The Consistent Development in the Whole River System

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■ Consistent development of the whole river system

■ Integrated management of water resources in the Kiso River system

- History of hydropower development
- Improvement of the river flow
- Redevelopment of existing power plants

■ Integrated management of sedimentation in the Kurobe River system

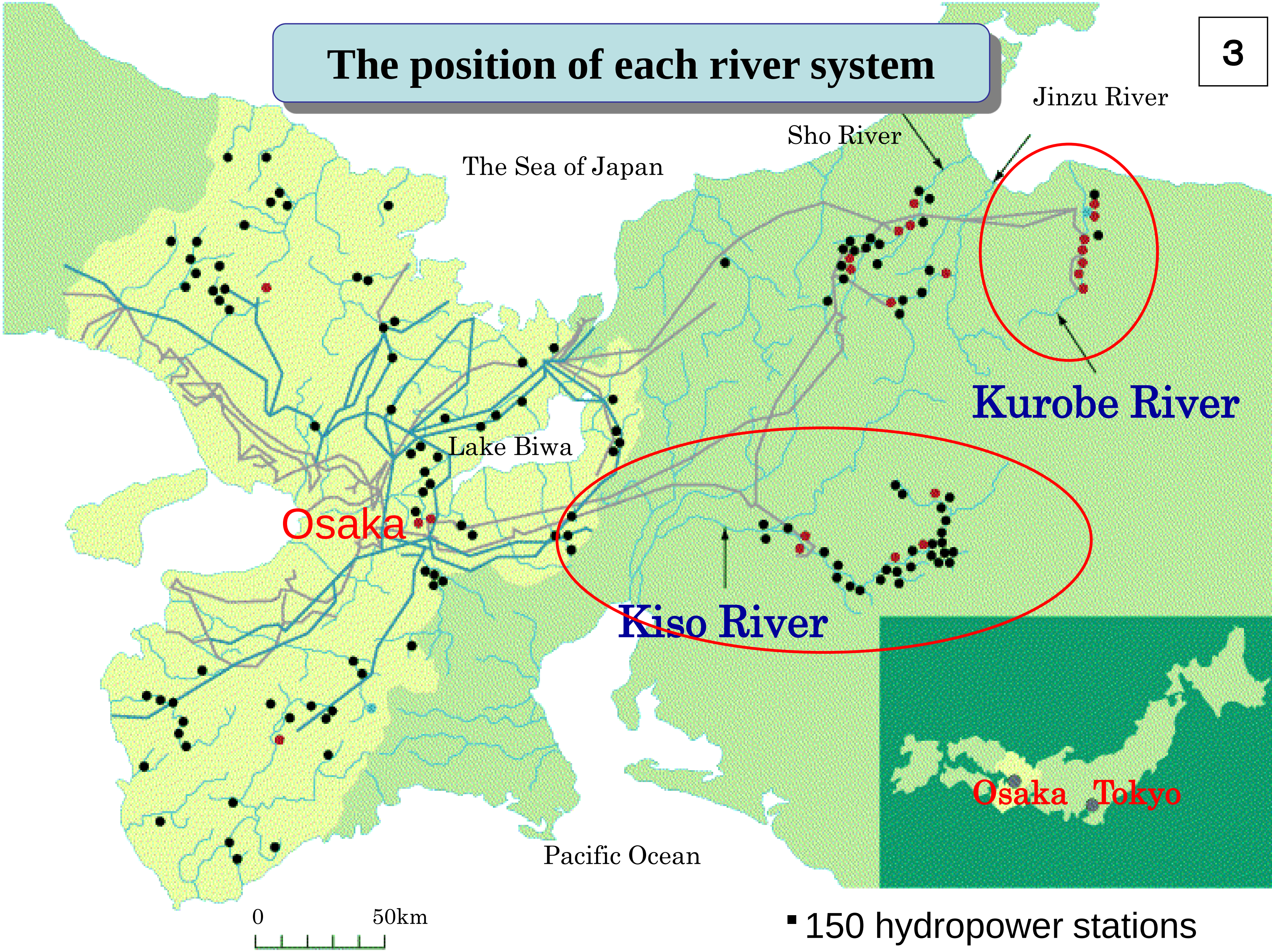
- Sediment
- Flushing Operation

Consistent development of the whole river system

The concept in Japan

**Consistent river-system development involves setting up a reservoir at the most upper-reach of the river system for improved river flow,
and making maximum use of the river's elevation head and water flow to achieve a large peak output across the whole river system.**

The position of each river system



- 150 hydropower stations

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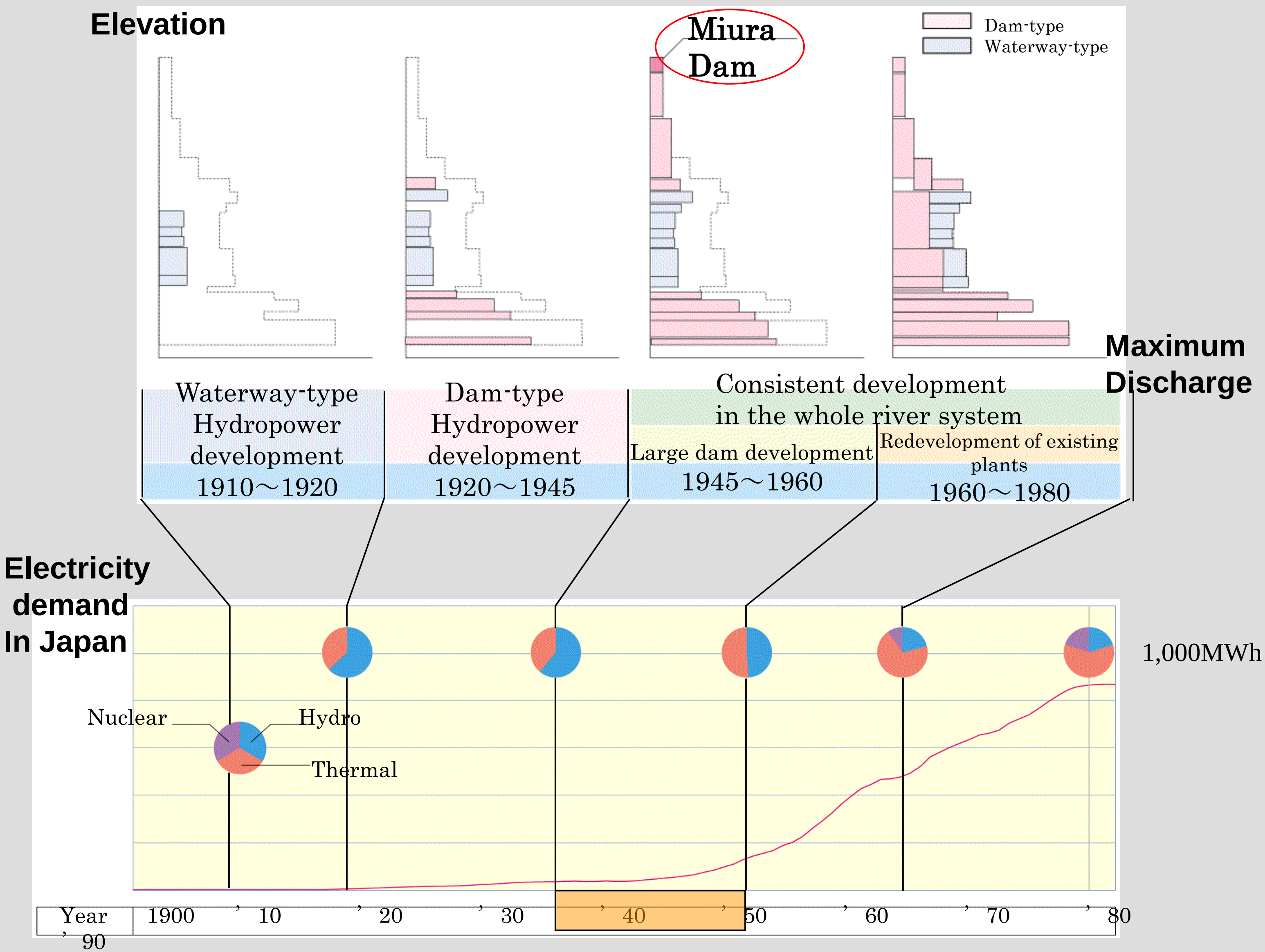
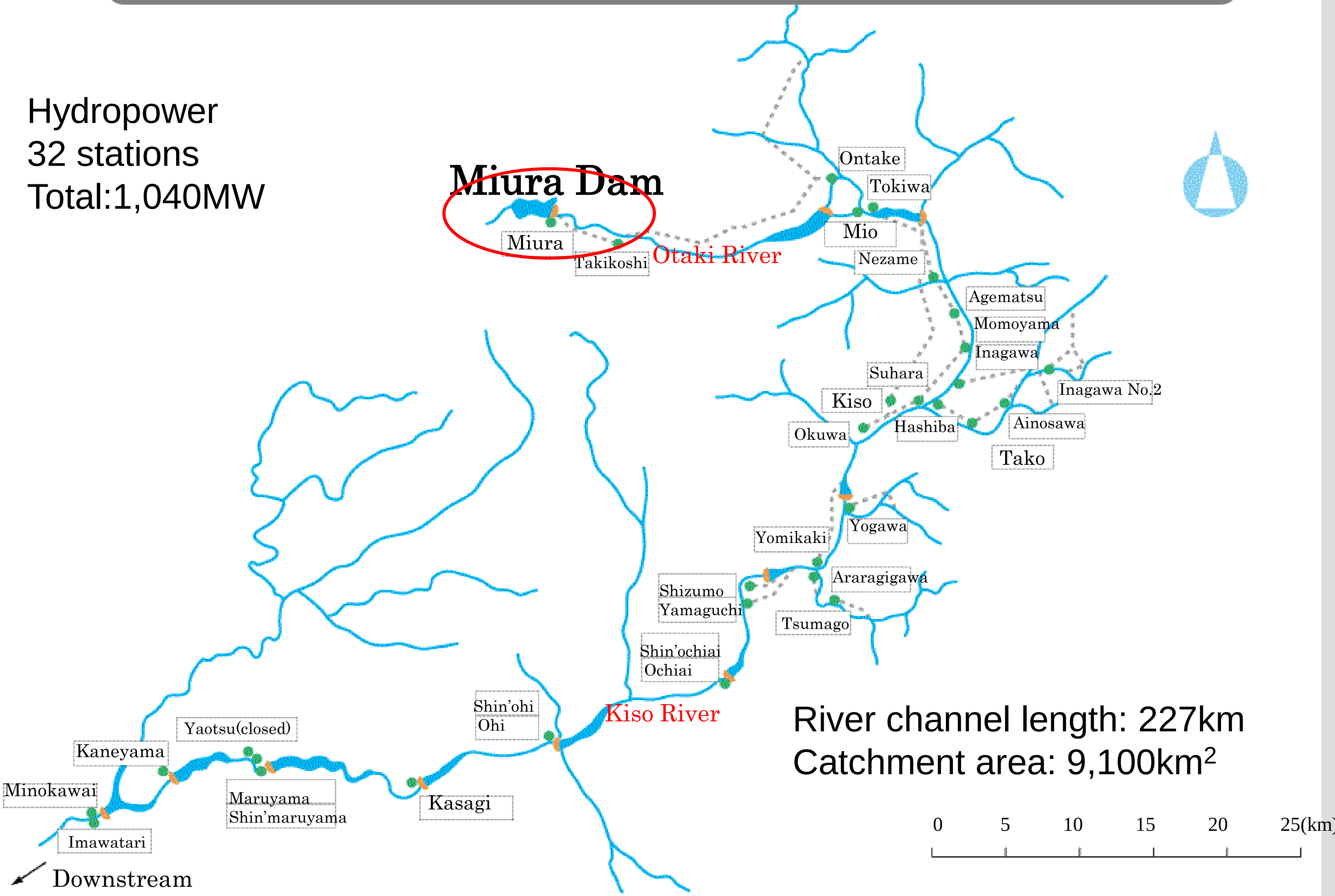
The history of hydropower development in the Kiso River



Hydropower Development in Kiso River System

Hydropower
32 stations
Total:1,040MW

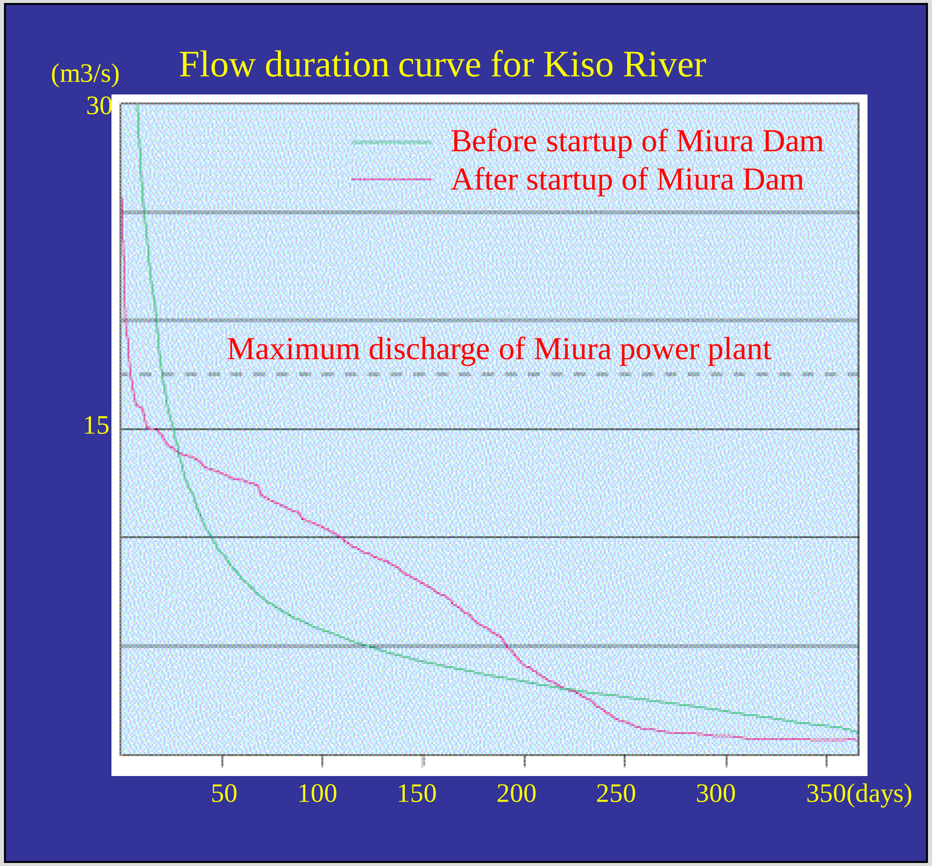


River channel length: 227km
Catchment area: 9,100km^2

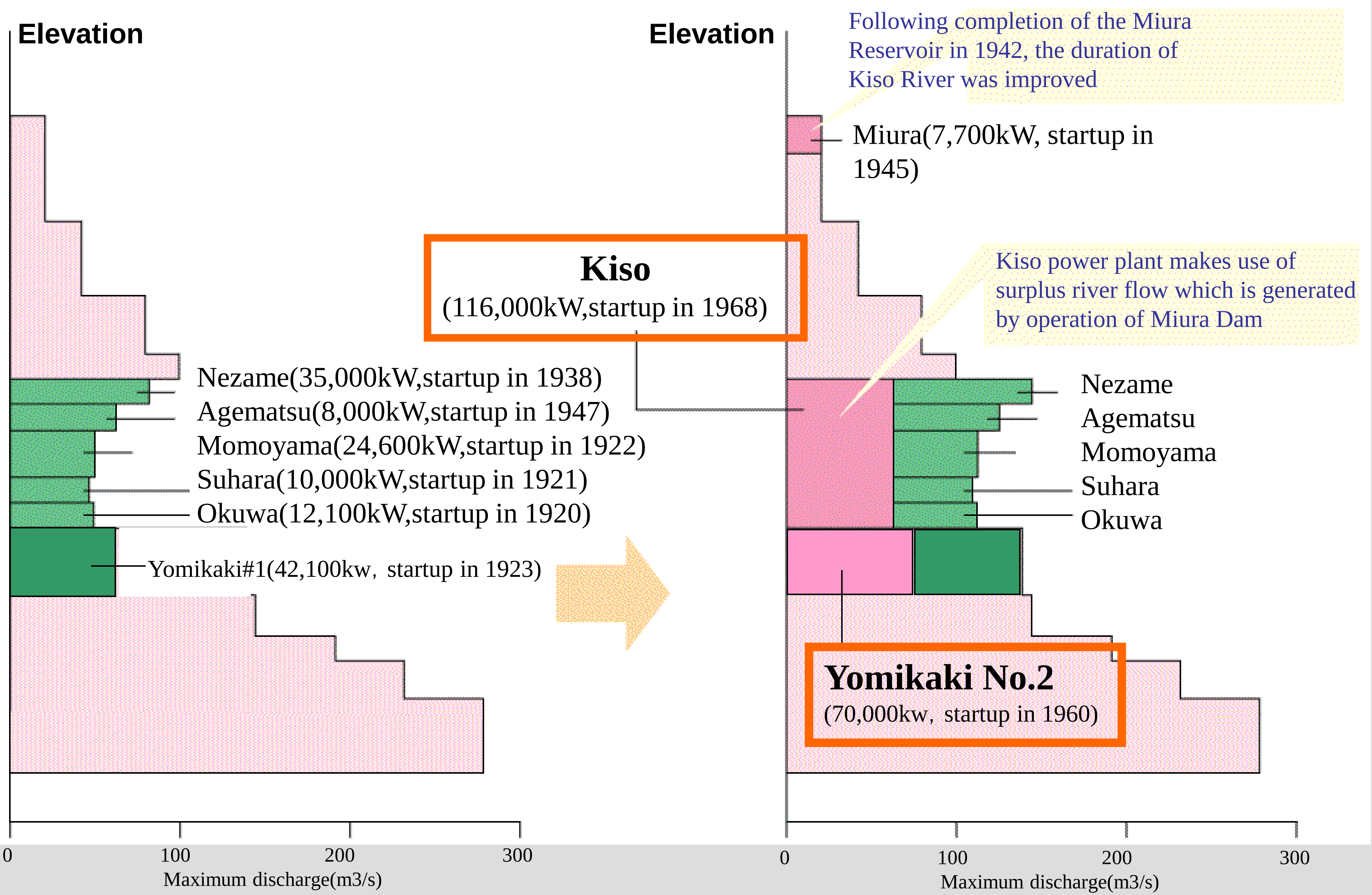
Miura power plant

Following the startup of Miura Dam, the annual river flow of Kiso river was improved as illustrated below

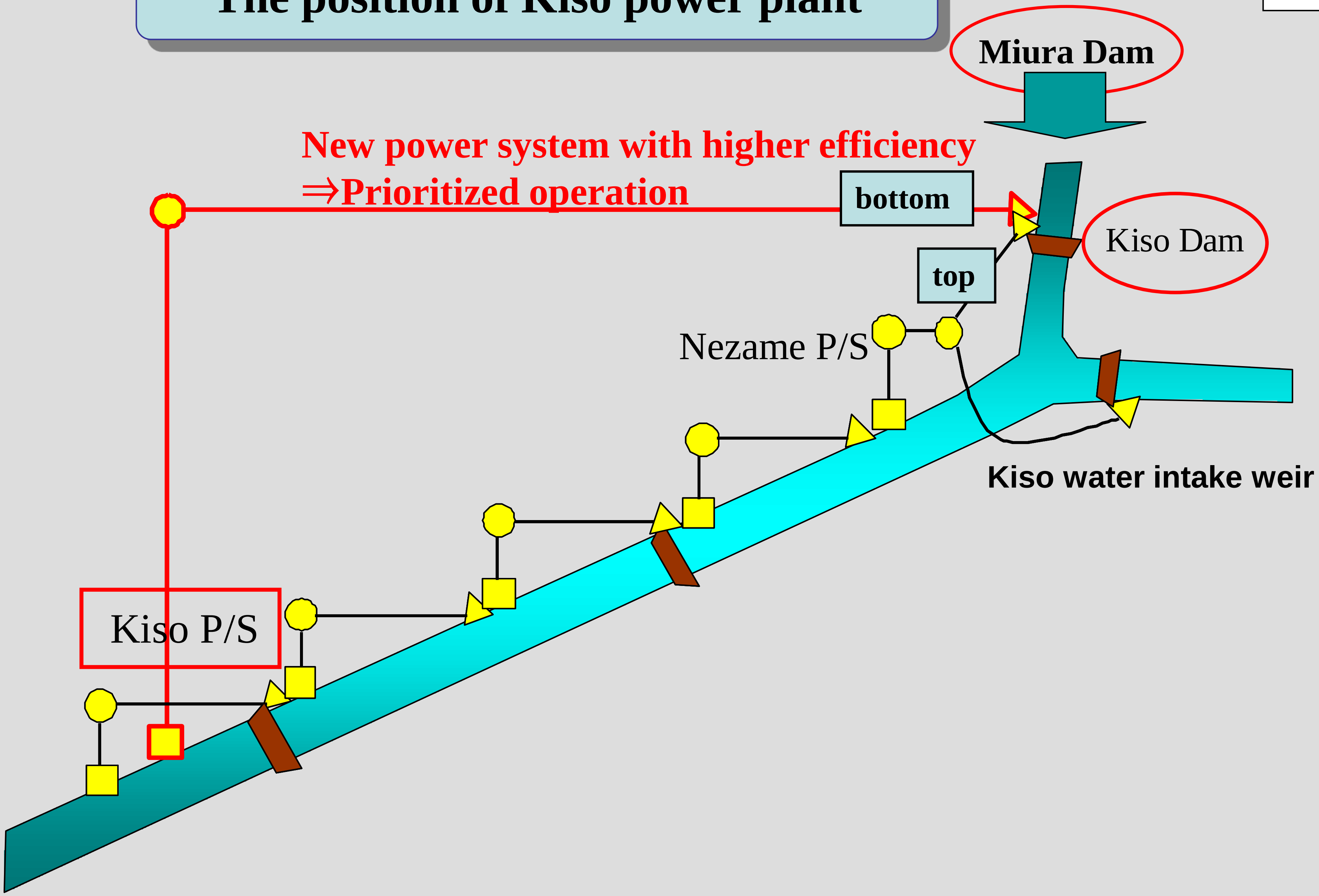
Miura Dam (Miura Power Plant)
Maximum output：7,700kW
Maximum discharge：17.5m3/s
Effective head：54.7m



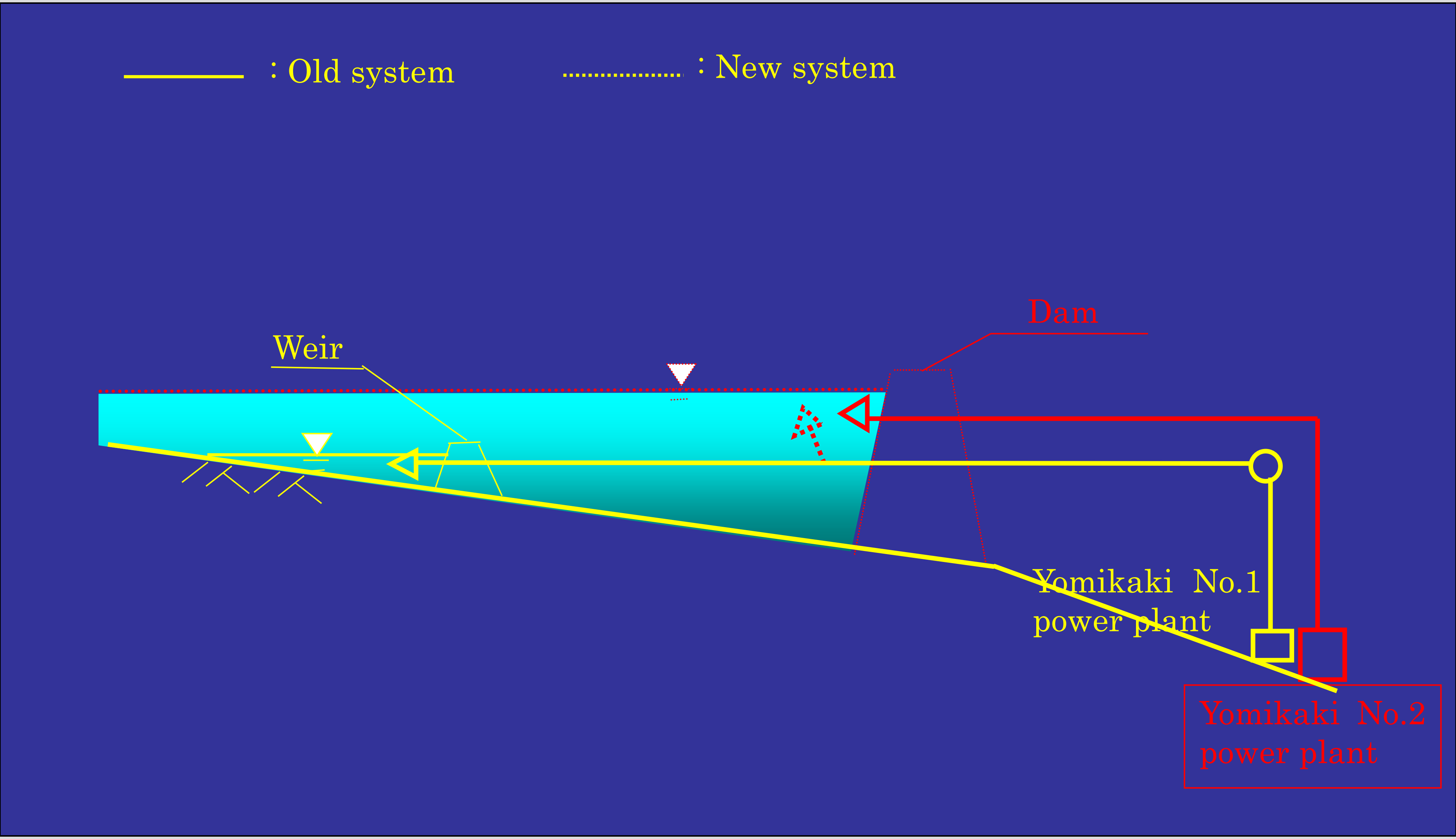
Redevelopment of hydropower plant, Kiso & Yomikaki P/S



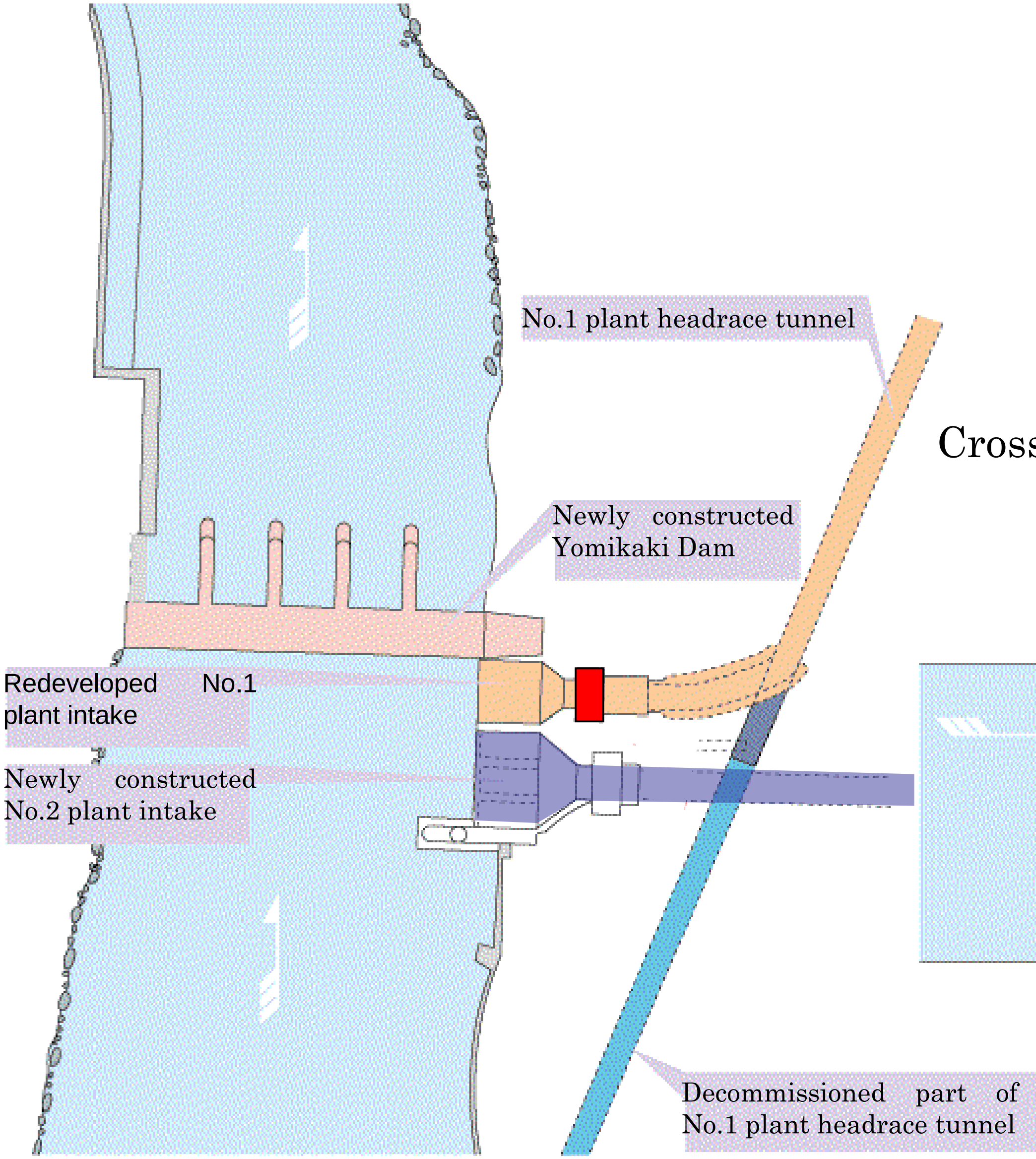
The position of Kiso power plant

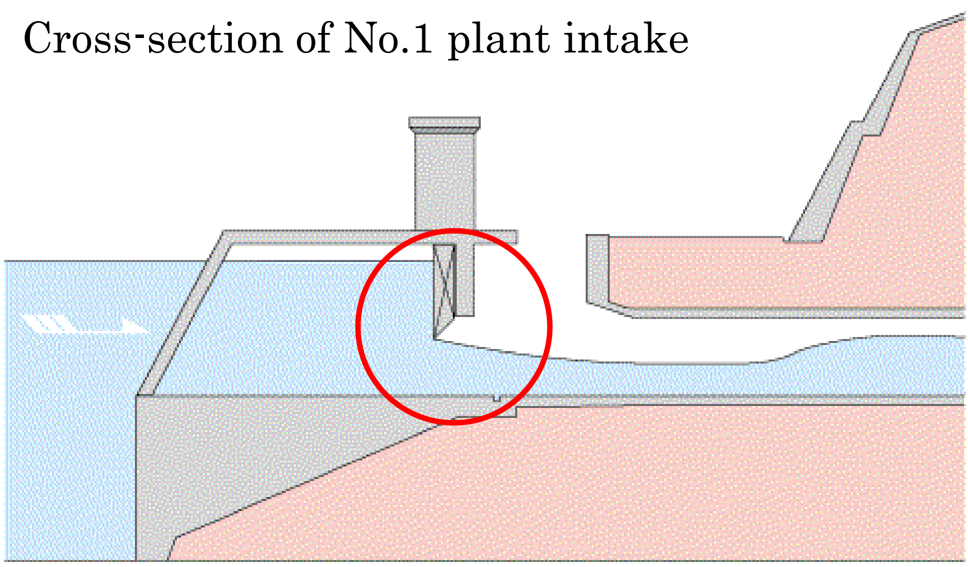


Development image of Yomikaki No.2 power plant



Optimal use of existing facilities





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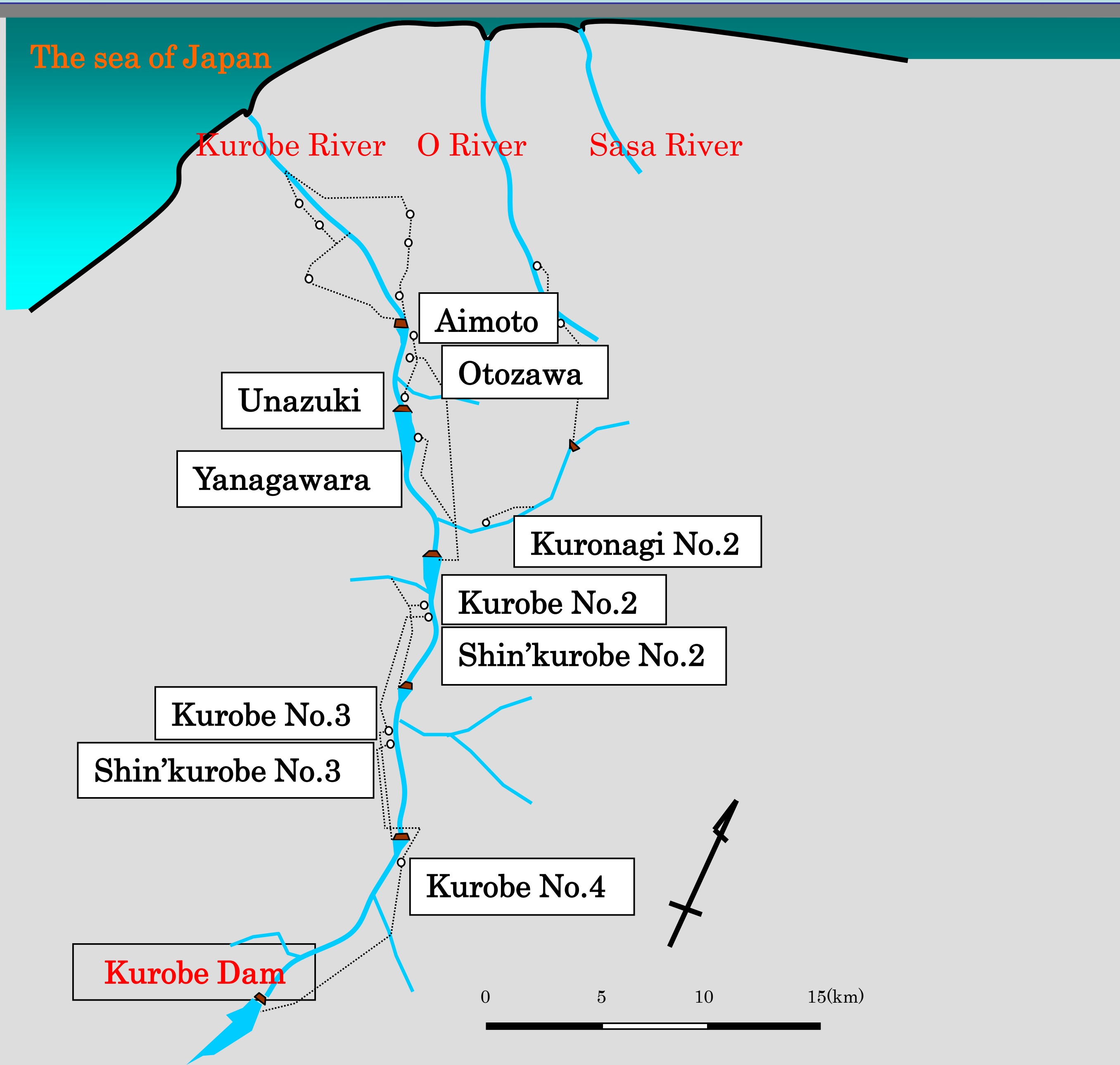
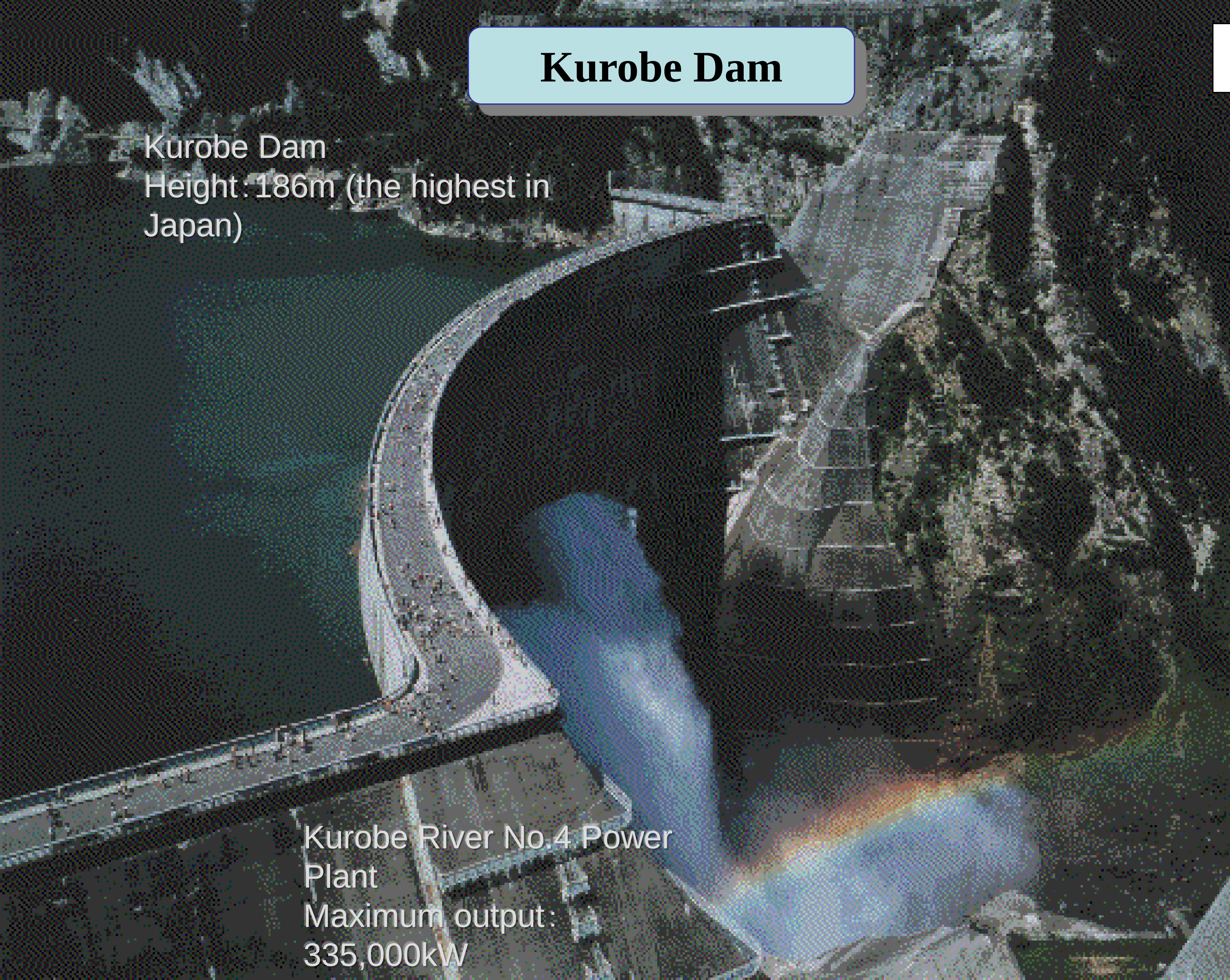
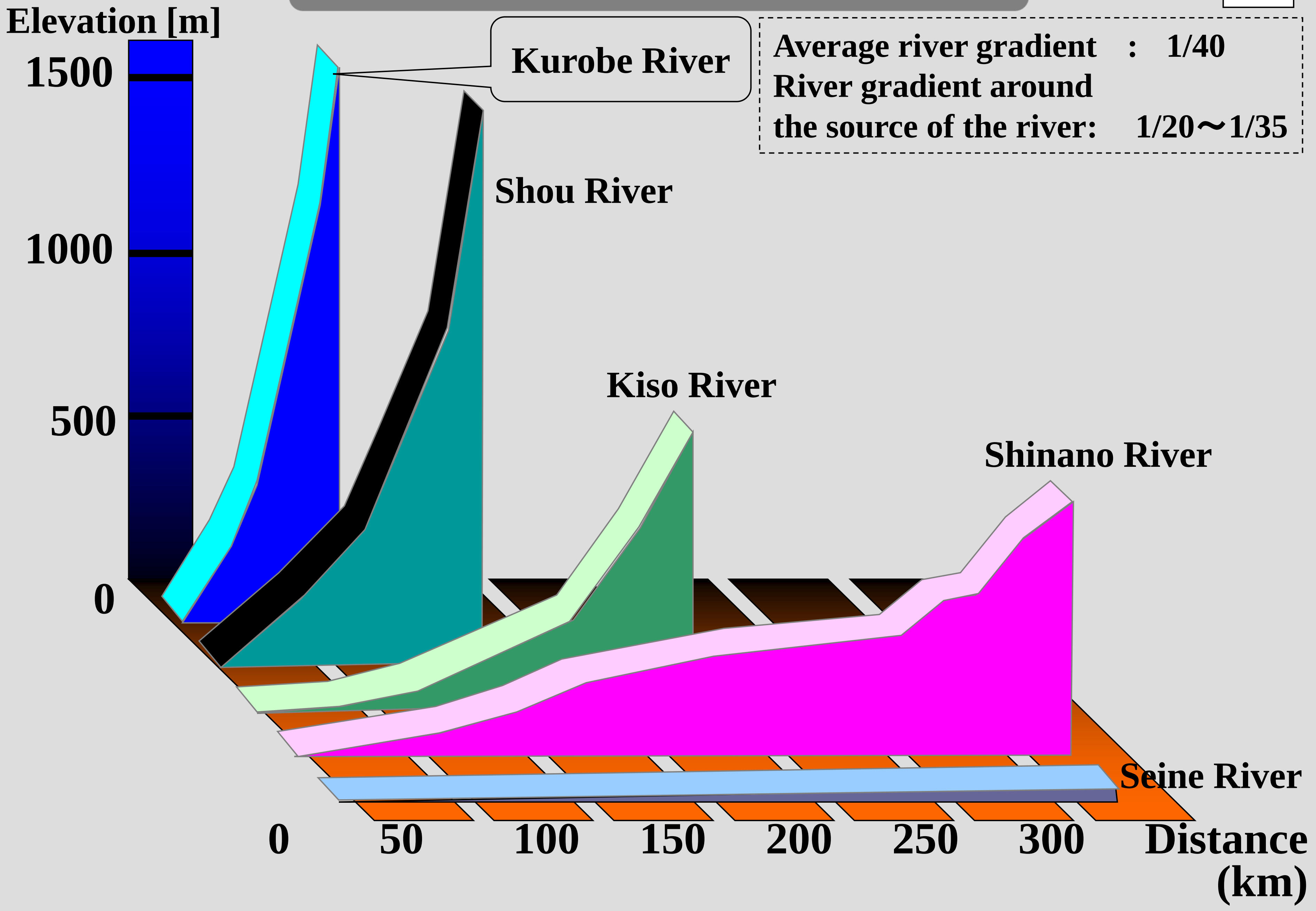
Hydropower development in the Kurobe River System




Kurobe Dam
Kurobe Dam
Height：186m (the highest in Japan)
Kurobe River No.4 Power Plant
Maximum output：335,000kW

River profiles



Background of flushing operation

Situation

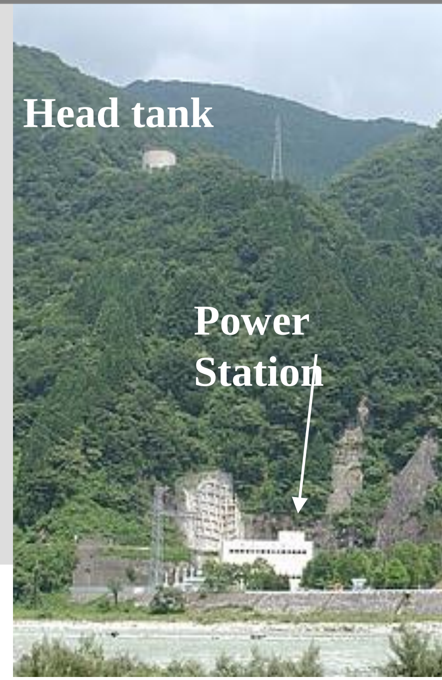
- The amount of inflowing sediment into dams is huge compared with reservoir capacities.
- It is difficult to transport excavated or dredged materials to the downstream under the conditions of steep gorge.

Blocking the flow of sand and soil causes
■raising the riverbed at the upstream
■lowering the riverbed or coastline set back at the downstream

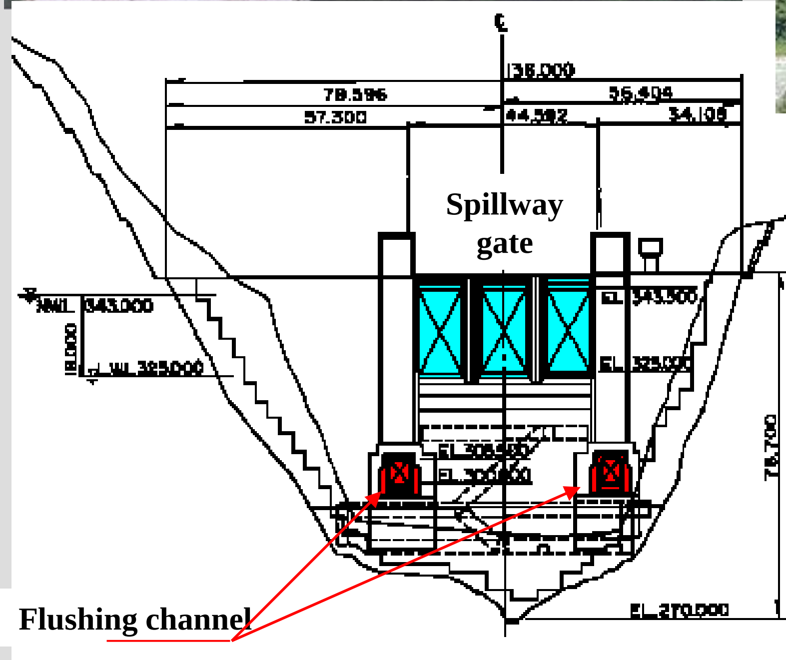
↓

A more comprehensive soil management approach is needed.

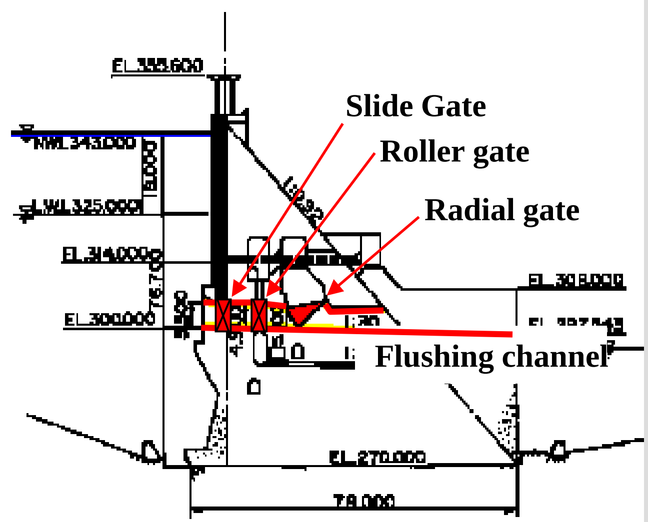
Outline of Dashidaira dam



Catchment area	$461.18\ km^2$	
Power Plant	Name	Otozawa
	Maximum Output	124MW
Dam	Type	Concrete gravity
	Height	76.7m
	Length	136.0m
Reservoir	Total Capacity	$9.01 \times 10^6\ m^3$
	Effective Capacity	$1.66 \times 10^6\ m^3$
	Operation area	18m
Flushing channel	Number	2
	Area	5.0 x 5.0m
Flushing gate	Upstream	Slide gate
	Center	Roller gate
	Downstream	Radial gate

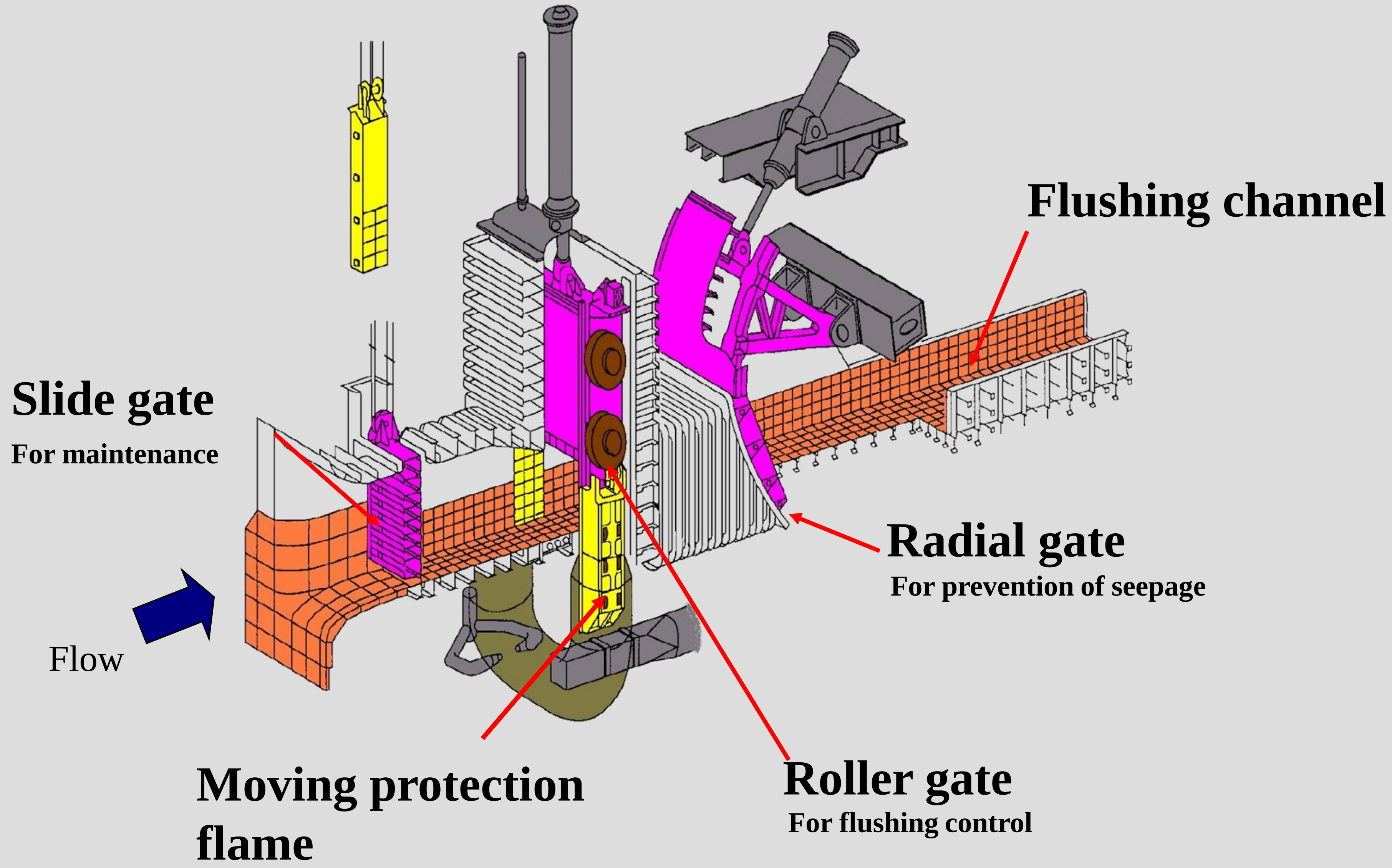


Upstream



Longitudial section

Outline of flushing facilities

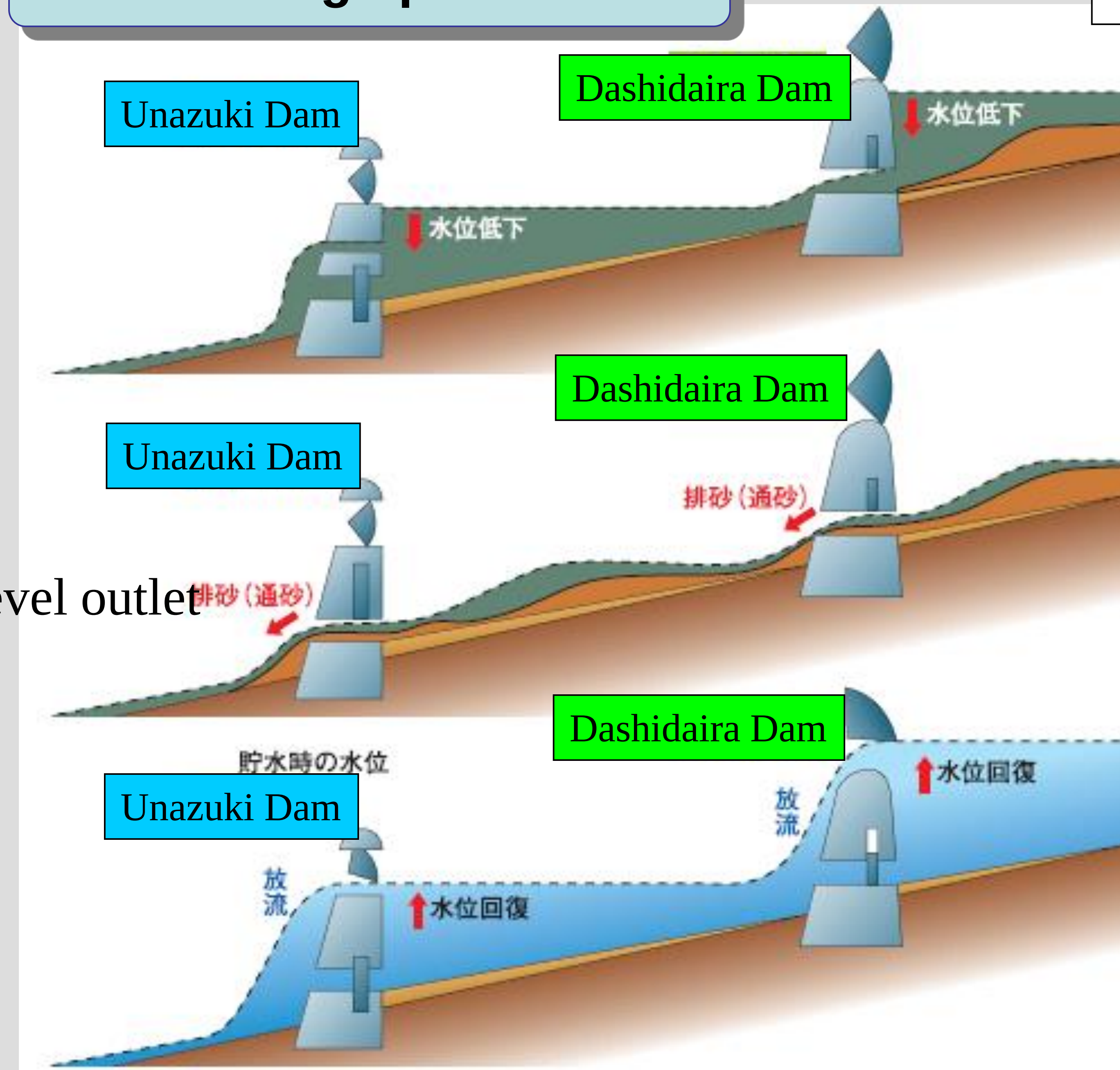


Flushing operation

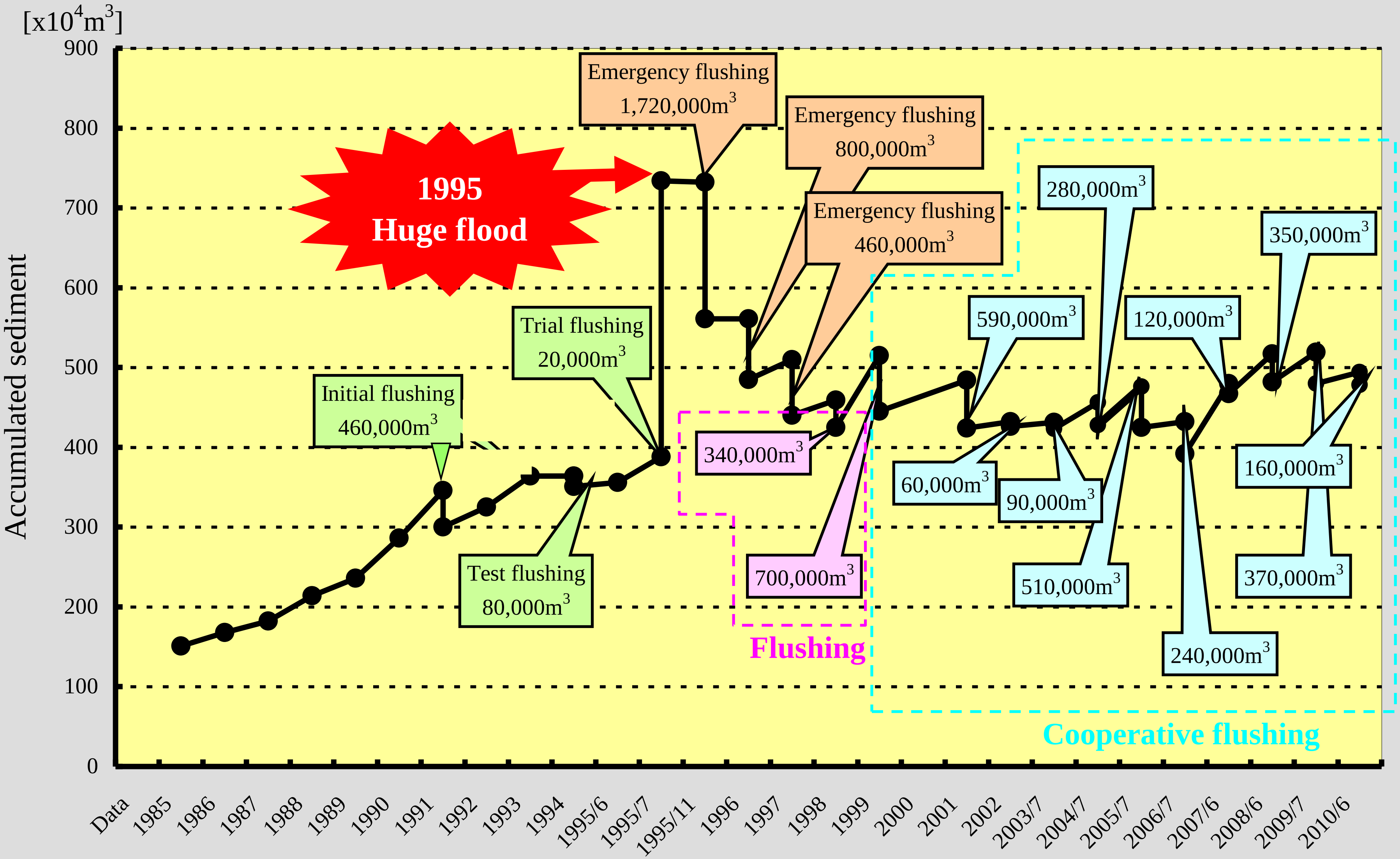
Drawdown

Flushing
through a low-level outlet

Refill



Sedimentation volume of Dashidaira reservoir



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