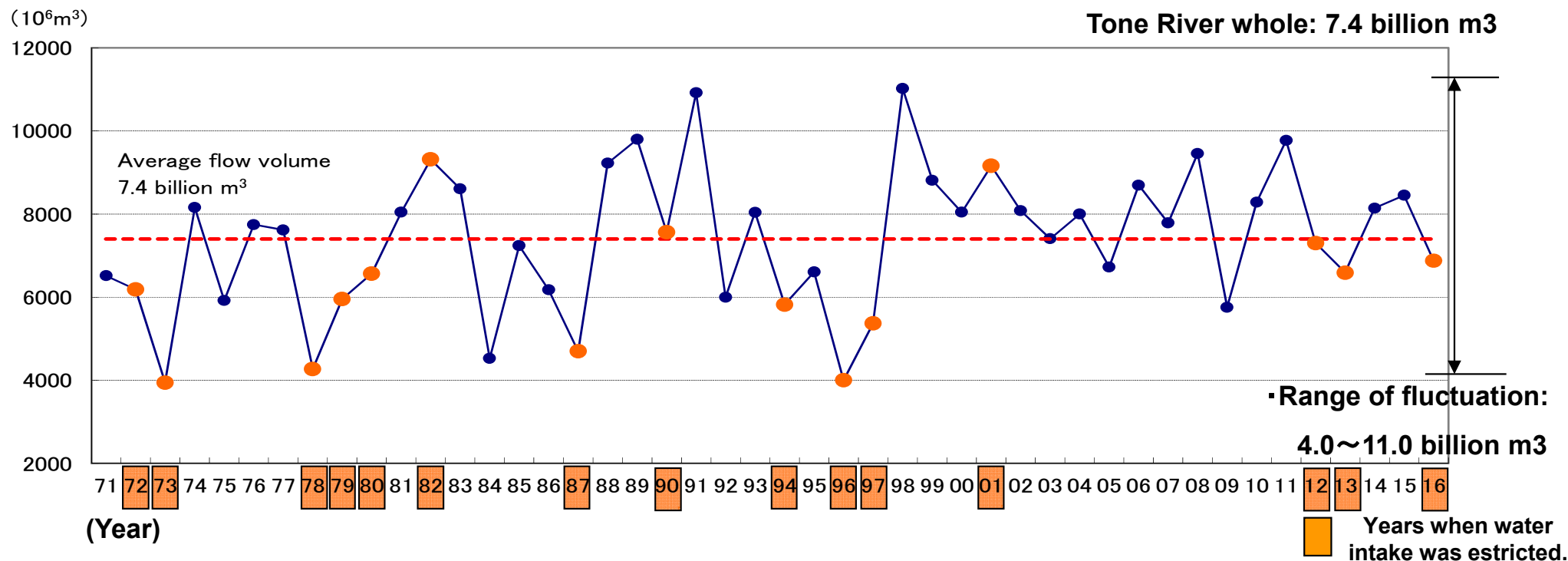
Days of restrictions on water intake from the Tone River



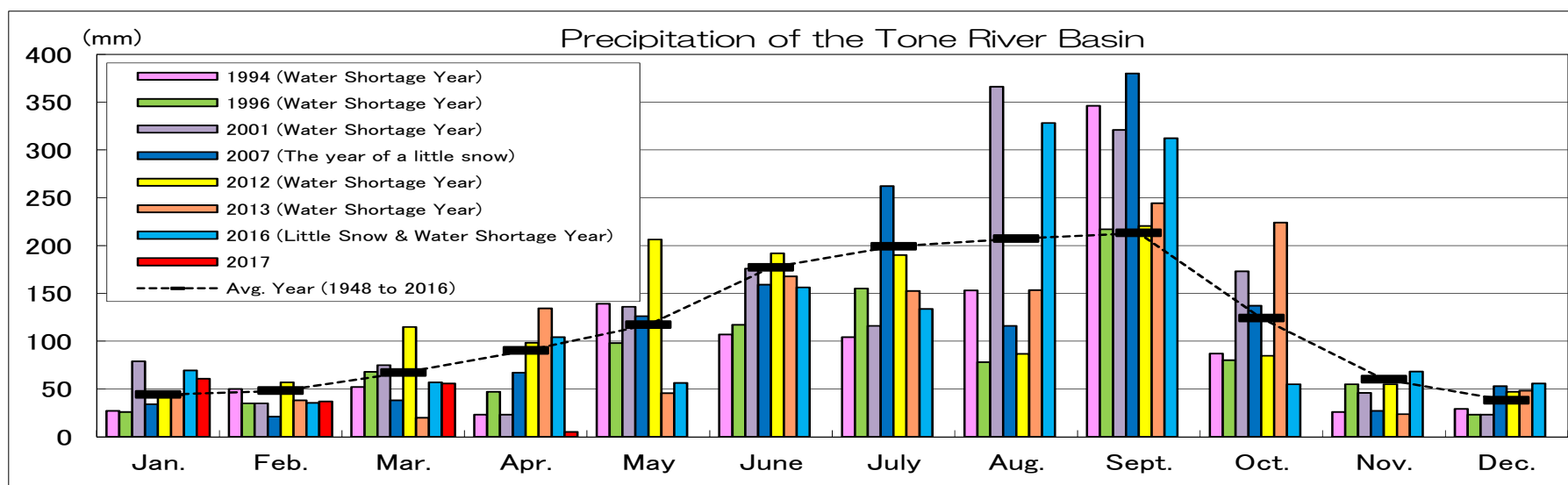
# Annual total volume of water discharged at Kurihashi

Annual total volume of water discharged at

Tone River whole: 7.4 billion m<sup>3</sup>



## Precipitation of the Tone River Basin





# Poundage of Eight Tone River Upstream Dams

