



Tokyo Tech Book



Addressing
Urban
Challenges



October 2023



Tokyo Metropolitan Government Technology Council

 TOKYO METROPOLITAN GOVERNMENT



Overview of the technology of the Tokyo Metropolitan Government

Tokyo has been working to solve various issues that require a technological perspective, such as disaster management and environmental issues, and has made many successful achievements. What Tokyoites take for granted, for example, earthquake and flood response, delicious water, clean air, trains that run frequently and on time, are some of those accomplishments that will be of value to people around the world.

Among the technologies that underpin such assets, we have compiled the technologies possessed by the Tokyo Metropolitan Government in this brochure. Through this Tech Book, we are taking the initiative in helping solve urban issues by introducing cities around the world to our advanced technologies and expertise in fields such as infrastructure development, disaster management and environment.

Infrastructure



INFRASTRUCTURE



DISASTER PREVENTION



ENVIRONMENT



Buildings

Seismic retrofitting while a building is occupied by residents

Reinforcement work inside units eliminates the need for foundation work, cutting costs by 40-50%



External bracing



Bracing of frames inside the structure

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Road, Traffic

Maintenance and management for sustainable bridges

Systematic repair and reinforcement to ensure the safety of aging bridges achieve renewal period and construction cost equalization and about a 50 percent reduction in total project costs.



Deck slab replacement



Pier foundation reinforcement

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Port and Harbor

Robust port facilities

Selecting the best construction method according to the location, and constructing numerous earthquake-proof reinforced quays. The world's first Low-Profile ship to shore gantry crane with seismic isolation functions.



Using the jacket method to construct earthquake-proof reinforced quays



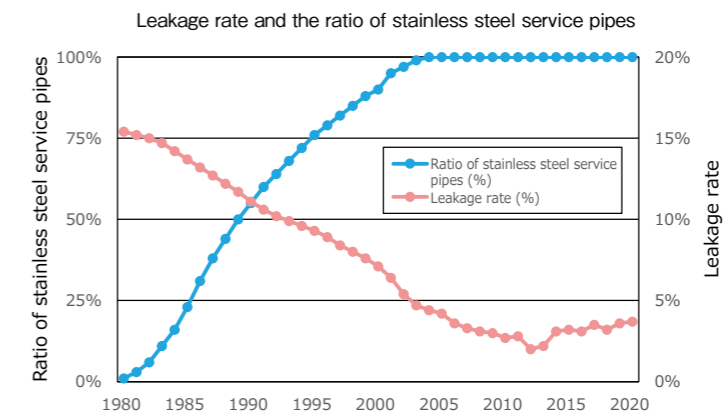
Adoption of a crane with seismic isolation functions capable of withstanding a major earthquake

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Waterworks

World's Lowest Leakage Rate of about 3%

Actively working on leakage prevention measures and maintaining the world's highest leakage rate of 3%

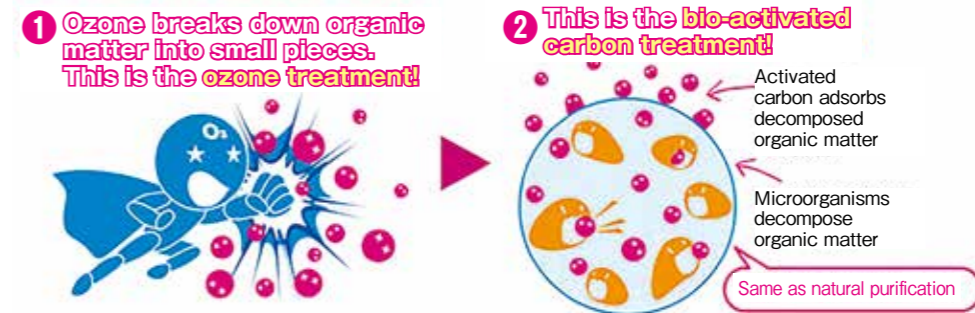


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Waterworks

Tokyo Water, the Highest Quality Advanced Water Purification

Approximately 60% of people answered that tap water tastes better (or the same) than bottled water



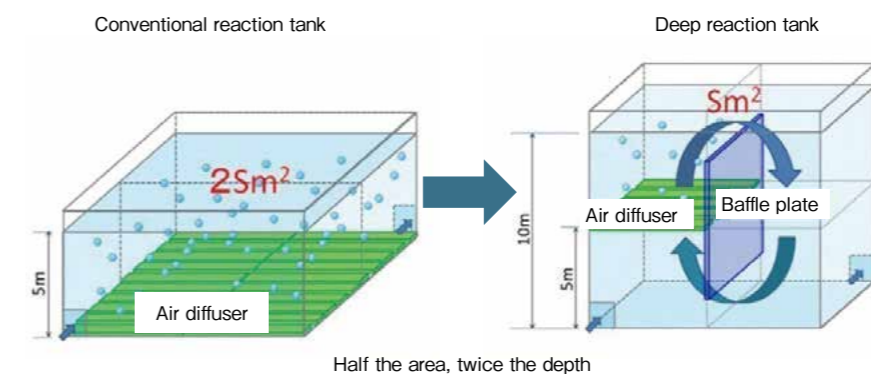
Supplies 100% high-quality tap water to the entire water supply area through advanced water treatment.

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Sewerage

Compact and effective wastewater treatment

Through the use of a deep reaction tank twice the depth of a conventional reaction tank, it is possible to build a wastewater treatment facility with sufficient capacity even on a small site.



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Sewerage

Renewal of Sewer Pipes

With this renewal method, a poly vinyl chloride profile is wrapped around the inner surface of old sewer pipes to renew. This method can be done while wastewater is flowing, without digging up roads.



Sewer pipe before renewal



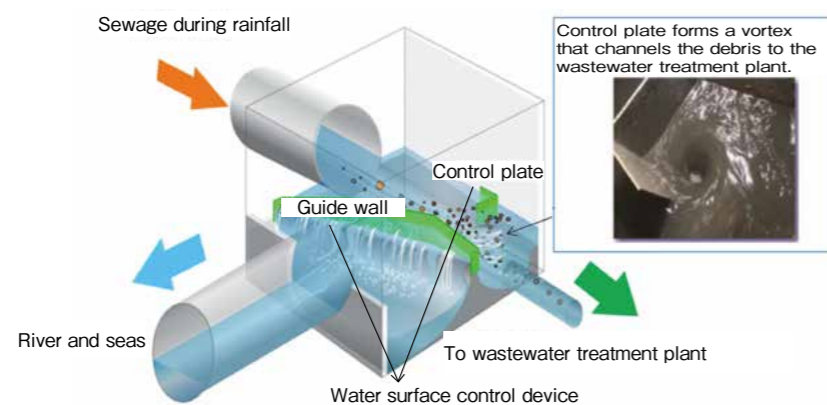
Sewer pipe during renewal

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Sewerage

Removal of 70% of Debris in the Discharge from Sewer Pipes to Rivers

This device can remove more than 70% of the debris that is discharged from a combined sewer system into rivers and seas when it rains.



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Sewerage

Water reclamation for effective use

Wastewater is collected and treated at four wastewater treatment plants for effective use as a valuable urban water resource



Use for uchimizu activities (sprinkling water on roads and other surfaces to lower temperature)



Use in an outdoor water feature (along the banks of the Shibuya River)

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Barrier-free

An inclusive city: Railway stations

Measures aim to improve ease of movement and safety for those who use railway stations which play a vital role in public transportation.



Platform door installation status 48%



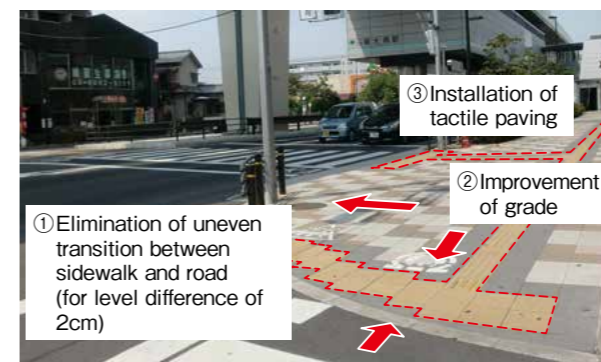
Percentage of stations with barrier-free routes 98%

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Barrier-free

An inclusive city: Roads, Parks

Promoting improvements to make roads barrier-free, centering on routes such as between major stations and welfare facilities, to enhance ease of movement by senior citizens, the disabled, and others.



Installation of playground equipment that incorporates universal design

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Barrier-free

An inclusive city: Buildings

By stipulating standards according to a building's purpose to create an environment that is easy to use by all, senior citizens and the disabled included, use of facilities in a safe and comfortable manner increases.



Elevator



Restroom



Parking lot

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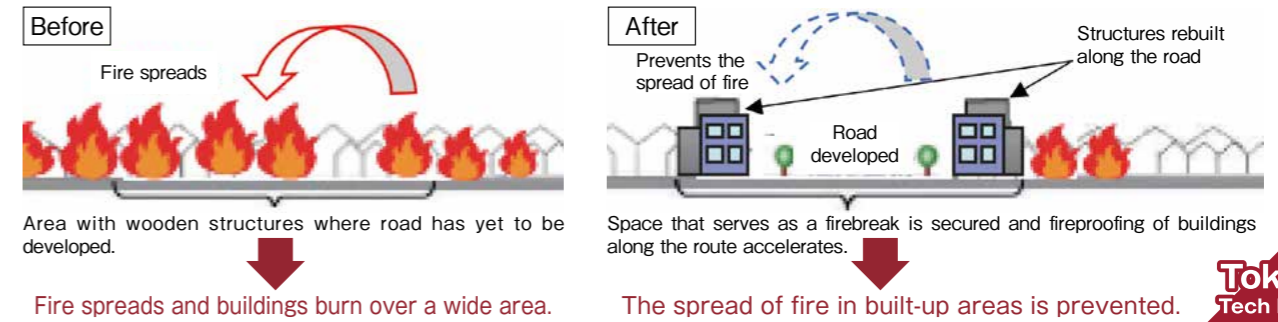


Earthquake Preparedness

Communities that do not burn or spread fire

Promoting the development of roads and the fire resistance of buildings advances the formation of firebreak belts and the improvement of districts with close-set wooden houses, making it possible to prevent large-scale fires in built-up areas.

Road development effective in blocking the spread of fire



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Earthquake Preparedness

Buildings that do not collapse or topple over on to roads

Preparing for the strongest anticipated earthquake



Seismic resistance of buildings along major roads

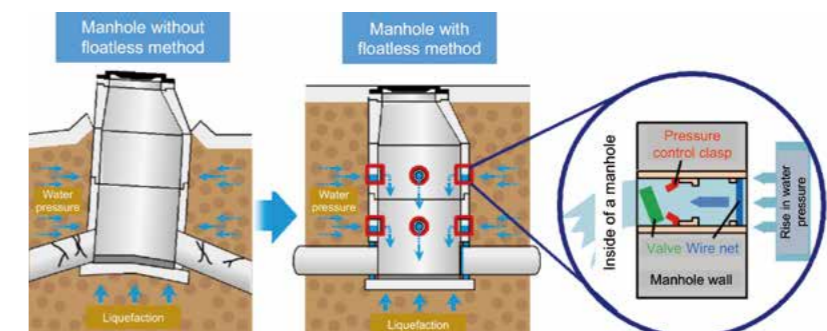
Transport of supplies

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Earthquake Preparedness

Preventing manholes from floating when an earthquake strikes

By releasing the excess water generated from liquefaction into the manhole, the floating of the manhole is suppressed, ensuring sewer pipe functions.



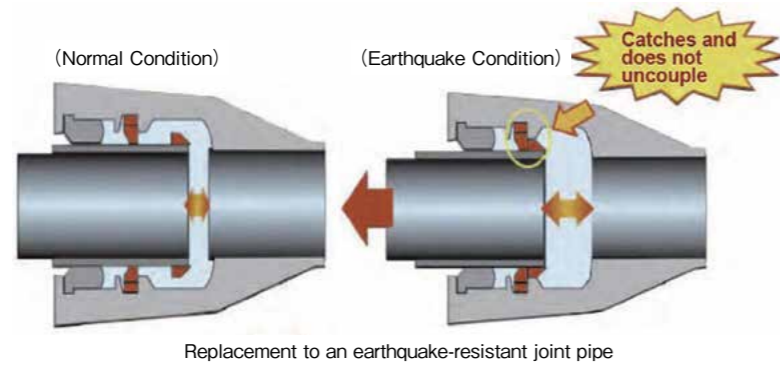
Measures to prevent manholes from floating (Floatless method)

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Earthquake Preparedness

Robust Water System

Promote the replacement of earthquake-resistant water pipelines to reduce water outages in the event of a major earthquake.



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Earthquake Preparedness

Protecting harbor users from a tsunami

Tsunami evacuation facilities that enable harbor users to evacuate to safety when a tsunami hits.



Tsunami evacuation walkway



Approx. 5.4 meters
Tsunami evacuation facility



Oshima Island (Port of Okata)



Approx. 17 meters
Kozushima Island (Port of Kozushima)

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Earthquake Preparedness

Earthquake resistant railway stations and bridges

Measures for seismic resistance based on the Great Hanshin-Awaji Earthquake have been completed. Implementation of further measures will facilitate the early resumption of operations following an earthquake.



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Storm and Flood Damage

Flood control through regulating reservoirs

In addition to river channel improvements (widening and excavation), work is in progress enhance safety against floods, such as installing regulating reservoirs at public land sites to effectively store some of the flood waters.



Underground box type



Underground tunnel type

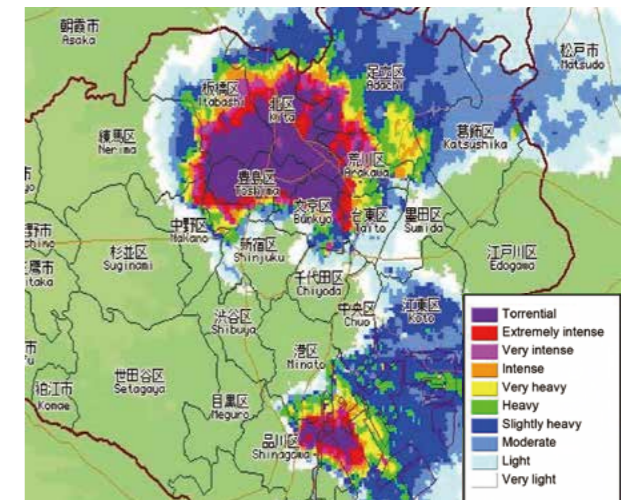
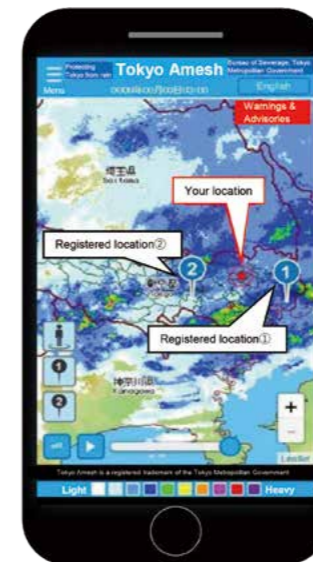
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Storm and Flood Damage

Real-time transmission of rainfall intensity

Rainfall intensity is color coded into 10 stages and displayed in 150-meter grid cells covering almost all of Tokyo. Even light drizzle at the beginning of rain can be shown.

Water levels and other observation data, as well as live camera images of the sea surface, are provided in real time to facilitate quick evacuation and other appropriate actions storm and flood damage.



Rainfall from two hours before to current time can be viewed.

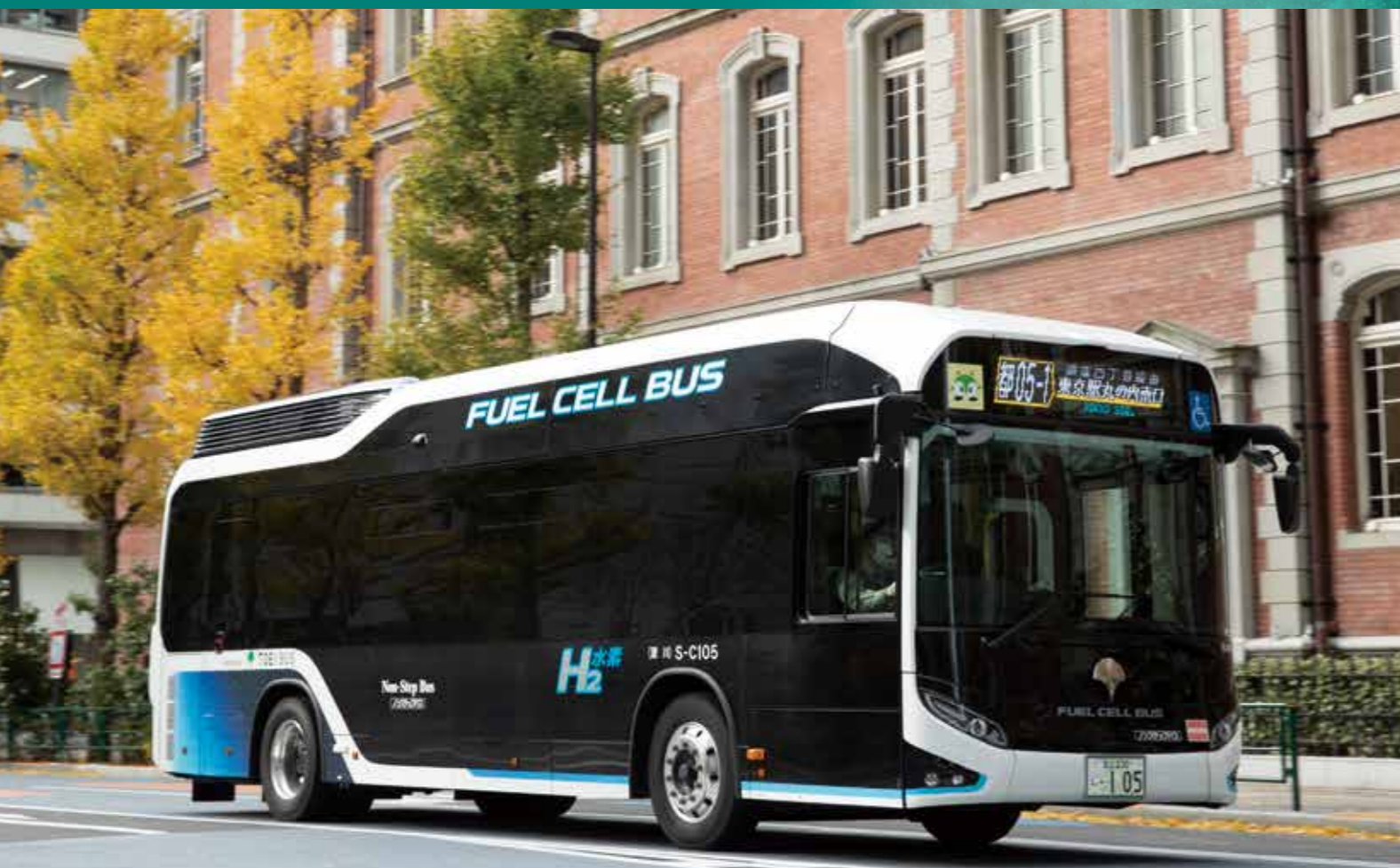


Live camera images of the river are streamed on YouTube



Live camera images of the sea surface are streamed on YouTube

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* Image

Global Warming

Solar heat-blocking pavement curbs the rise in surface temperature by around 8°C

Reflects the sun's near-infrared rays and reduces noise



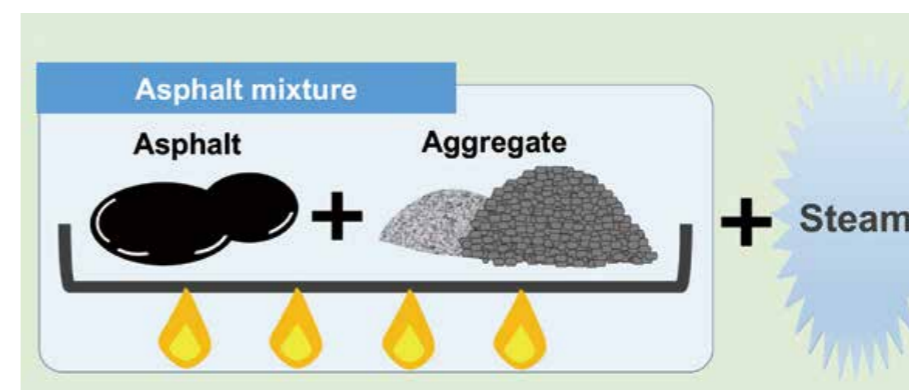
Thermal infrared imaging

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Global Warming

Low carbon asphalt contributes to reduced CO₂ emissions

Adding steam to produce the asphalt at lower temperatures lowers CO₂ emissions.



Low carbon asphalt mixture

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Energy

Using hydrogen energy aiming for environmentally-advanced-city

Through development of facilities, including a hydrogen station, pipeline, and pure hydrogen fuel cells, the social implementation of hydrogen as a power of community will take place at the former athletes' village for the Olympic and Paralympic games.



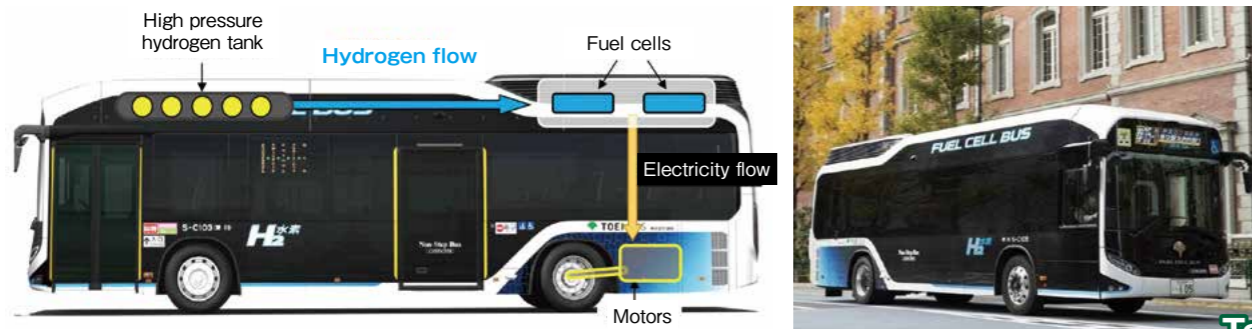
Artist's rendition of the completed Urban Redevelopment Project
* The Harumi Passenger Ship Terminal is an image of the current plan and is subject to change.
© Consortium for the Type 1 Urban Redevelopment Project in the West Harumi 5-Chome District

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Energy

Toei Bus operates 73 fuel cell buses—the most in Japan.

An approx. 2,200t reduction in CO₂ emissions equivalent to the amount of CO₂ absorbed by about 250,000 Japanese cedar trees annually.



Hydrogen-powered buses

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Energy

Achieving a balance between comfort and energy efficiency

By reducing thermal loads, introducing energy-saving systems, and using diverse renewable energies, a building's energy consumption is reduced by about 60%.



Solar power generation equipment / Rooftop greening

Double glass

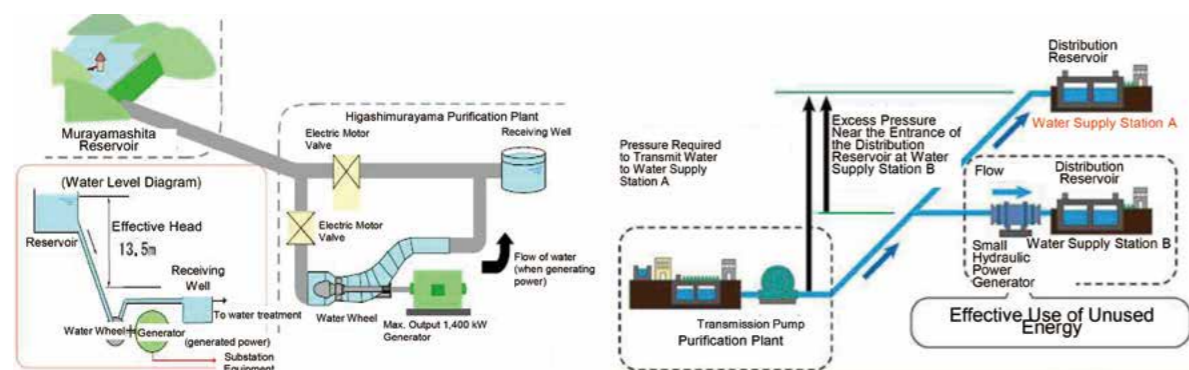
High-efficiency packaged air conditioner

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Energy

Generating power with excess water pressure

Small hydraulic power generation using the elevation gap or the excess pressure.



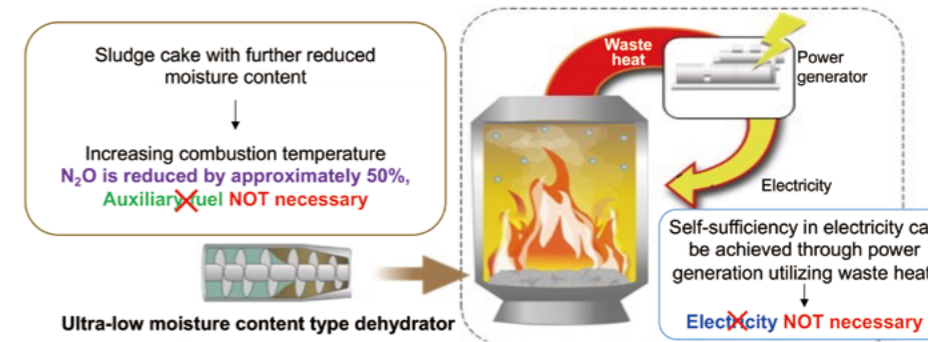
Effective Use of Unused Energy

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Energy

Energy Neutral Incinerator

In order to further reduce greenhouse gas emissions, we have been striving for maximum use of sewer system potentials in the sludge treatment process.



Energy Neutral Incinerator

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Energy

Effective utilization of rooftops to generate electricity

Increasing average generating capacity per building by approx. four fold compared to previous levels. (Approx. 5kW ⇒ Approx. 20kW)



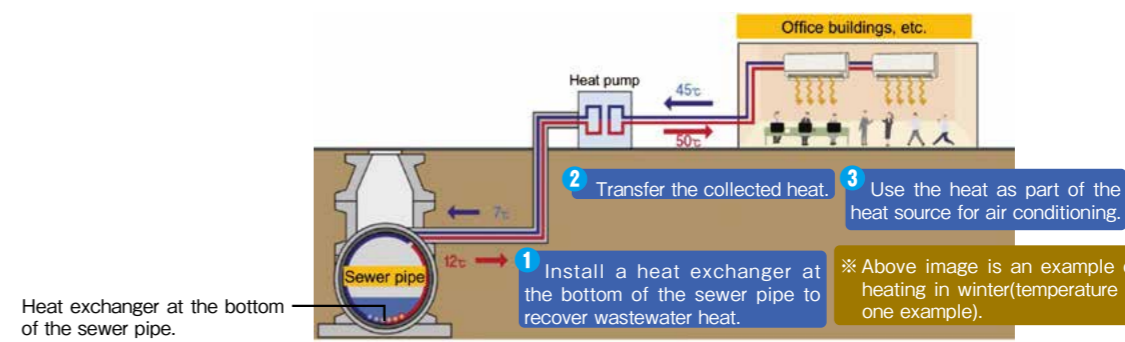
Lighter panels with greater generating capacity

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Energy

Utilization of Wastewater Heat Energy

Total floor area of private facilities, etc., using wastewater heat has become approx. 700,000 sqm, equivalent to about 15 Tokyo Domes.



Heat exchanger at the bottom of the sewer pipe.

Utilization of heat from sewer pipes (Process flow diagram)

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Print number (5) 80

Tokyo Tech Book

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Published October 2023



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