MANAGING WATERWORKS SYSTEM IN MEGACITY TOKYO

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Today's Topic

1 Overview of the Tokyo Waterworks

2 History of Securing Water Volume and Quality of Water

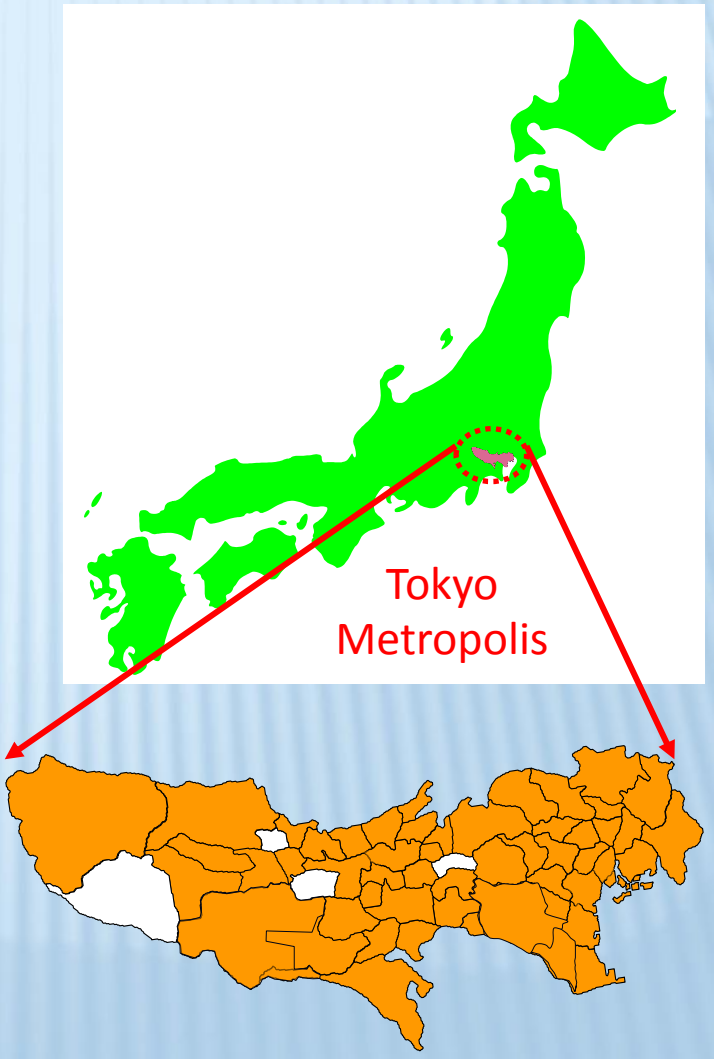
3 A Path to Resilient and Sustainable Waterworks

1 Overview of the Tokyo Waterworks

Overview of the Tokyo Waterworks

Supply Started	1898
Service Population	13.3 mil.
Daily Average Distribution Volume	4.19 mil. m^3/day
Daily Maximum Distribution Volume	4.51 mil. m^3/day
Total Length of Distribution Pipes	27,038 km

*As of FY 2016



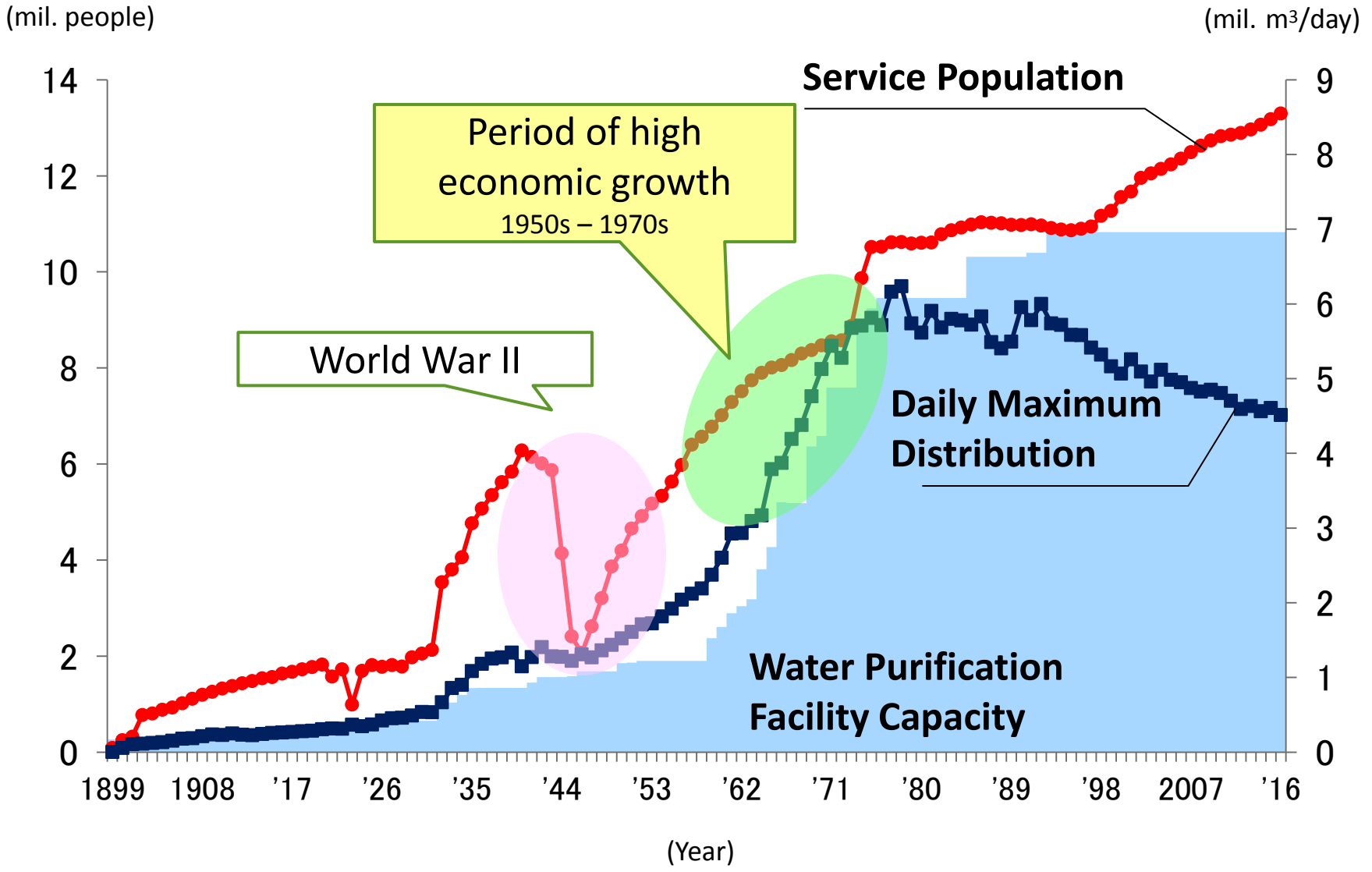
2 History of Securing Water Volume and Water Quality

① Responding to Increased Demand

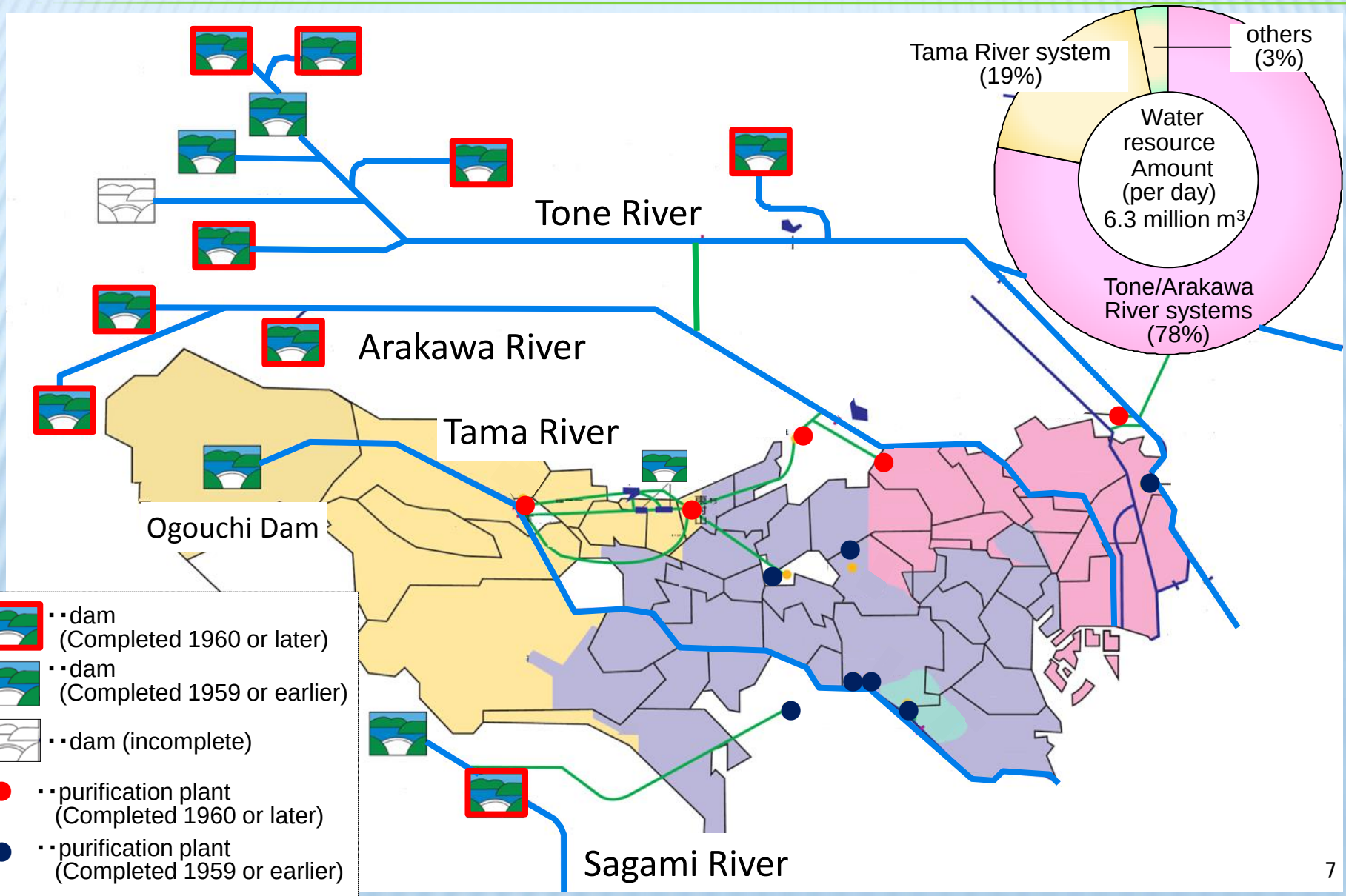
② Leakage Prevention Efforts

③ Water Quality Improvement Efforts

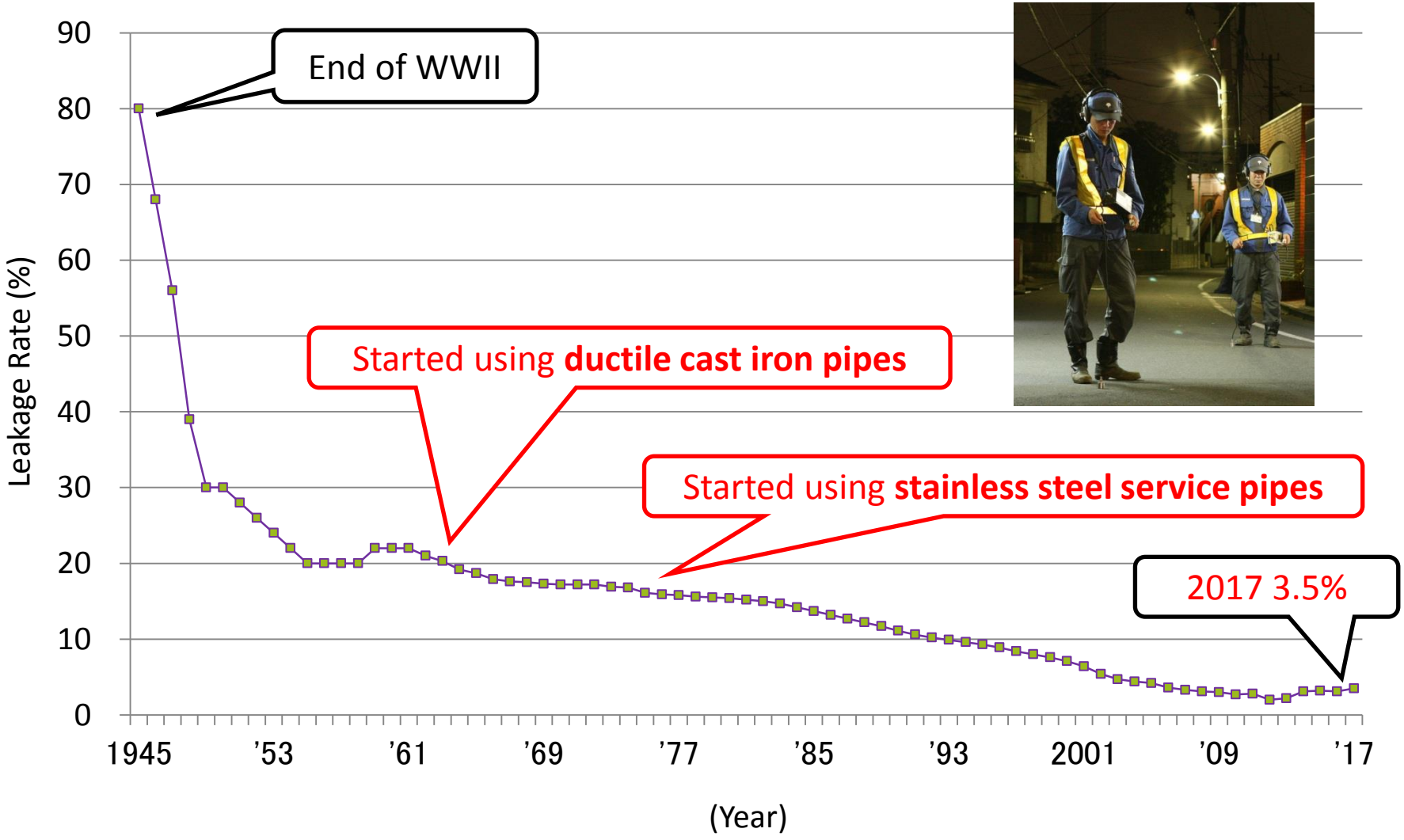
Transition of Water Demand



Water Resources and Purification Plants



Trends in Leakage Rate



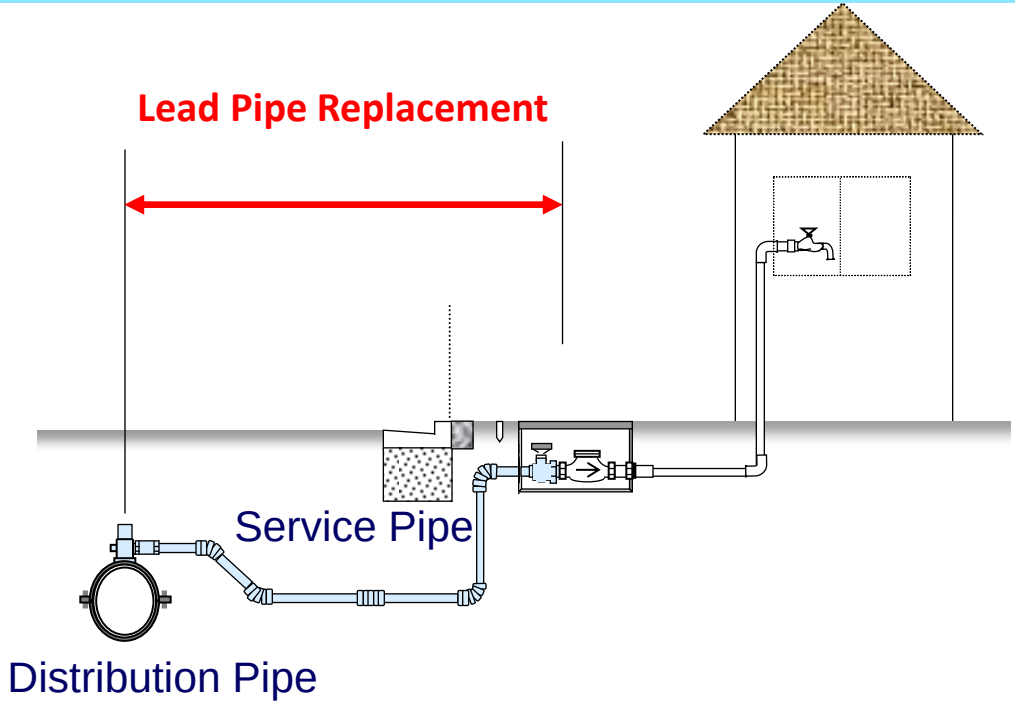
Improving Pipe Material Quality

< Replacement with **ductile cast iron pipes** >

Old cast iron pipes breaking

Ductile cast iron pipe covered with a polyethylene sleeve

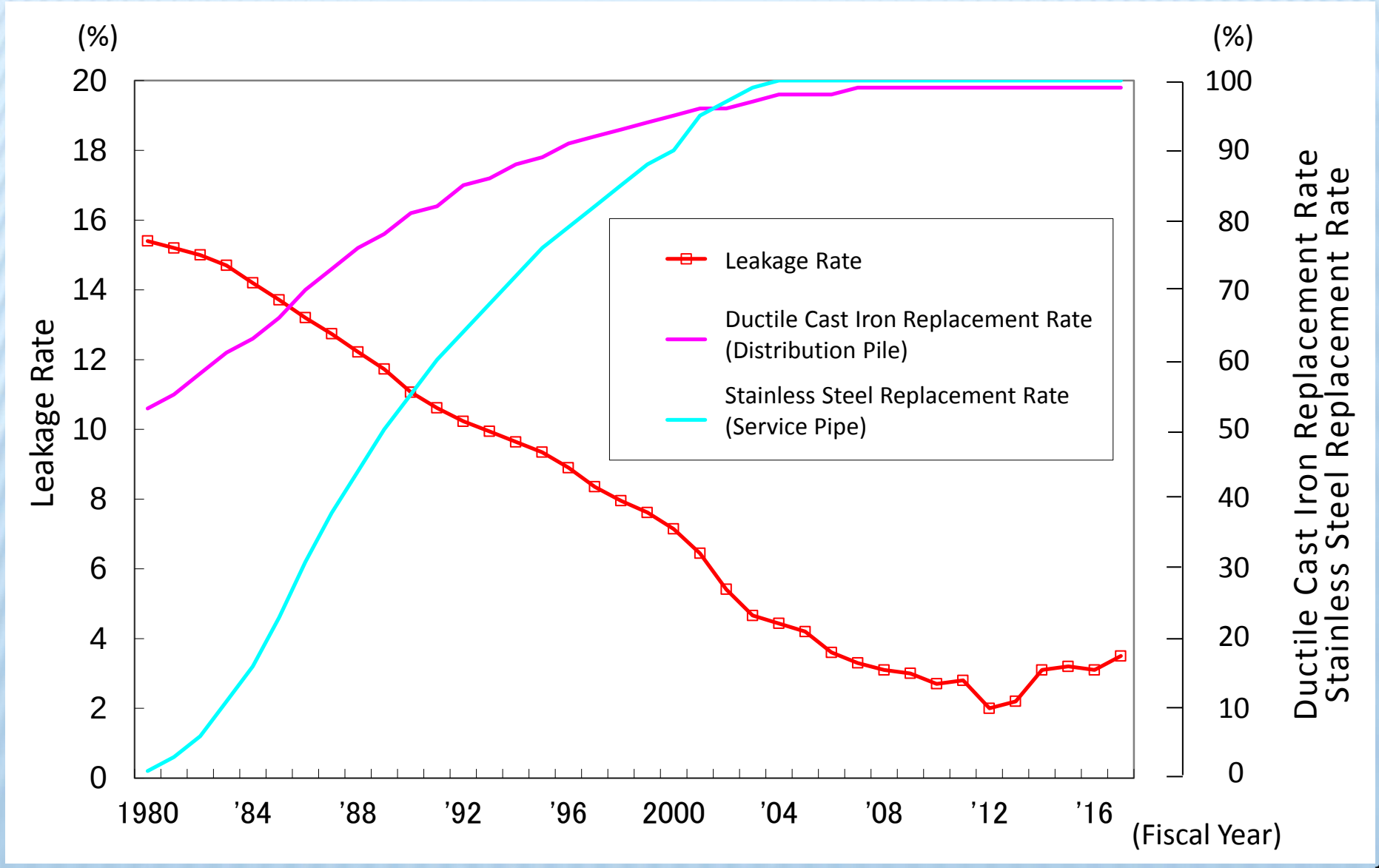
< Replacement **with stainless steel service pipes** >



Lead Pipe

Flexible Stainless Steel Pipe

Trends in Leakage Rate in relation to Ductile Replacement Rate/Stainless Steel Replacement Rate

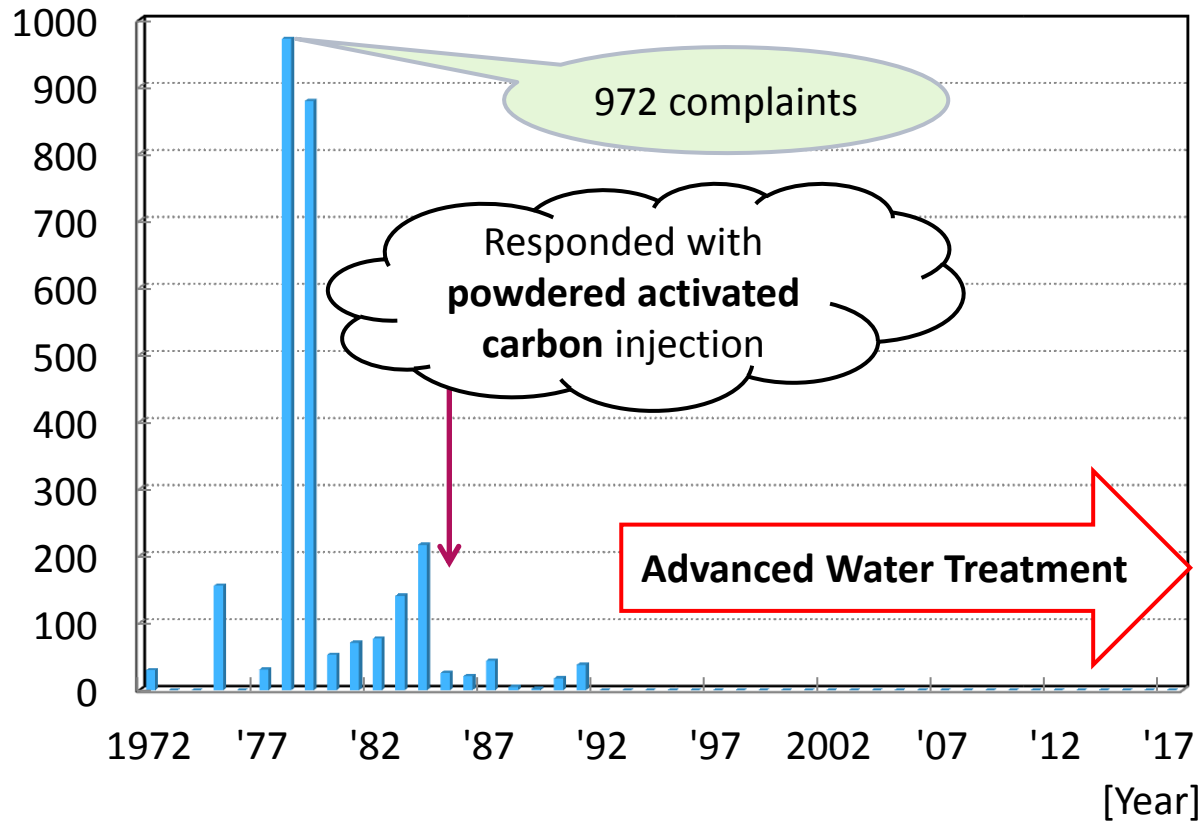


Degradation of River Water Quality Caused by Urban Development

- Rapid urbanization since 1965, degraded river water quality
- Musty odor caused by 2-MIB

< Trends in complaints about musty odor >

Kanamachi WPP Service District



0 musty odor complaints since the introduction of advanced water treatment

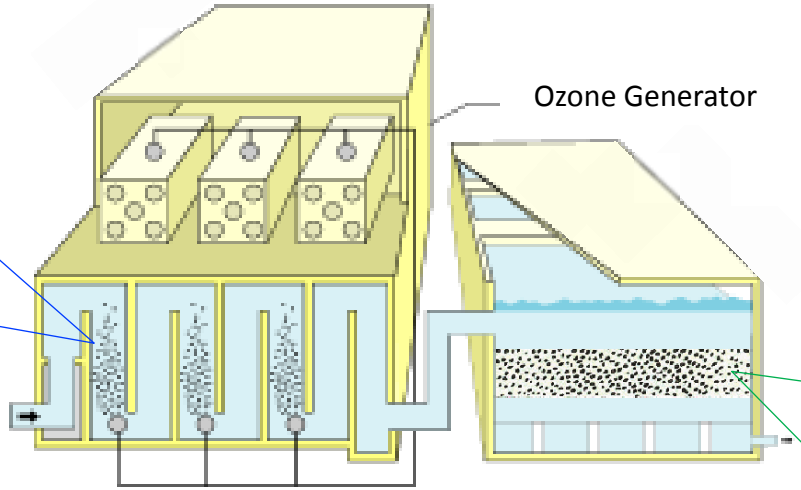
Introduction of Advanced Water Treatment

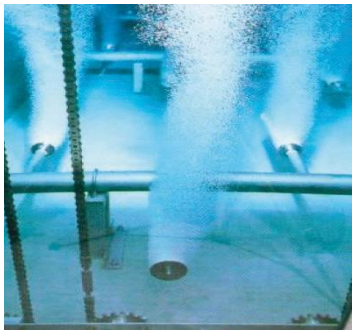
Advanced Water Treatment

Added to Conventional Treatment

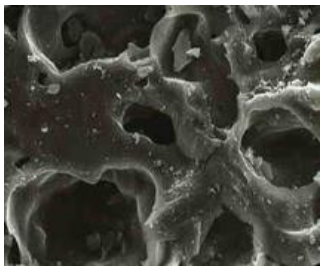
Raw water → Coagulation → **Ozonation** → **Biological Activated Carbon Adsorption Treatment** → Sand filtration → Tap water

Chlorine injection





Ozone Contact



Surface of Biological Activated Carbon

3 A Path to Resilient and Sustainable Waterworks

① Rebuilding Core Facilities

② Preparing for Various Disasters

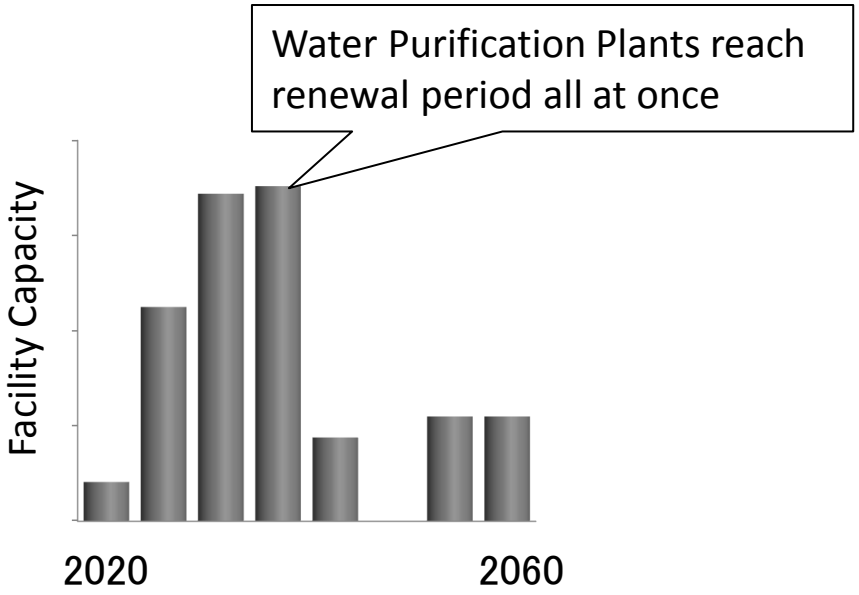
③ Using Energy More Efficiently

Renewals of Water Purification Plants

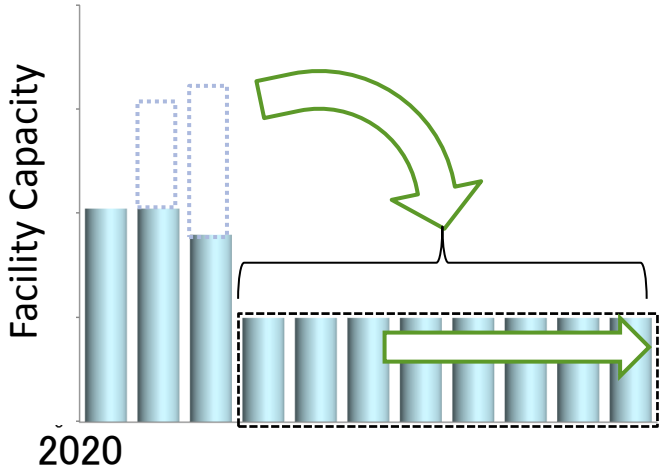
- Planned Renewals of Large Water Purification Plants
- Life Prolongation and Standardized Renewals of Facilities by Using Asset Management

< Conceptual Diagram of Renewals >

(Renewed 60 years after Construction)

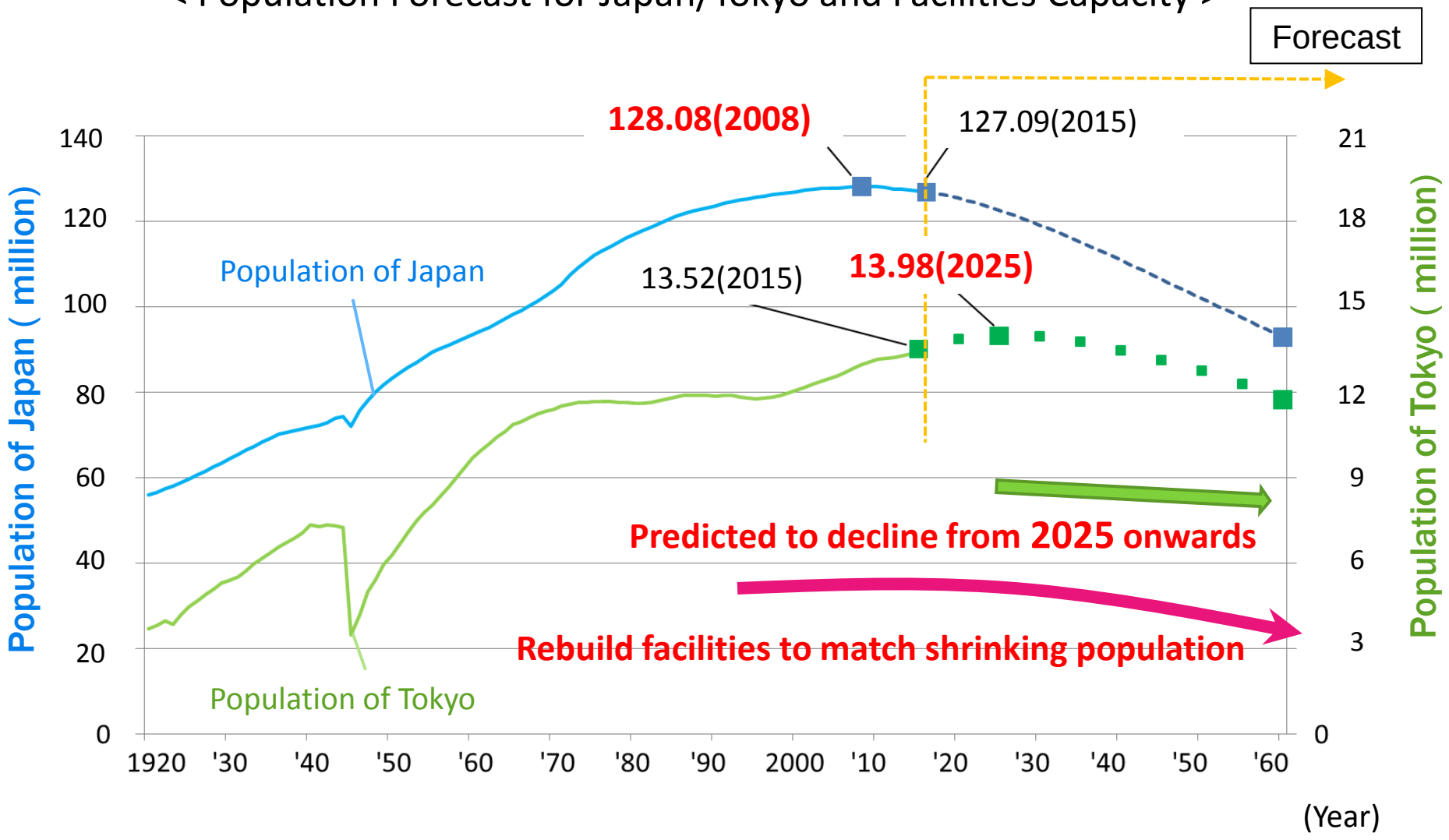


(Planned Renewals)



Shrinking Population and Rebuilding Facilities

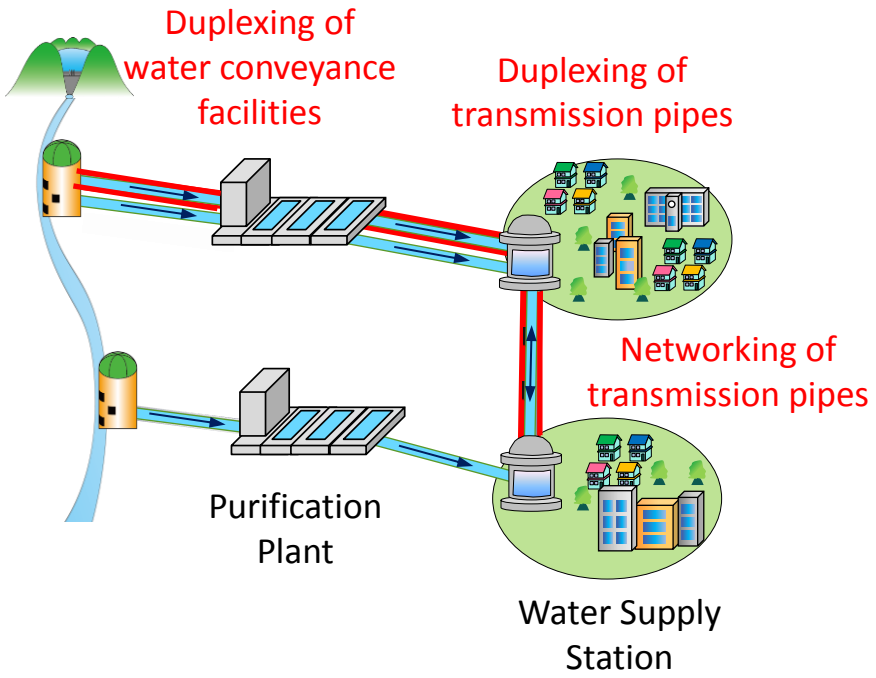
< Population Forecast for Japan/Tokyo and Facilities Capacity >



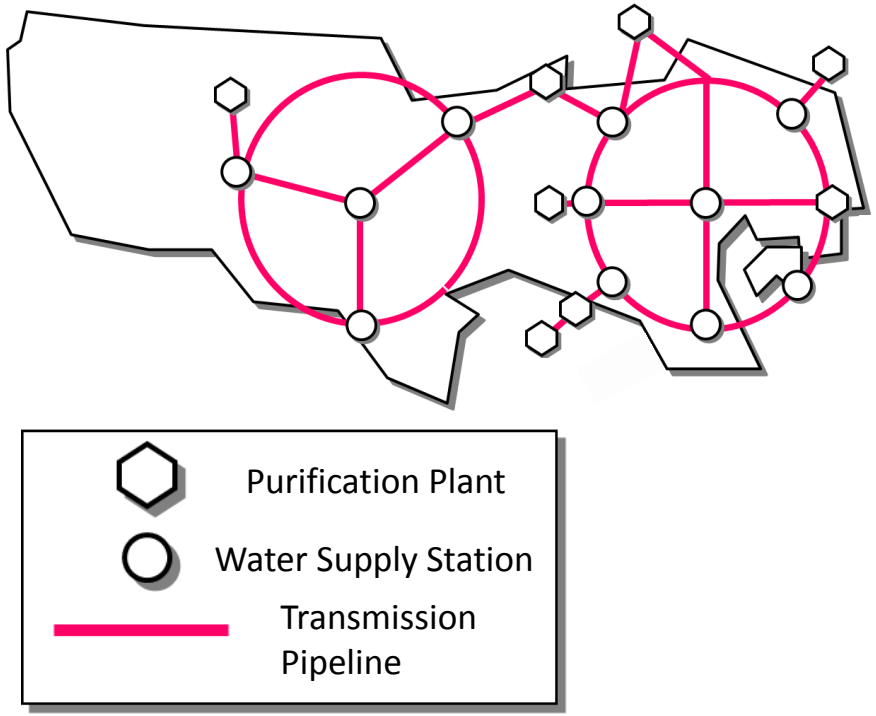
Duplexing and Networking of Main Pipelines

○ Securing Back-up Functions upon Constructions due to Disasters, Accidents, or Renewals

< Duplexing and Networking Main Pipelines >

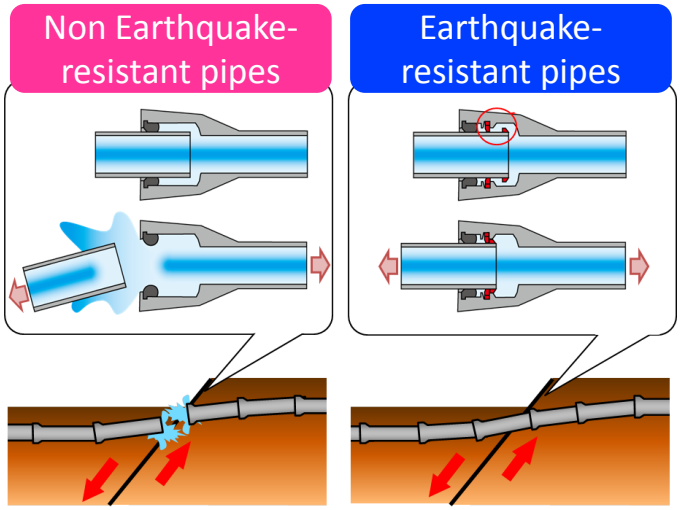


< Transmission Pipe Network >

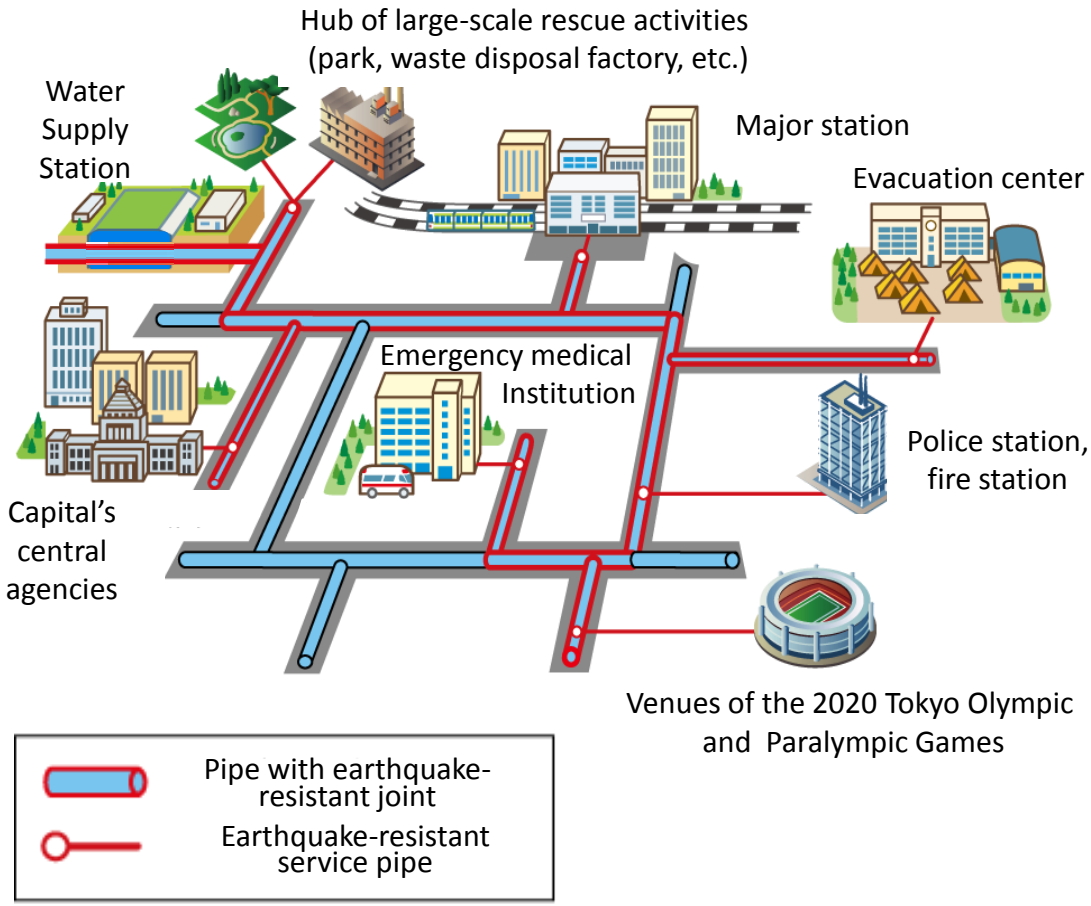


Reinforcement of Distribution Pipes to Earthquake-Resistant Joints

< Structure of earthquake-resistant pipes and movement in earthquakes >



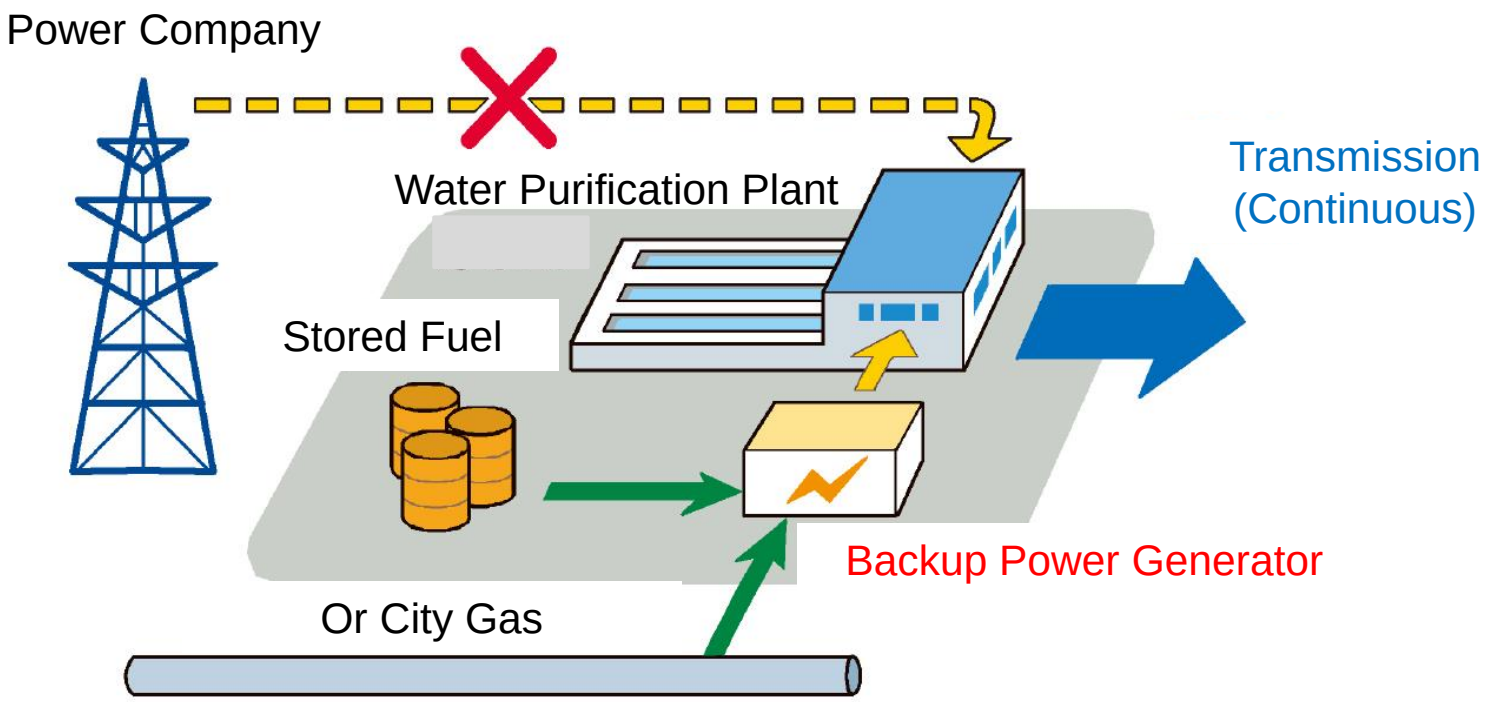
< Pipe jointing by earthquake-resistant joints in water supply pipes connected to major facilities >



New Construction and Reinforcement of Backup Power Generators

- Scale that allows water purification plants to demonstrate 100% of capacity
- Service stations to operate the same as normal

< Securing electric power in a large blackout (conceptual image) >



Measures against Flooding due to Heavy Rain

< Example of flood damage in Yamaguchi>

Courtesy of JWWA

Submerged water purification plant

Flooded pump room

< Example of flood countermeasures >

Elevation

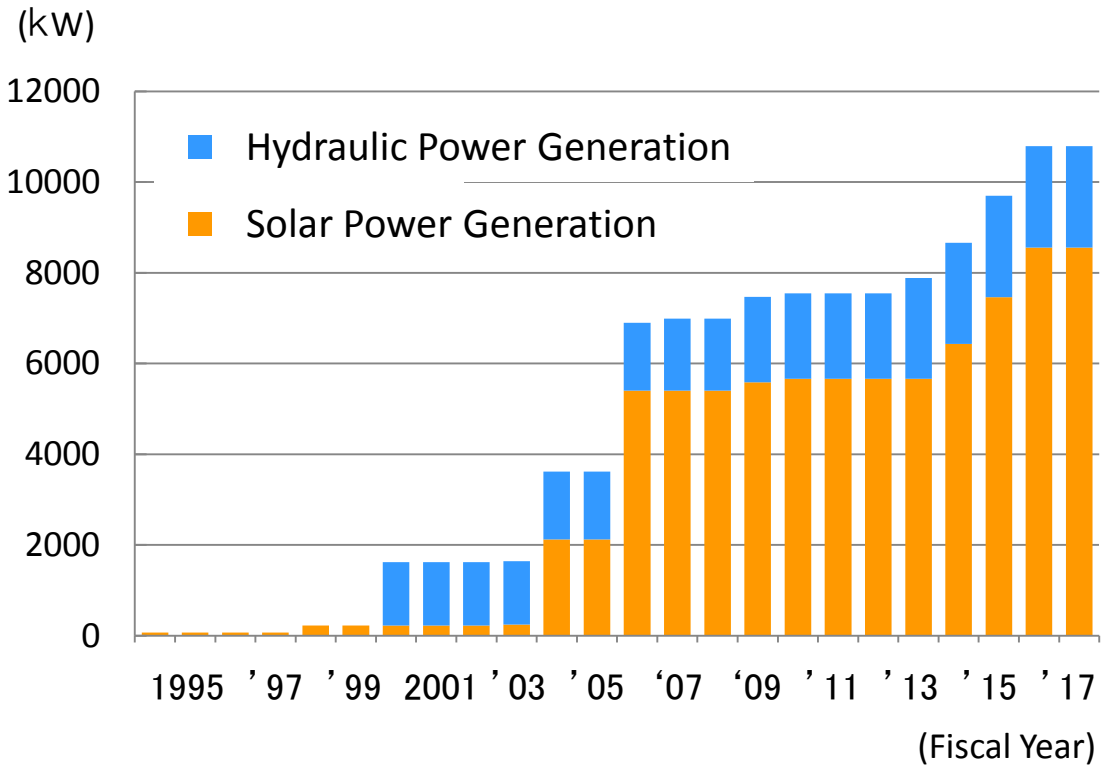
Courtesy of Central Disaster Management Council Committees for technical investigation

Cutoff weir

Use of Renewable Energy

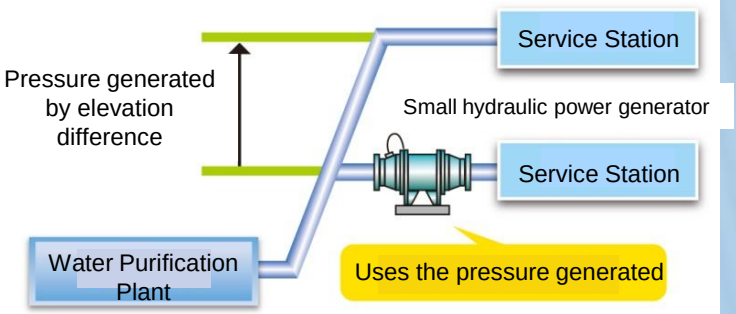
- Tokyo Waterworks consumes approximately 1% of electric power used in Tokyo
- Reduce greenhouse gas emissions by using renewable energy

< History of renewable energy use >



< Solar panels on top of filtration basins >

< Small hydraulic power generators >

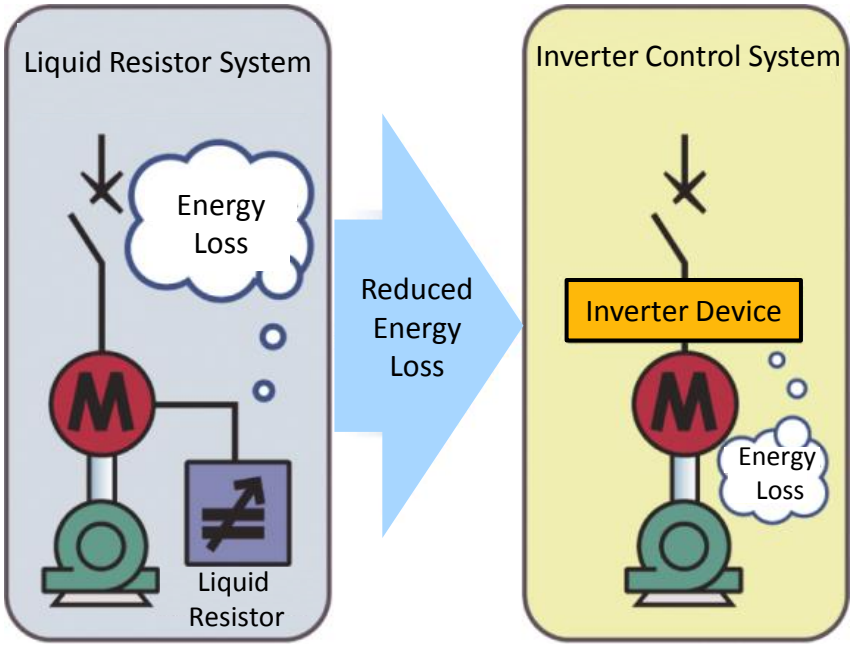


Energy Saving

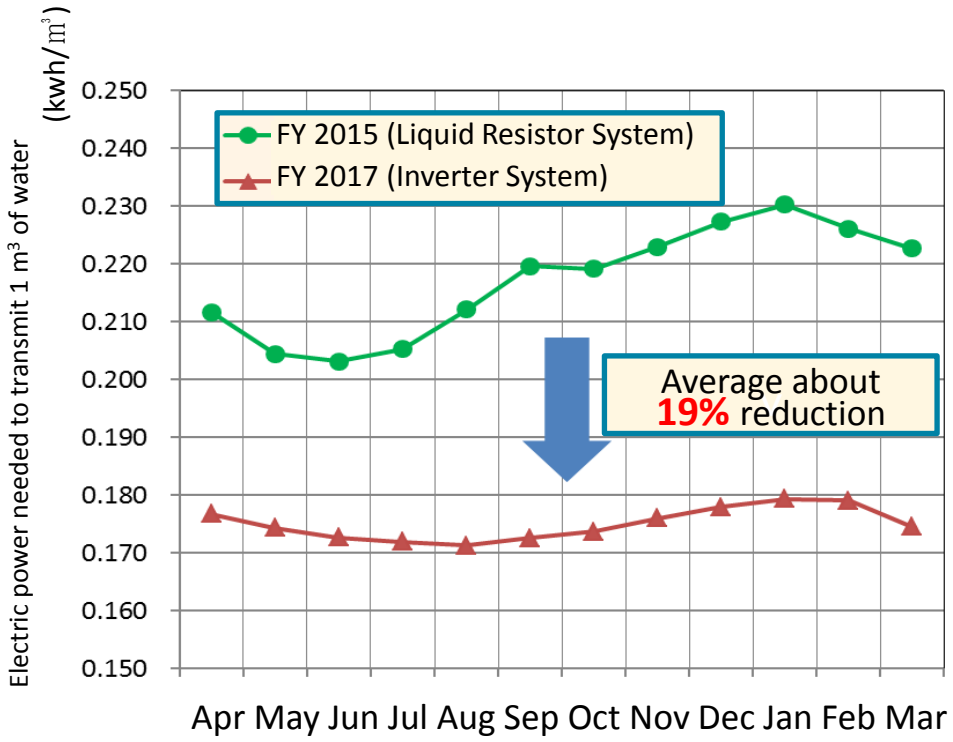
Example:

◎ Improve energy efficiency in pump operation using inverter control

< Conceptual diagram of inverter control >



< Energy saving benefits from converting to inverters >



- Experience and Technology Cultivated through History over 120 years
- Response to Disasters, Climate Change, and Social Change

Realizing Resilient and Sustainable Waterworks that Support Tokyo, the Capital of Japan

THANK YOU FOR LISTENING!