JWA and Its Experience

on River Basin Management

Japan Water Agency (JWA)

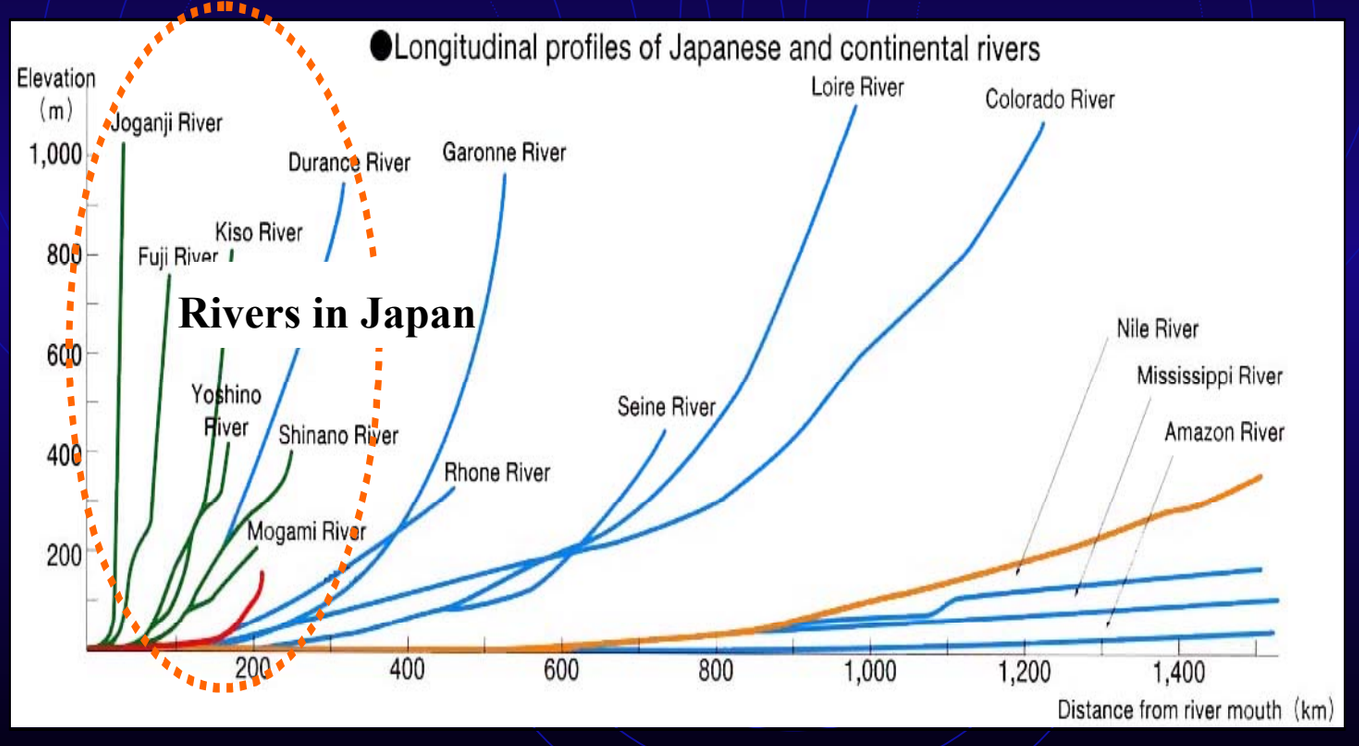
JWA's Experience in River Basin Management

1) Necessity of integrated water resources development in Japan
2) Severe water shortage during the hyper-growth period
3) Establishment of two laws regarding water resources development:
   - Water Resources Development Promotion Law
   - Water Resources Development Public Corporation Law
4) Outline of WARDEC operations
5) Case Study: Resolving the Desertification of Tokyo (The Tone Canal Project)
6) Financing WARDEC projects

Necessity of Integrated Water Resources Development in Japan

- Rainfall varies regionally and seasonally.
- Sites suitable for water resources development are limited due to geological and geographical constraints.
- Water resources development projects need to consider both flood control and water utilization.
- Projects require a long work period to complete.
- Projects must be carried out comprehensively and cost-effectively.

Longitudinal Profiles of Rivers in Japan and Continents

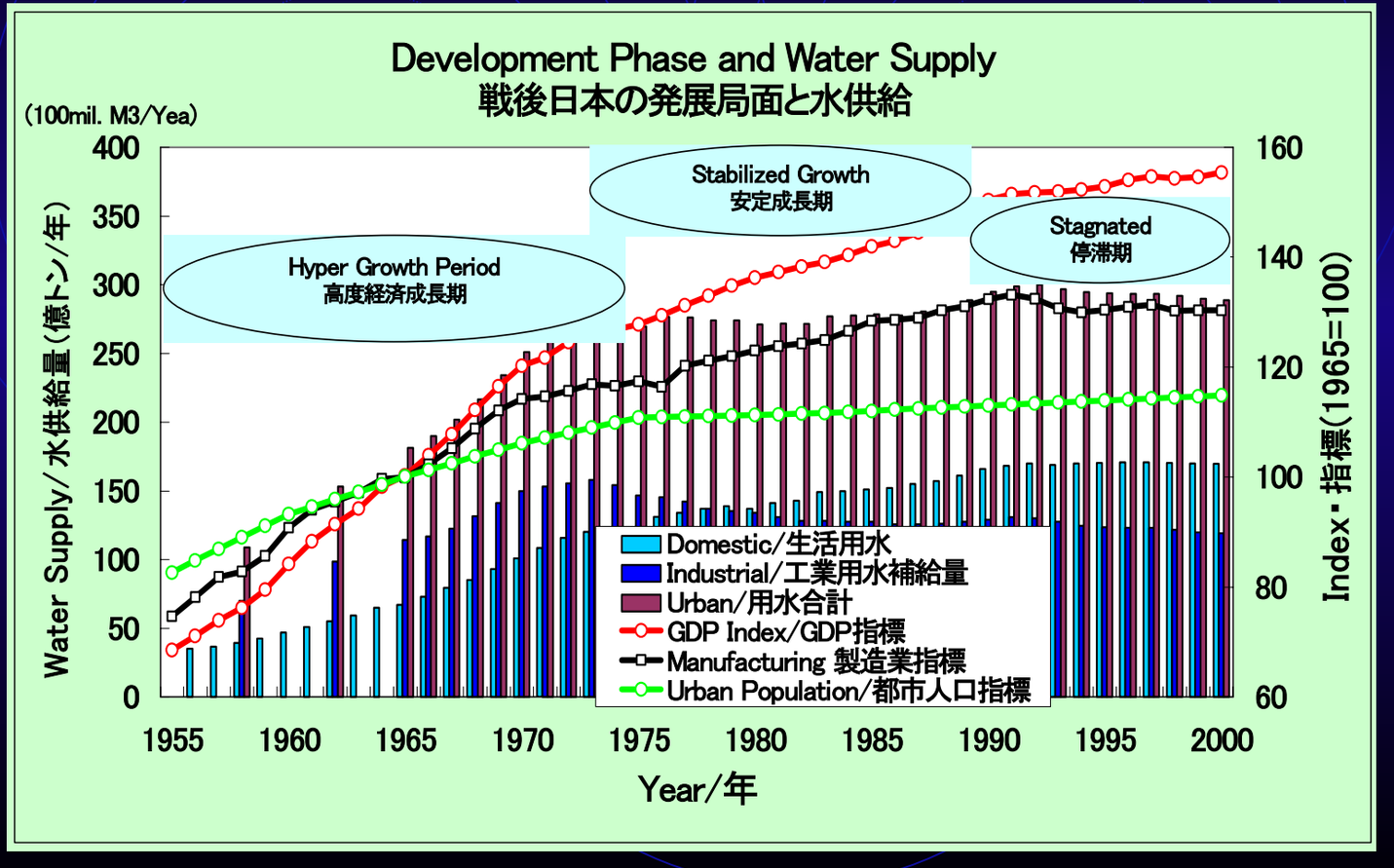



Precipitation (Snowfall)
Precipitation (Rainfall)
Snow Clearance and Melt Water
Irrigation Water (Cultivated Fields)
Fill Dam
(Rockfill Dam)
Concrete Dam
(Arch Dam)
Development of Lake
Fish Farming Water
Irrigation Water (Paddy Fields)
Intake Weir
Drinking Water
Supply System
Industrial Water
Water for Environment
Household Water
Estuary Barrage
Water Purification Plant
Aquifer
Utilization of Thermal Energy of Water
Evaporation (River Water, Sewage Treatment Works, River Water Stored by Dams, etc.)
Reclaimed Water
for General Purposes
Utilization of Rain Water
(Water for City Use)
Desalination of Sea Water
Sewage Treatment Works

Water Shortages in The Mid-1950s

- Sharp increase in domestic and industrial water demand from the mid-50s.
- Remarkable industrial growth.
- Centralization of population in the cities.
- Improvement of living standards.
- To resolve water shortages, an organization needed to be established.

Development Phase and Water Supply in Japan from The Mid-1950s



A Single Organization Instead of Four

- Four ministries suggested four different organizations.
  - Ministry of Construction: Water Resources Development Organization
  - Ministry of Agriculture and Forestry: Water Supply Development Management Public Corporation
  - Ministry of Health and Welfare: Water Service Public Corporation
  - Ministry of International Trade and Industry: Keiyo Industrial Development Public Corporation
- The Ministry of Construction's plan was selected.

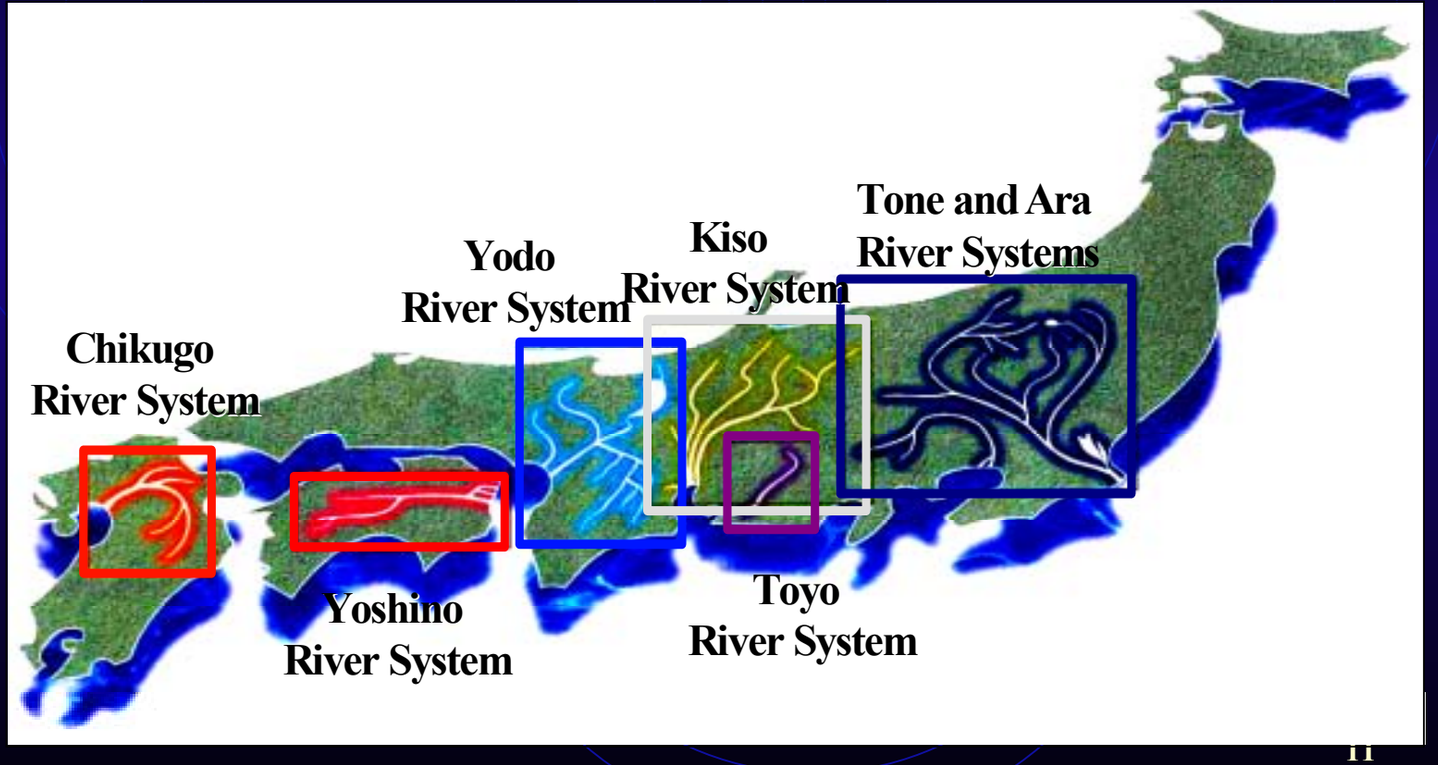
Establishment of Two Laws Regarding Water Resources Development

- Water Resources Development Promotion Law
- Water Resources Development Public Corporation Law

Water Resources Development Promotion Law

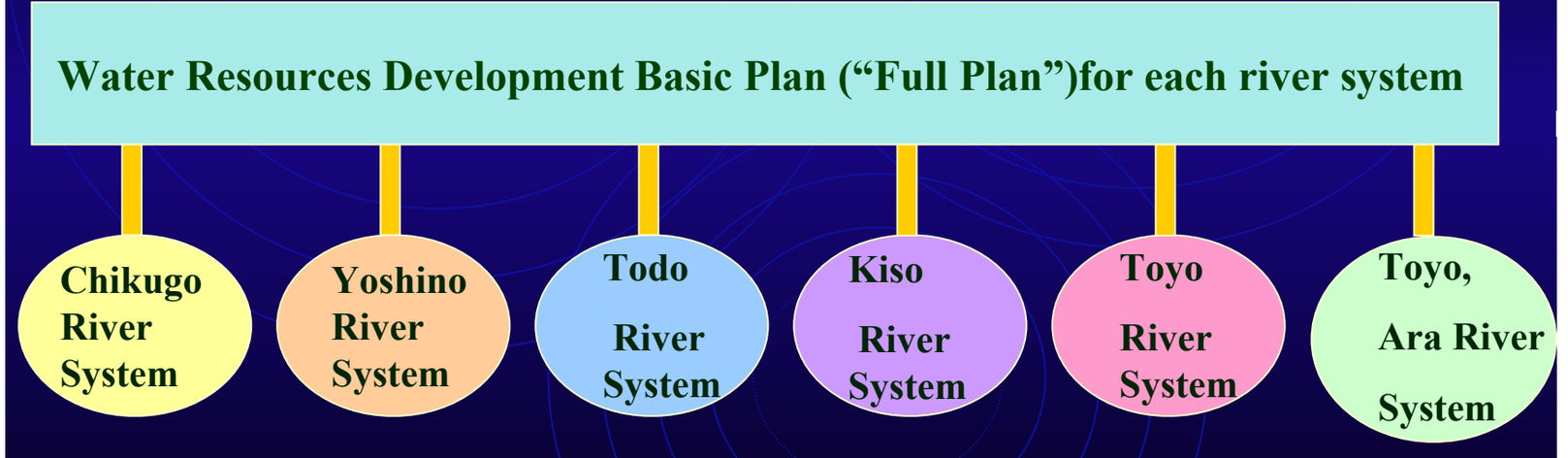
- Designation of Water Resources Development River Systems
- Seven river systems encompassing areas that form Japan's socio-economic centers:
  - Tone and Ara
  - Kiso and Toyo
  - Yodo
  - Yoshino
  - Chikugo

Designated Seven River Systems



Water Resources Development Promotion Law

- River systems in need of water resources development



Basic Plan for Water Resources Development ("Full Plan")

- Estimation of water demand in a river system in the future (broken down by usage type)
- Supply goals
- Outline of facilities

Water Resources Development Public Corporation Law

- Water Resources Development Public Corporation (WARDEC, now JWA) was established in 1962.
- Responsibility to construct and manage water resources development facilities.
- Dams, estuary weir, water-level control facilities for lakes.
- Canals.

Ministers Who Oversee WARDEC

- WARDEC is supervised by different ministers depending on the purpose of the projects:
  - Flood control: Minister of Land, Infrastructure and Transport
  - Domestic water: Minister of Health, Labor and Welfare
  - Industrial water: Minister of Economy, Trade and Industry
  - Agricultural water: Minister of Agriculture, Forestry and Fisheries

Activities of WARDEC

1.Water Resources Development Promotion Law

Water Resources Development Basic Plan ("Full Plan") for each river system

2.Water Resources Development Public Corporation Law

WARDEC's activities

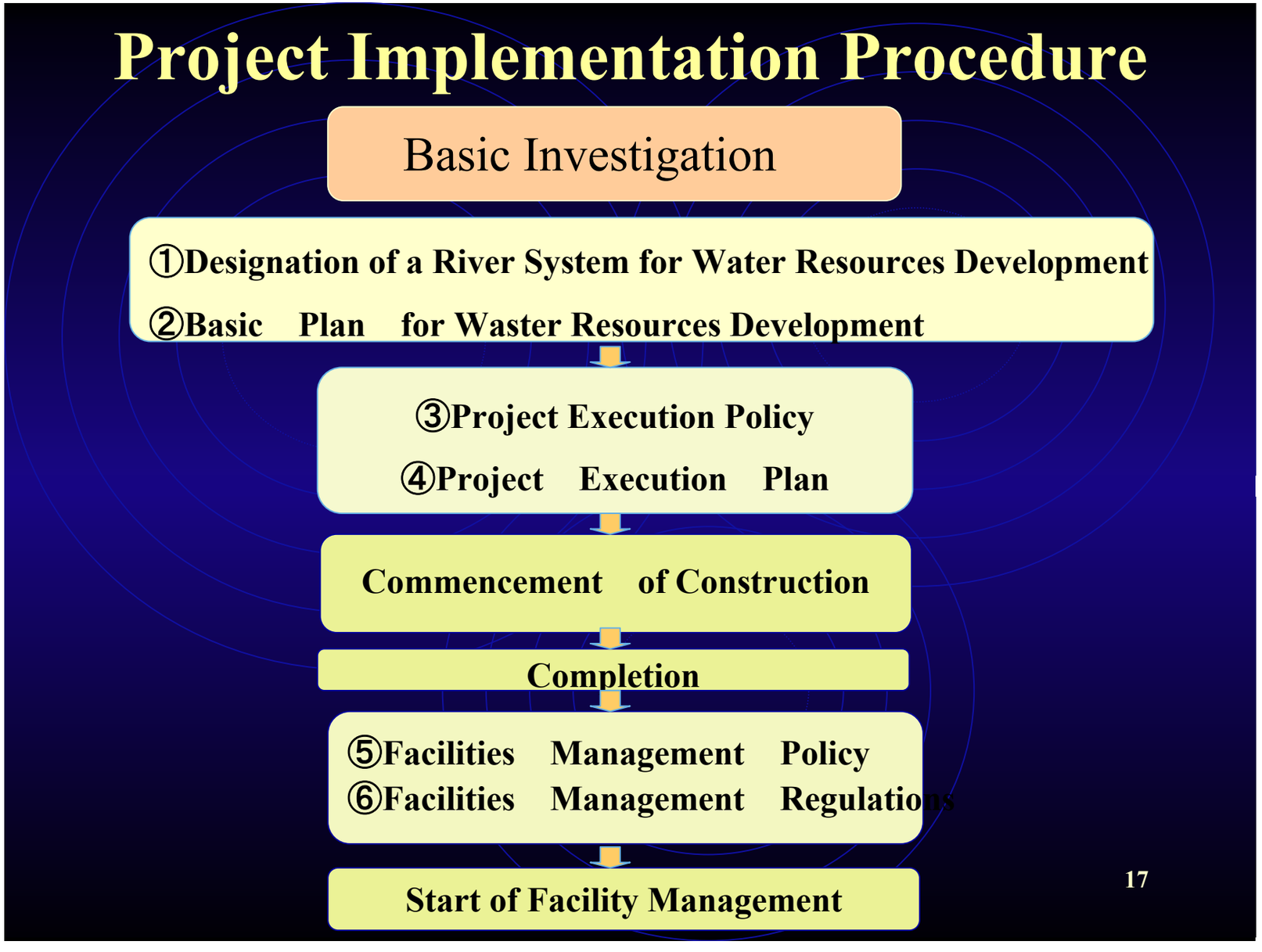
New construction and reconstruction of *Water Resources Development Facilities* and operation of completed facilites

Water supply
- **Domestic Water**
- **Industrial Water**
- **Irrigation Water**

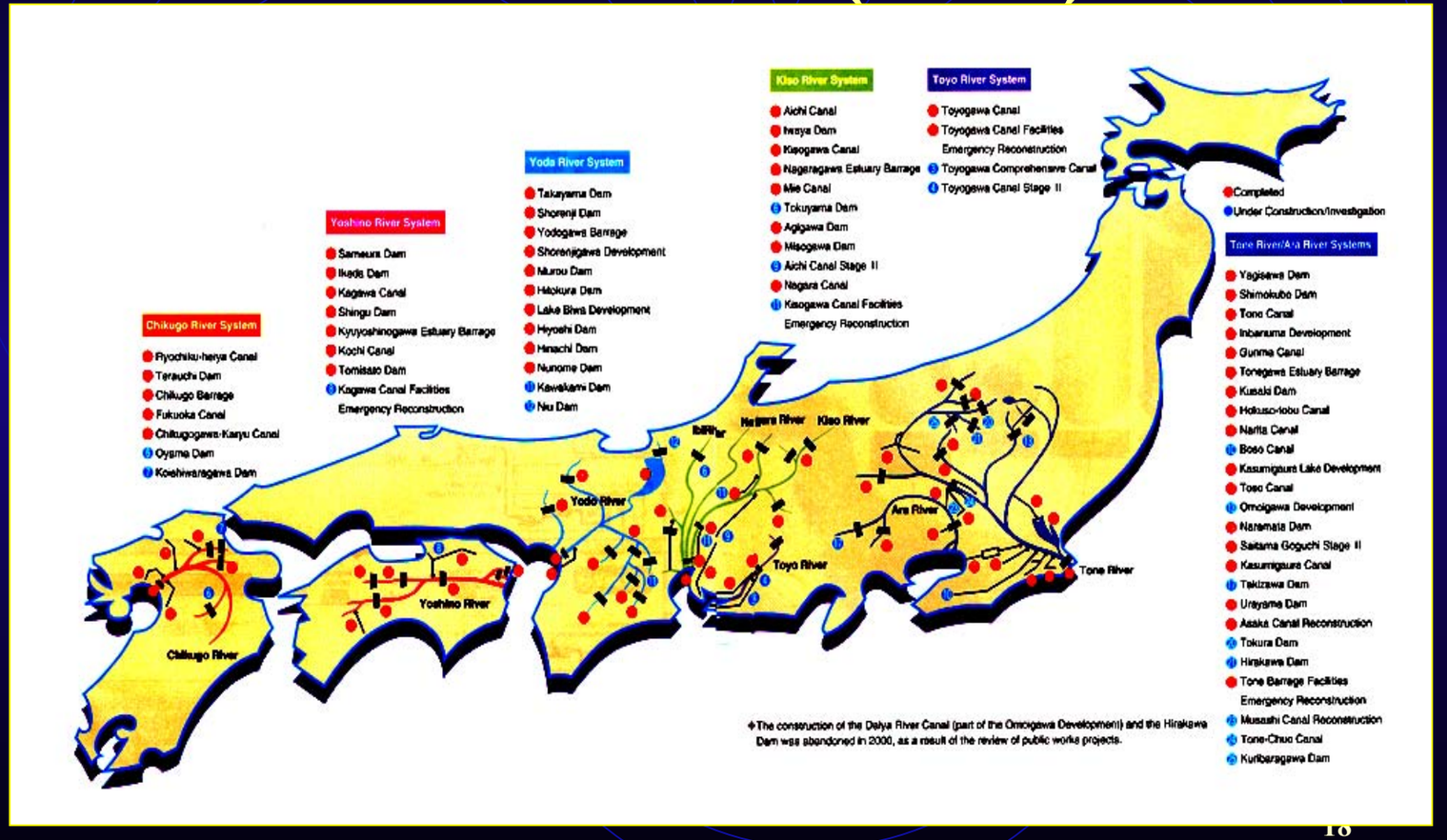
Flood control

Ministers supervising WARDEC's activities

Project Implementation Procedure



Project Enforcement Situation of WARDC (2001)



Status of WARDEC Projects

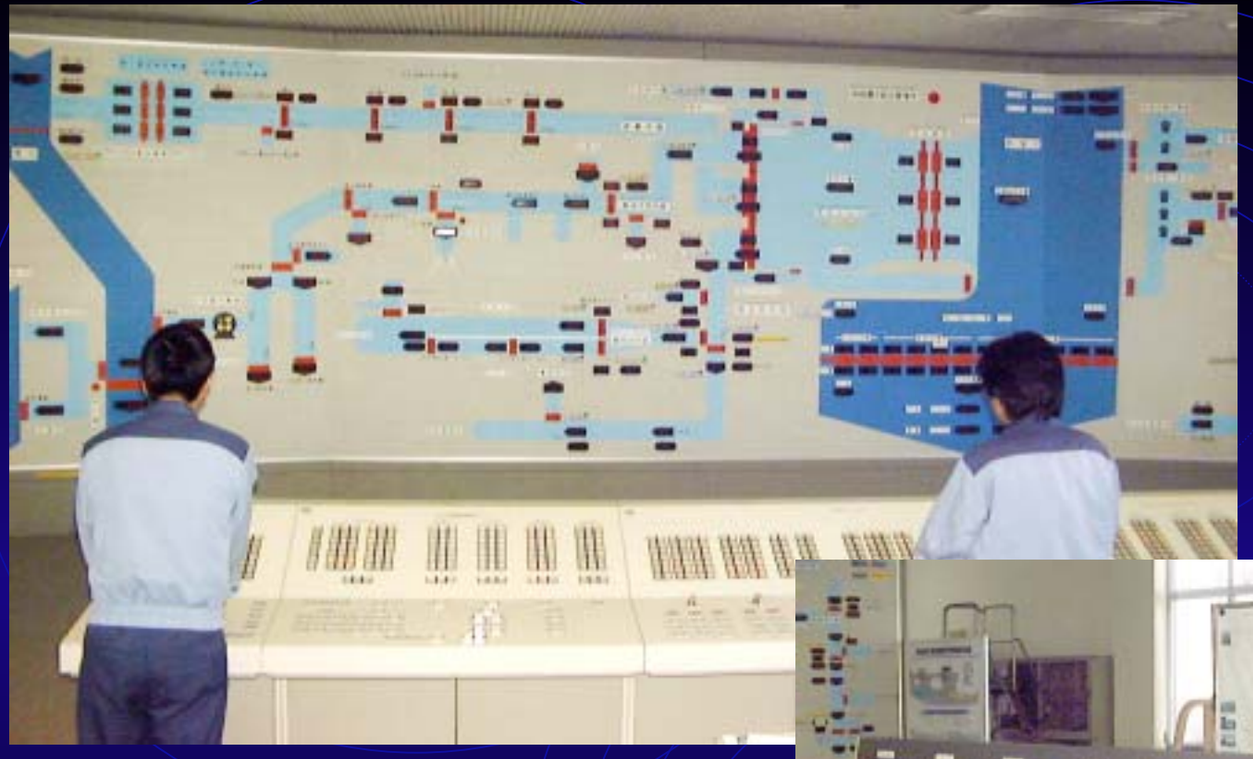
- The seven river systems cover only 16% of the national land.
- However, these river systems serve 50% of Japan's population and of its industrial shipments.
- Manage over 50 completed projects.
- 15 projects under construction/investigation.
- 362 m^3/s has been created by WARDEC
- (90% of newly developed total volume in the whole country)

Yagisawa Dam

Lake Biwa Development

Aichi Canal

Nagaragawa Estuary Weir



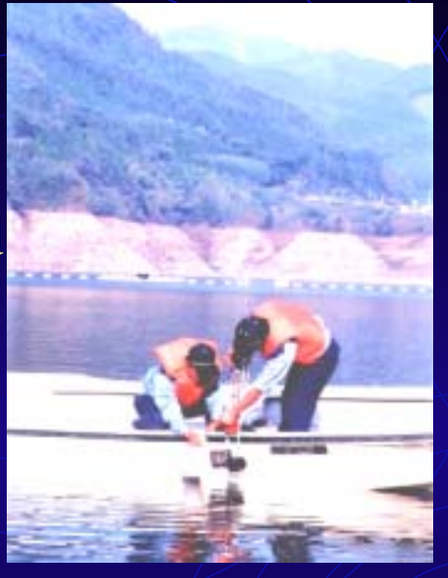
Graphic Panel and Main Computer

Opration Room in The Tone Canal Control Center

Monitors for Facilities

Observation of Dam and Reservoir

Inspection of water quality and Dam Safety



Open to The Public

Open Reservoir

Open Exhibition Room （in dam body)

Water Park (dam lakeside)

Canoe Play (open reservoir)

Conservation of Environment

Conservation of Ohmurasaki (giant purple)

（Ohmurasaki：Japanese national butterfly）

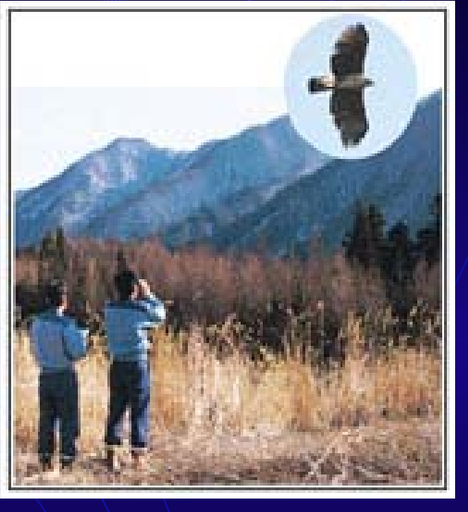
●Enoki (nettle tree) which Ohmurasaki chrysalis ate were transplanted in order to conserve Ohmurasaki which is valuable butterfly.

（After 1 year and 9 months）

Creation of Wetlands

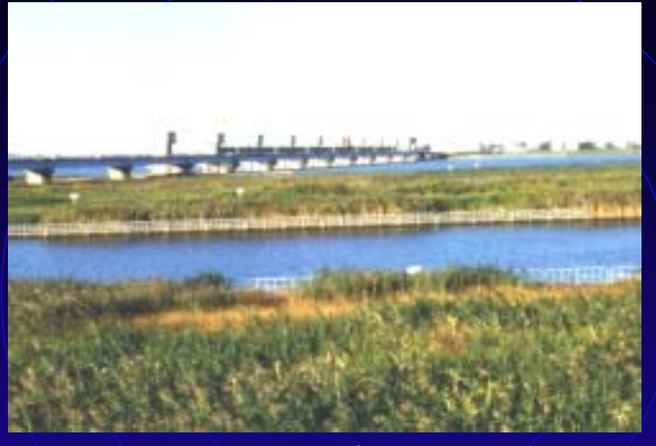
●Wetlands filling by dam reservoir, new wetlands were created outside dam reservoir.

Conservation of Endangered Raptors



●For conservation of rare birds of prey such as raptors, JWA surveys situation of inhabiting and breeding and conserves environment of inhabiting and feeding.

Fishway



Estuary Weir

Natural Brook-like Fishway

Inducing-type Fishway

Upstream Migration of Fish (Aye)

Conservation of Water Quality

Hypolimnion Aeration (front)
and Surface Aeration (back)

Epilimnion Aeration

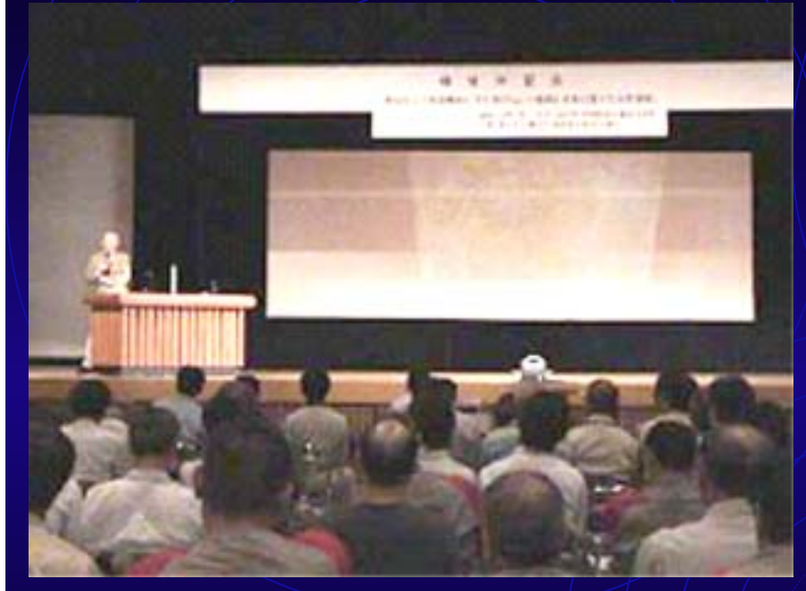
Reed Colony for Water Purification

Separative Curtain

Quarry Site for
Rock Material

Revegetation on
Excavated Slopes

Reforestation in Disposal Area



Environment Learning on Ecology of Animate Beings in Caves for Citizens

Lecture Meeting for Citizens

From WARDEC to JWA

- WARDEC had made many contributions to the nation's growth for over 40 years.
- However, the needs and demand/supply conditions for water resources have changed significantly over the years.
- To meet the new requirements, we decided to make a new start as Japan Water Agency, an incorporated administrative agency, as of October 1, 2003.

JWA's Corporate Philosophy

- Providing steady and inexpensive high quality water safely to communities, along with proactively contributing to the preservation of the water environment in basins and invigoration of communities.

The End

We Appreciate All Your Kind Attention

Case Study: The Tone Canal Project and the Resolution of the Desertification of Tokyo

Outline of the Tone River Basin

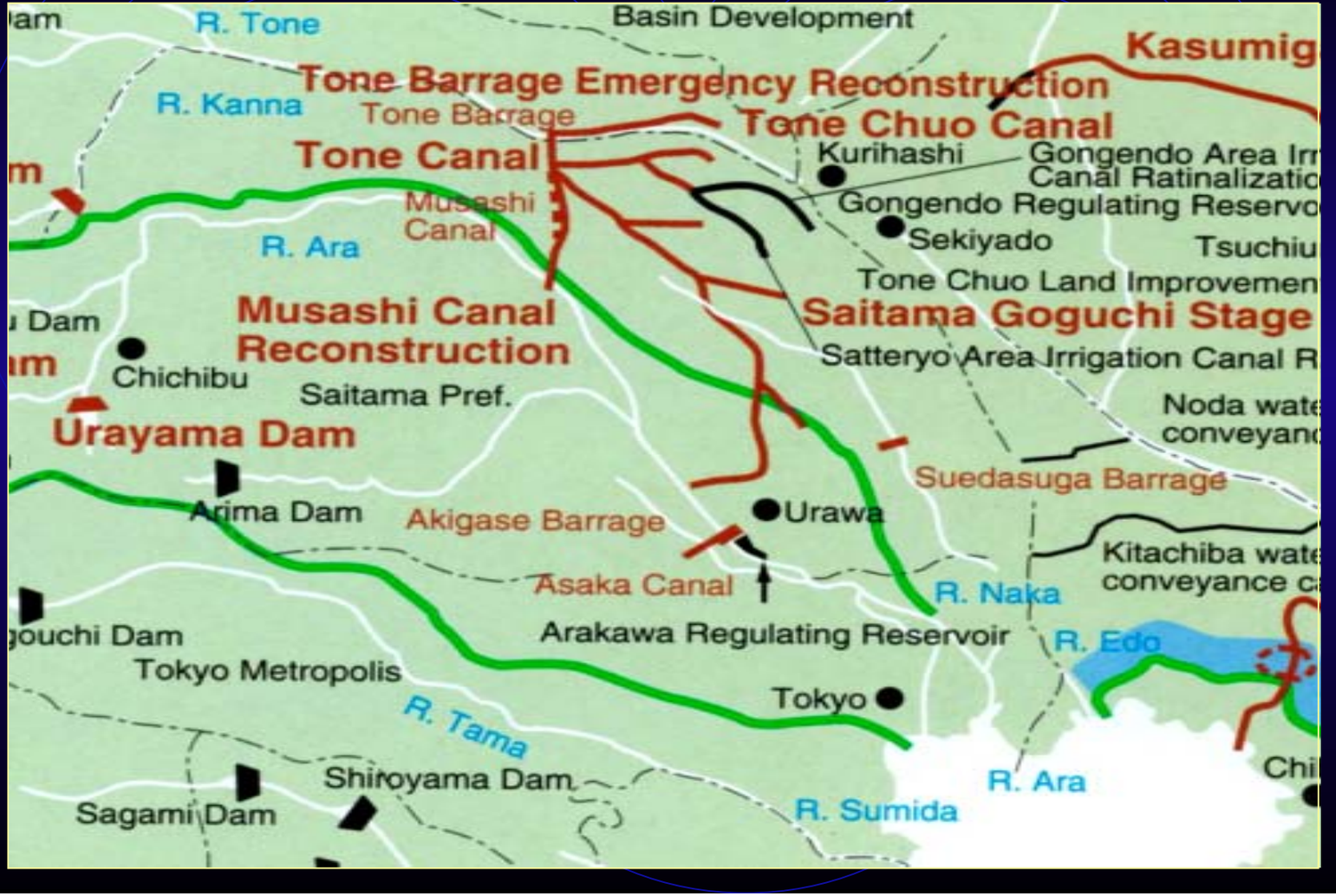
- Top of the river basin in Gunma Prefecture, 150 km north of Tokyo.
- The largest catchment area in Japan of 16,840 km^2.
- The main flow is 322 km long.

Outline of the Ara River Basin

- Its source is in Saitama Prefecture, north west of Tokyo.
- Catchment area: 2,940 km^2.
- Main flow is 173 km long.

The Tone and Ara River System 1

The Tone and Ara River System 2



Annual Precipitation

- Tone River Basin: 1,200 mm at Maebashi in the middle river basin.
- Ara River Basin: 1,300 mm at Chichibu in the middle river basin.
- Below the national average of 1,714 mm of annual precipitation.
- Peak discharge during typhoon and rainy seasons.

Dramatic Increase in Water Consumption

- The area is central to Japan's political, economic and cultural life.
- Proper water utilization and flood control needed.
- Dramatic increase in water consumption since the beginning of the 1950s due to industrial development and population concentration.
- Currently, water supply is stable.

History of Water Resources Development

- Primarily agricultural use from ancient times.
- Gradual shift towards municipal use and power generation.

Meiji Period (1868 – 1912) to the early Showa Period (1926 – 1989)

- Water Resources Development: Reconstruction efforts after World War II.
- Dams for unspecified irrigation, flood control and power generation.

Severe Water Shortage

- Hyper-growth period from the mid-1950s.
- Japan's capital suffered severe water shortage, so-called "Tokyo Desert," in the midst of preparing for the 1964 Tokyo Olympic Games.
- A project was launched to realize the dream of bringing water from the Tone River to Tokyo. Musashi Channel
  - 50 m^3/s (max)
  - Total length: 14.5 km
  - 1.7 billion m^3 (approx. 30% of the annual average total discharge at the site)
- The Tone Canal prpject was begun in March 1963 and was completed in March 1968 by WARDEC.
- Total supplied water until now : 1.7billion m3

Tokyo Olympics

- In 1964 and 1965, Tokyo suffered an unprecedented water shortage.
- Some of the facilities under construction were used temporarily.
- Tokyo Olympics was held without any difficulties.
- Since then, many dams and canals were constructed to serve the entire Tokyo metropolitan area.

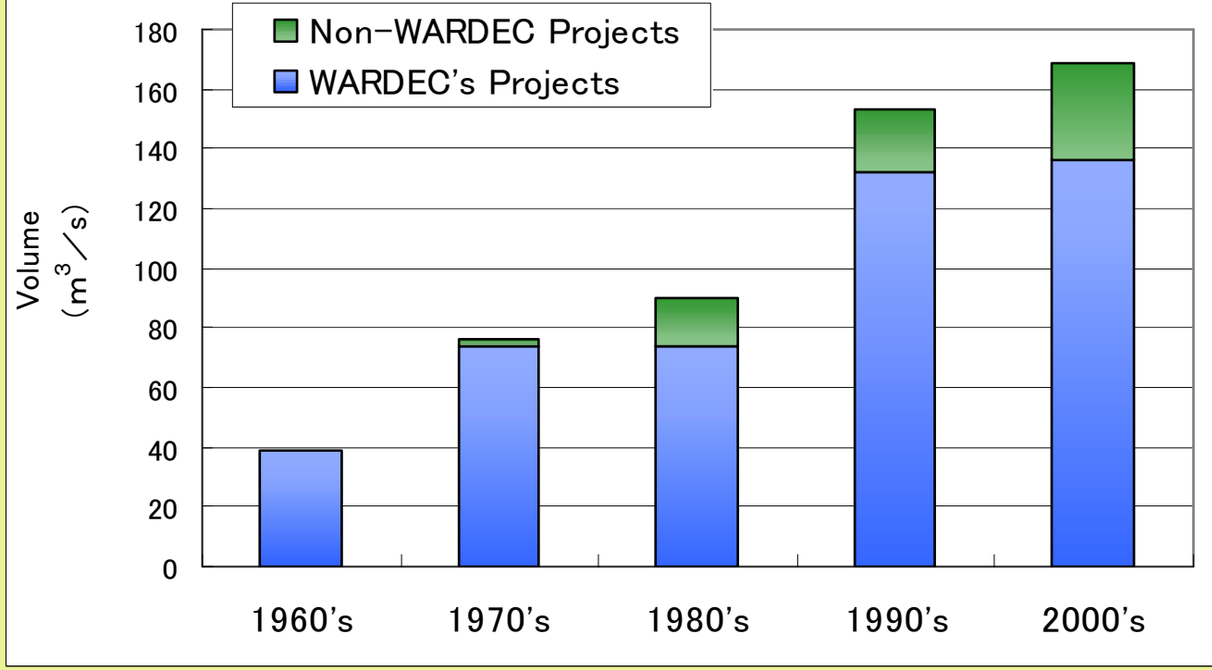
Tone Canal

Performance of WARDEC in the Tone and Ara River Systems

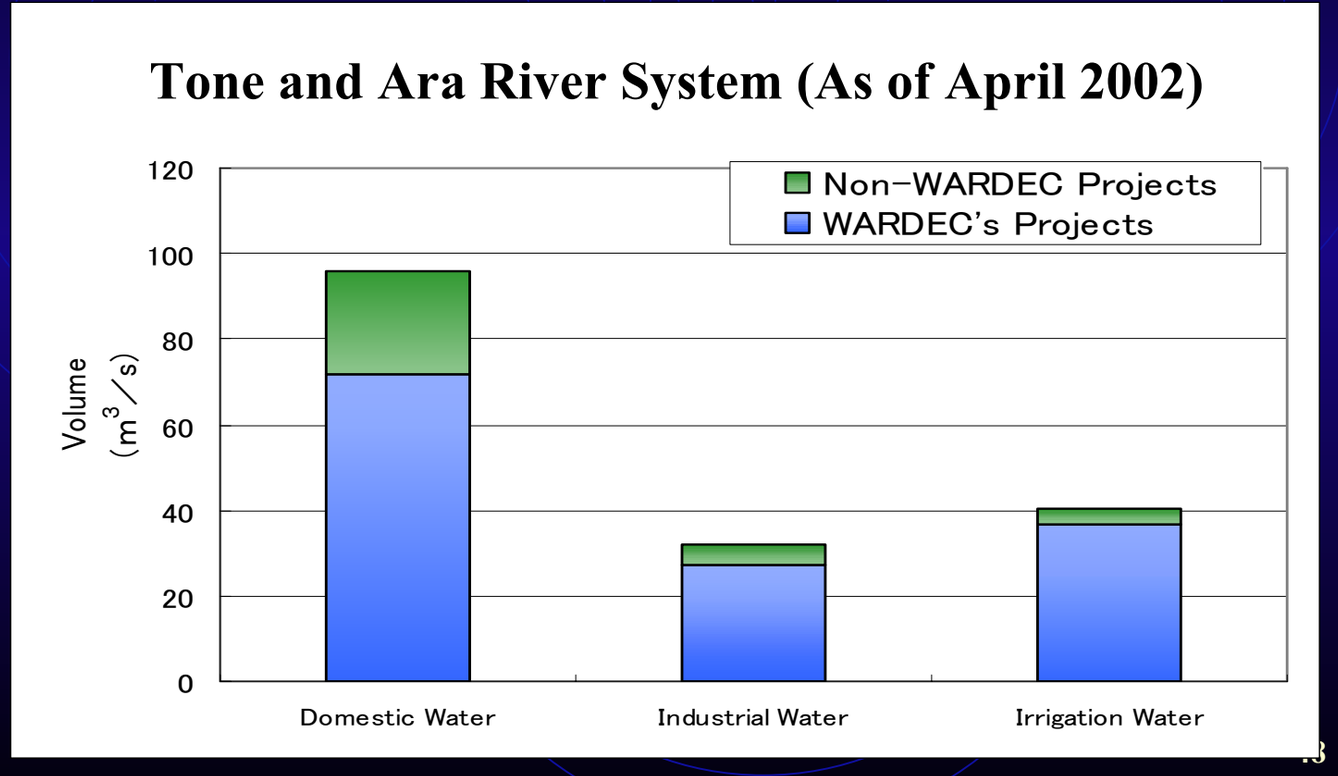
- WARDEC completed eighteen projects to date.
- Currently operates and maintains those facilities.
- Implementing 3 other projects.
- WARDEC provides approximately 80% of the total volume of water resources developed for the entire Tone and Ara river systems.

Changs of Water Resources Development Volume and WARDEC's Share

Tone and Ara River System



Water Resources Development Volume and WARDEC's Share in Tone and Ara River System

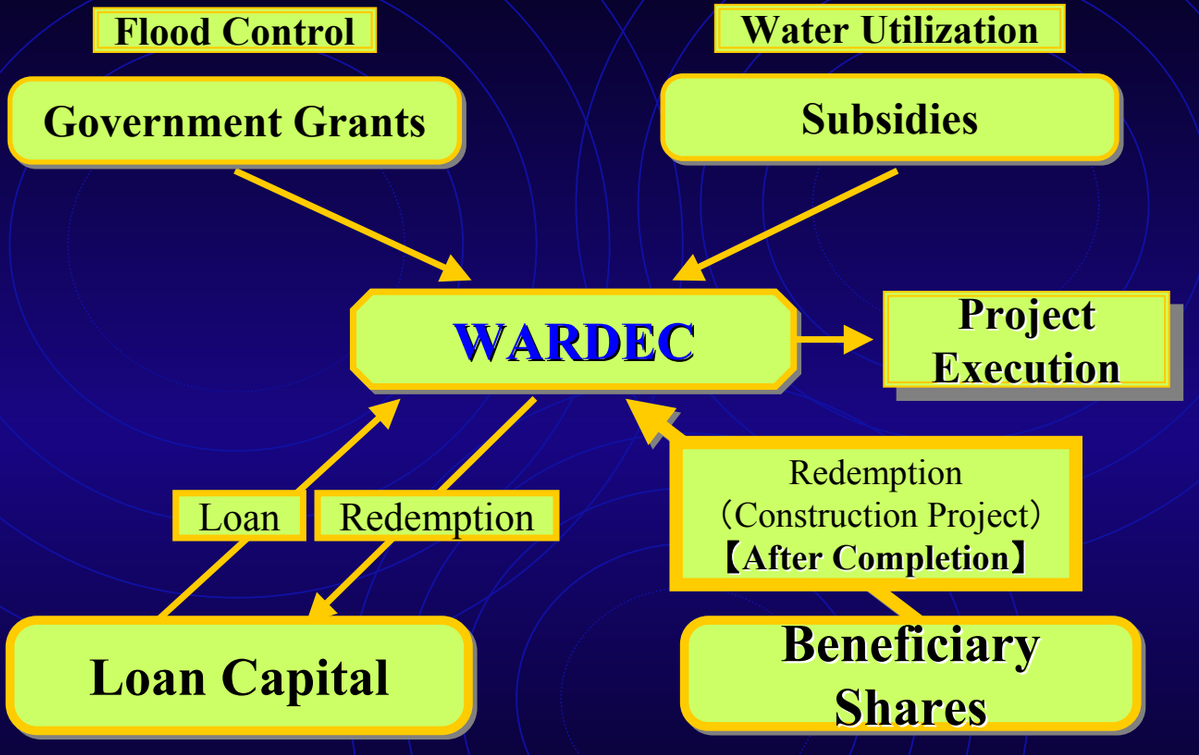


Takizawa Dam (Under Construction)

Procurement of Project Funds

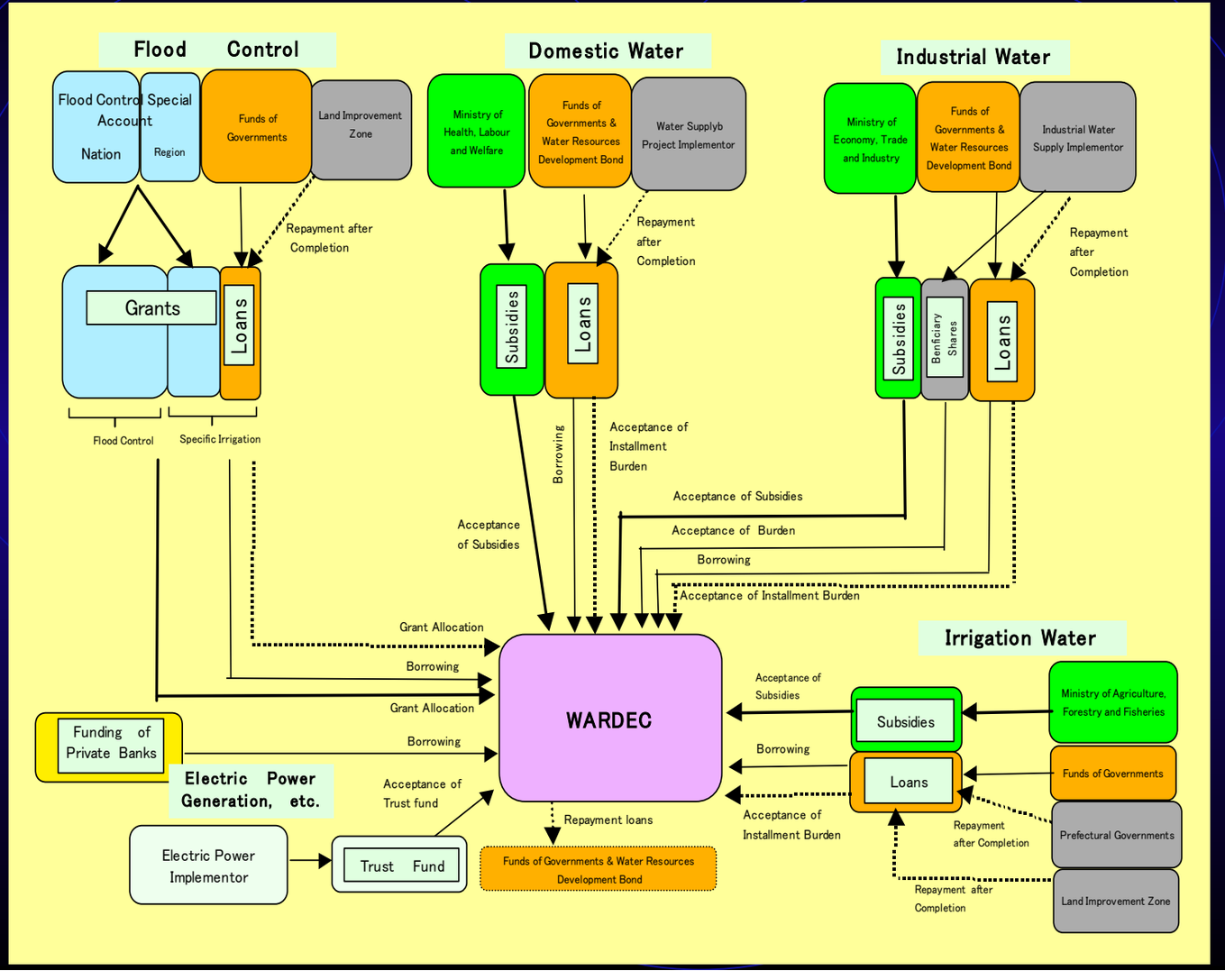
- JWA performs extremely important work of high public responsibility.
- Therefore, ways to cover necessary expenses are stipulated by law.
- In principle, expense calculation for construction and management requires determination of the cost burden of each party involved in a project.
- The determination is done by a cost allocation system that splits the costs equitably based on the benefits each party receives from the project.

Financing system of WARDEC

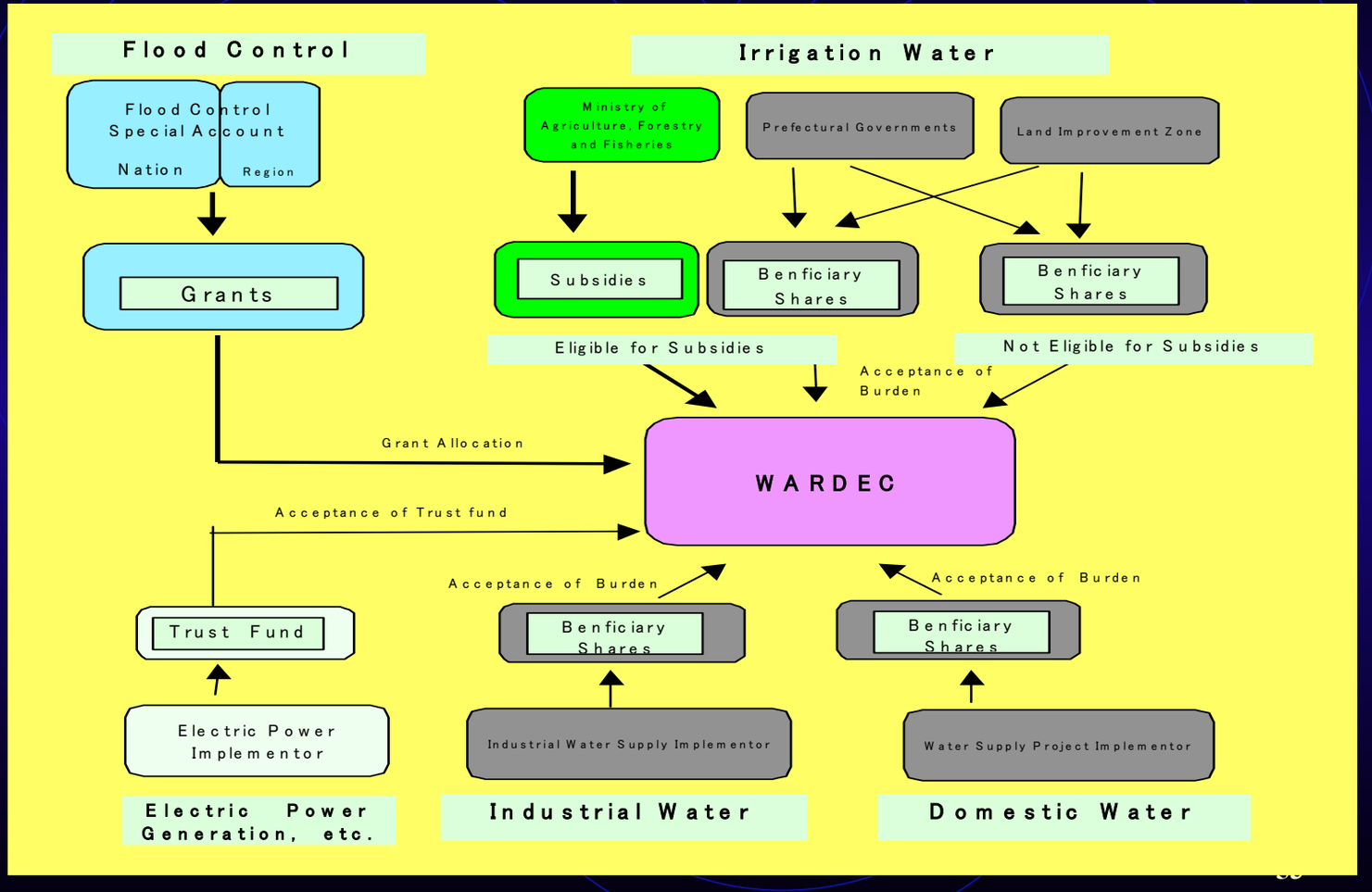


- Construction Project Budget ・・・・・・ about $103 billion
- Management Project Budget ・・・・・・ about $38.1 billion
- Number of Employees ・・・・・・ 1,848 (FY 2003)

The Expense Burden (construction project)



The Expense Burden (Operation & Maintenance)



Grants

- Flood control, etc.: Grants from the Flood Control Special Account.
- Outlays made by national and local governments.

Subsidies

- Various subsidies are available for projects according to objectives.
- Irrigation water: Subsidies from the Ministry of Agriculture, Forestry and Fisheries.
- Domestic water: Subsidies from the Ministry of Health, Labor and Welfare.
- Industrial water: Subsidies from the Ministry of Economy, Trade and Industry.

Subsidies (cont'd)

- Based on a principle that the parties utilizing the water resources share a burden of the cost.
- Subsidies ease the water users' cost burden.
- Precious financial resources including taxes, grants and subsidies must be utilized equitably and efficiently.

Funding Water Users' Share of Cost

- Water users' responsibility = total expenses – subsidies.
- WARDEC borrows funds from the national government to cover the water users' portion of the cost burden.
- Water users are to repay in installments upon the completion of construction.
- Water users pay expenses for facility operation and maintenance each fiscal year.

Loans

- From the government through the fiscal investment and loan program (FILP) funded by reserves from the nation's postal savings system, employee pension plans, etc.
- Issue water resources development bonds.
- Issue publicly subscribed bonds based on WARDEC's credit.
- Funds from financial institutions in the private sector.

Cost Redemption
Urban Water projects

- Pay either in installments or in a lump sum during construction or after its completion.
- Normally, installments are made over a 23-year term with equal semi-annual payments including interest.

Cost Redemption
Agricultural water projects

- Pay annually in equal installments including interest.
- Payment term is 17 years (including an initial 2-year deferral period right after the project completion).

History of Dam Project Planning in Japan

Meiji Period (1868 – 1912)

- Dams for specific purposes, such as domestic water and irrigation water.

Taisho Period (1912 – 1926)

- Dams exclusively for power generation were constructed one after another.
- Not planned from the viewpoint of integrated (comprehensive) development.

Projects for Flood Control and Water Utilization

- Proposals for river-control projects with dual purposes.
- Projects in the U.S. provided a powerful impetus.
- Subsidies for multi-purpose initiatives.
- The beginning of direct control by the government.

Comprehensive Development of Rivers

- Comprehensive development played a key role.
- The government promoted multi-purpose dams for flood control/irrigation water/power generation.
- Jointly constructed/maintained/managed upon their completion.
- Required complicated adjustments with regards to construction entities, cost allocation and managerial provisions.
- Expeditious and appropriate water level control during floods.
- Integrated management was essential.
- Multi-purpose dams under the direct control by the government.

Cost Allocation System

- Methods of cost allocation for multi-purpose dams were established by the government.

Environmental Impact Assessment

- Expansion of the scale of public-works projects in the 1980s.
- Impact on natural and social environment.
- Diversification of the sense of values among the Japanese.
- Need for environmental assessment.
- Implementation of environmental impact assessment in 1984.
- Environmental Impact Assessment Law in 1997.
- Opportunities for the public to participate in the evaluation process.

Efficiency and Transparency

- Demand for efficiency and transparency in public projects.
- A system was created in 1998 for reviewing projects.
- Rethinking the future of projects.
- Possible cancellation of projects.

Basic policy for River Project and planning