

Shielding Tokyo from a Changing Climate

The subway system isn't this city's only underground claim to fame. Some mega construction projects are protecting citizens while staying largely invisible.

by Chiho Iuchi

Most of the drivers making their way down Ring Road No.7, one of Tokyo's most important thoroughfares, have no idea what lies under their wheels. But deep below them is a massive underground facility that protects the city from flood disasters on a vast scale.

It's the Kanda River/Ring Road No.7 Underground Regulating Reservoir, a huge tunnel around 40 meters under the surface and 4.5 kilometers long with an inner diameter of 12.5 meters. With a capacity of approximately 540,000 cubic meters, it is the biggest of 12 underground reservoirs currently in operation.

The impressive project is part of Tokyo's disaster prevention program. Japan is located at the eastern end of the East Asian monsoon, a flow that reaches from the Indian Ocean. Tokyo's annual average rainfall is 1,700 millimeters, equivalent to about twice the global average, and it's concentrated from June to October.

In the 1940s, 42 percent of the land around the Kanda River, which runs through eastern Tokyo, was still forests or fields that absorbed the water back into the soil. "However, due to rapid post-war urbanization and economic growth, the fields were paved to make way for roads and residential areas," says a Tokyo Metropolitan Government (TMG) official in charge of the project. "The rainwater had no outlet and flowed into the river all at once, often causing overflows."



The massive Kanda River/Ring Road No.7 Underground Regulating Reservoir protects a large area of Tokyo from flood damage.

After several major flooding events, the Tokyo government began implementing measures such as flood control channels and reservoirs. The common method of flood prevention is to increase the volume of water the river can hold, either by broadening or deepening the river. In crowded urban areas where available land is limited, however, this is easier said than done. Tokyo instead turned to constructing facilities utilizing the space under the roads and parks owned by the TMG as a valid and feasible way to limit flooding damage.

The Ring Road No.7 project, which was launched in 1988 and took some 20 years to reach its present structure, has dramatically proved its worth. In August 1993, a typhoon caused significant flood damage in the middle basin of the Kanda River when a rainfall of 288 millimeters inundated 85 hectares of land and 3,117 houses.

In October 2004, when the first half of the project was completed and the latter stage was under construction, a similarly strong typhoon with a rainfall of 284 millimeters hit the same area. Thanks to the parts of the underground reservoir that had already been completed, however, the amount of flood damage was significantly reduced. Only four hectares of land and 46 houses were inundated.

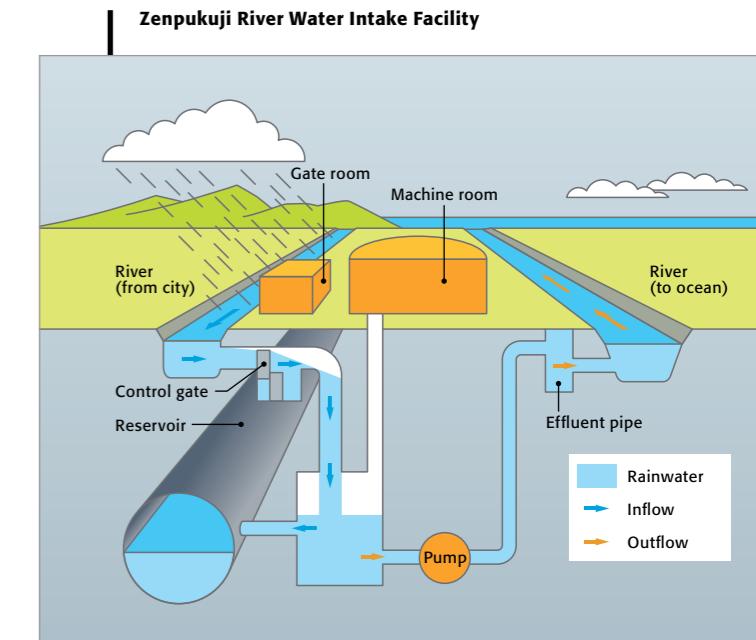
The regulating reservoir is comprised of three main facilities: the intake, where floodwaters from rivers are guided into the underground tunnel; the tunnel where the inflow-

ing floodwaters are reserved and temporarily stored; and the control building that operates, controls and monitors water inflow and discharge facilities.

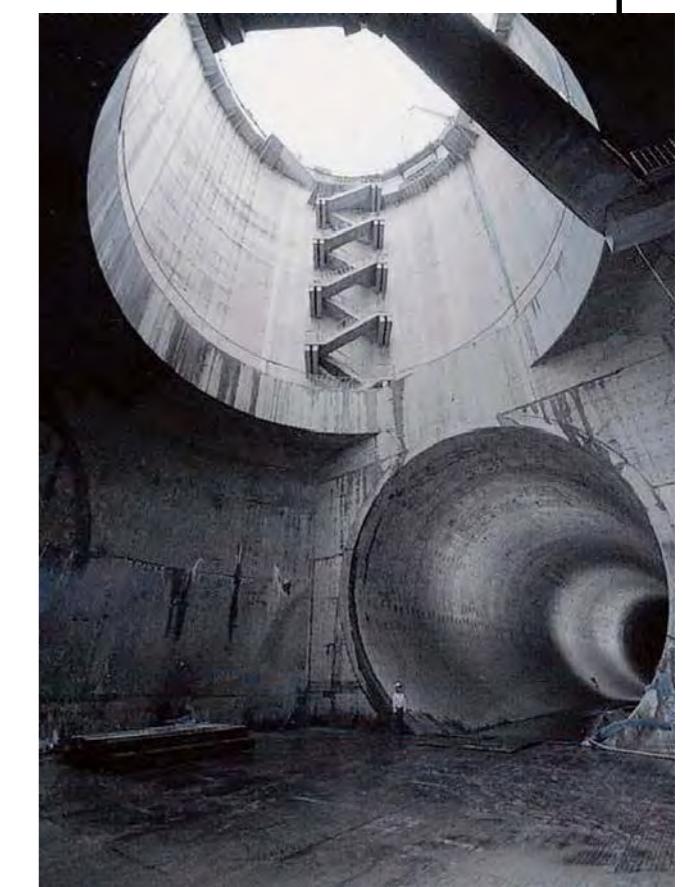
"Once the water level of the rivers reaches a certain level, the gate opens and the excess water flows into the underground reservoir through the vertical drop shaft," the TMG official says. "The water in the drop shaft forms a whirlpool that acts to suppress noise and vibration, as the facility is located in a very quiet residential area."

Construction is now underway to connect the existing underground reservoirs at Kanda River and Shirako River. Once the connection is completed as scheduled in March 2026, it will function as the Ring Road No.7 Underground Multi-basin Regulating Reservoir—featuring a breathtaking 13.1 kilometers in length and a storage capacity of around 1,430,000 cubic meters, a large part of Tokyo's planned total reservoir capacity of 3,600,000 cubic meters. With intake facilities that can share overflow from five rivers, it will make history with its capacity to handle even the most torrential local downpours.

The Kanda River/Ring Road No.7 reservoir receives a number of visitors from abroad, including China, South Korea and Southeast Asia, eager to learn the Japanese methods of flood control. "I hear that Malaysia uses a similar system using underground motorway tunnels as temporary reservoirs at the time of heavy downpours," says the Tokyo official.



The vertical shaft of the Kanda River/Ring Road No.7 Reservoir.



Preparedness is more important than ever. As climate change is expected to bring even more frequent torrential rainfalls and powerful storm surges, Tokyo's vast flood prevention plans look increasingly prescient.

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