Tokyo Climate Change Adaptation Plan

March 2024

CLIMATE CHANGE ADAPTATION

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◆ Action plan

1. Introduction

Background

As the impacts of climate change become increasingly serious, "Climate Change Adaptation Act" was enforced in December 30 (2018), which legally positions measures to avoid and mitigate (adaptation measures) the damage caused by climate change in addition to measures to reduce greenhouse gas emissions (mitigation measures), which are a cause of global warming. In response to this, Metropolitan Government announced “Tokyo Climate Change Adaptation Policy” in December 2019 and formulated “Tokyo Climate Change Adaptation Plan” in March 2021 as well.

This plan comprehensively promotes measures from the perspective of adaptation and aims to build a resilient city that protects the lives and properties of Tokyo residents from extreme weather changes by implementing various measures to avoid and reduce as much as possible the impact and damage on life of Tokyo residents and the natural environment in a wide range of fields, including natural disasters, health, and agriculture, forestry and fishery etc.

However, natural disasters caused by typhoons and torrential rains have frequently occurred even after this plan was formulated, such as the debris flow disaster in Shizuoka Prefecture in July 2021 that caused many deaths and injuries due to record heavy rain, and heavy rains caused by Typhoon No.2 caused overflow in Zenpukuji river in Tokyo in June 2023.

Mitigation measures and adaptation measures
(Illustration source: A-PLAT)

In addition, in 2023, it was hit by record-breaking heat across the country, with the number of extremely hot days of the year (daily maximum temperature of 35°C or more) was the highest on record at many locations, including 46 days in Kiryu City, Gunma Prefecture. In the center of Tokyo, the number of summer days of the year (daily maximum temperature of 25°C or more) exceeded 140 days, breaking the record for the most summer days in a year. It is likely that these various impacts will continue to spread over a long period of time.

On the other hand, in order to protect lives and livelihood of Tokyo residents from the danger of disasters such as wind and flood disasters, “TOKYO Resilience Project” was launched in 2022 and “TOKYO Resilience Project *Upgrade* I” was announced in December 2023.

In light of these developments, we have decided to revise the plan, as it is necessary to work harder than ever mitigation measures to reduce greenhouse gas emissions and further strengthen adaptation measures to avoid and reduce the damage caused by climate change.

Purpose of the Plan Revision

In order to contribute to the world's net zero CO2 emissions by 2050, Metropolitan Government formulated the "Zero Emission Tokyo Strategy" in December 2019 and formulated "Tokyo Environmental Master Plan" in September 2022 to realize "A Green and Resilient Global City Tokyo Opens up a Future."

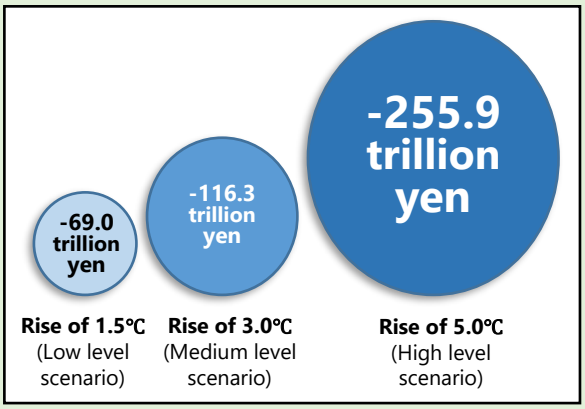
In addition, " TOKYO Resilience Project *Upgrade* I" was announced in December 2023, and in January 2024, Metropolitan government's long-term plan, "'Future Tokyo' Strategy version up 2024," was announced.

On the other hand, in April 2023, the Diet passed and established Revised Climate Change Adaptation Act to strengthen measures against heatstroke, which is a field of adaptation to climate change, including the creation of Special Heat Stroke Alert information and the designation of designated heat evacuation facilities (Cooling shelters).

In the new revised plan, based on these trends and the perspective of contributing to the realization of the Sustainable Development Goals (SDGs), and aims to promote sustainable development by implementing measures to protect lives and property in the future from both climate change mitigation and adaptation in partnership and collaboration with Tokyo residents and businesses etc.

●TOPIC● What is the economic impact of climate change?

According to OECD(Organization for Economic Co-operation and Development) "Integrated Report on investment to the climate and investment to the growth," if global warming measures are not implemented in the future, the world as a whole will lose about 12% of annual GDP[1] in 2100.
On the other hand, we estimated the potential economic impact of climate change in Tokyo[2], and found that a cumulative total of -116.3 trillion yen, assuming 3°C rise in temperature by 2100, and a cumulative total of -255.9 trillion yen, assuming 5 °C rise in temperature.
In order to minimize the risks caused by economic activity impact factors[3] such as heat and wind and flood damage, it is essential to promote not only mitigation measures but also adaptation measures.



Scenario of temperature rise[4] as of 2100・Economic activity impact amount in Tokyo (Cumulative for each year from 2023 to 2100)

1 World GDP in 2022 was about 14,125 trillion yen※
*Source: IMF - World Economic Outlook Databases (October 2023)
Converted at the closing price of 141.06 yen to US dollar at the end of December 2023
2 A fixed baseline is set that organizes the current industrial structure etc. based on the reference population, GDP, and input-output tables, without taking into account the various impacts of temperature rise and climate change. The difference from the baseline is calculated the potential economic impact of climate change.
3 As economic activity impact factors, "the impacts of heat on workers," "the impacts of health damage on workers," "the impacts of climate change on agriculture," and "the impacts of wind and flood damage", "the impacts of climate change on households' energy demand" are set.
4 Each scenario represents the increase in temperature in 2100 relative to the global average temperature between 1850 and 1900.
(Created based on Report commissioned survey to estimate future economic impacts on climate change in Tokyo)

2. The Past situation of Climate in Tokyo and the Forecast of Future changes

The past situation of climate in Tokyo and the forecast of future changes are roughly as follows. Details are available on the homepage of Tokyo Metropolitan Government Bureau of Environment.

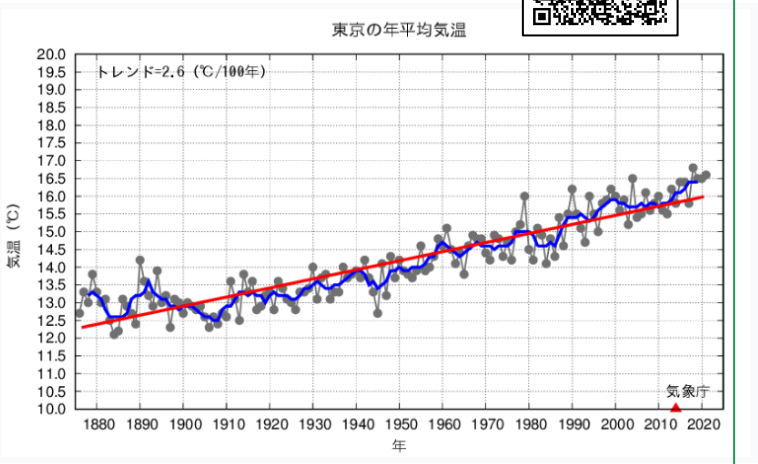
The Past situation of Air temperature

Air temperature

▷ The average annual temperature is on the rise.

▷Midsummer days and tropical nights are on the increase in all areas, the wards and Tama area and the islands.

▷The number of extremely hot days is on the increase in the wards and Tama areas, but not in the islands.



Annual average temperature in Tokyo (from Tokyo District Meteorological Observatory homepage)

Precipitation

▷Precipitation varies greatly from year to year, and there is no clear of change in all areas, the wards and Tama area and the islands.

▷The number of no rainfall days is on the rise in the wards, and there is no clear of change in Tama area and the islands.

▷According to the Japan Meteorological Agency's data on the annual occurrence of short duration heavy rain (hourly rainfall of 50 mm or more) at 1,300 locations nationwide, the average for the last 10 years has increased approximately 1.5 times compared to the average for the first 10 years of the statistical period[1].

Typhoon[2]

▷According to the observation data for 40 years from 1980 to 2019, the number of approaching typhoons has been increasing in Tokyo. In addition, the frequency of the approach of strong typhoons is increasing and the speed of movement is getting slower and the time affected by typhoons is getting longer.

Sea Level[3]

▷The average sea level along the coast of Japan has been on the rise since 1980.

1: Japan Meteorological Agency “Changes such as heavy rain and extremely hot days (extreme events) till now” (https://www.data.jma.go.jp/cpdinfo/extreme/extreme_p.html)

2: Meteorological Research Institute press release: "Typhoons approaching the Pacific side have increased in the past 40 years" (August 25, 2020)

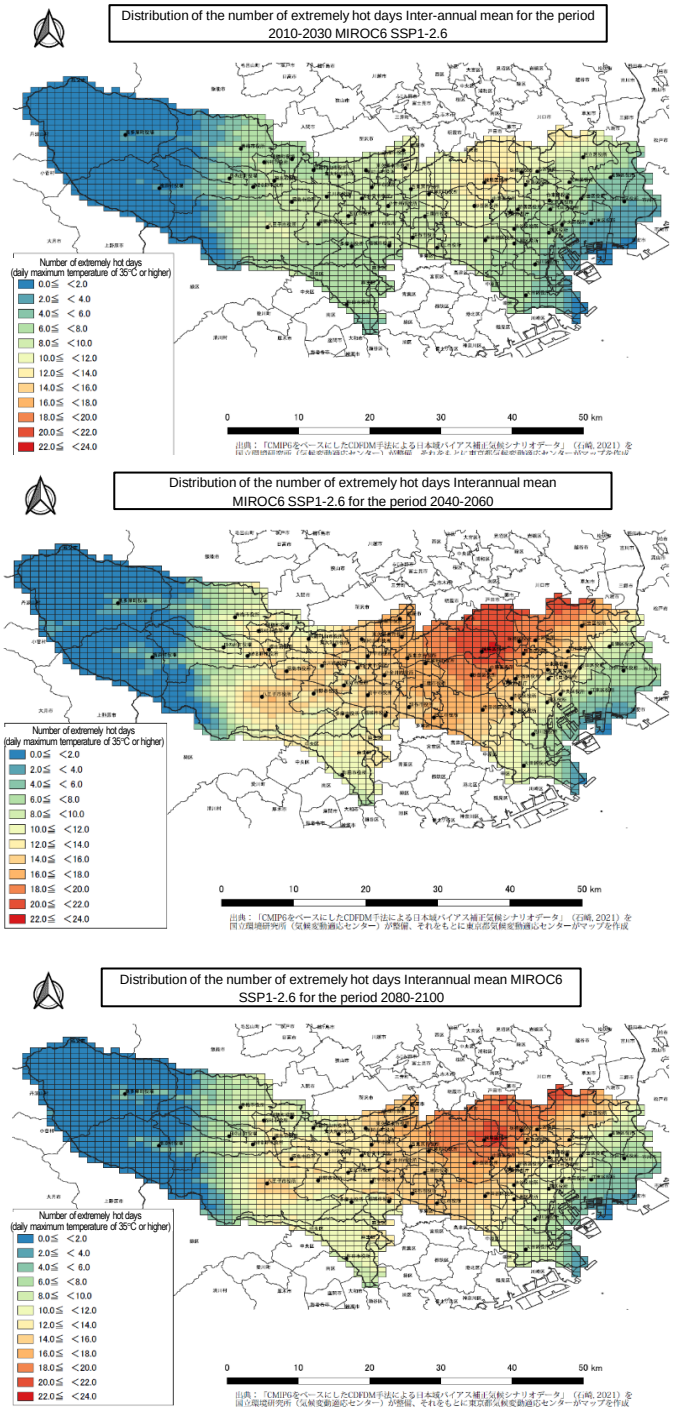
3: Japan Meteorological Agency announcement: "Long-term change trend of sea level along the coast of Japan (forecast (2021)" (February 15, 2022) (https://www.data.jma.go.jp/cpdinfo/extreme/extreme_p.html)

Forecast of Future Climate Change

Air temperature

▷Temperatures in the wards, Tama and islands are expected to rise in the future. In addition, daily minimum temperatures are expected to increase more than average temperatures and daily maximum temperatures in all areas.

▷ Midsummer days, extremely hot days and tropical nights are expected to increase in the future.



Forecast of the number of extremely hot days in Tokyo

Source: “Bias corrected climate scenarios over Japan based on CDFDM method using CMIP6” (Ishizaki, 2021) developed by National Institute for Environmental Studies (Center for Climate Change Adaptation) and Local Climate Change Adaptation Center in Tokyo created a map based on it.

Precipitation

▷Annual precipitation amount in the wards and islands tends to decrease in the future. On the other hand, the Tama area has shown on the increasing, and there are differences on the increasing and decreasing depending on the area.

▷The number of days with short duration heavy rain and no rainfall is increasing in all areas. In addition, the severity of individual short duration heavy rain is also predicted, and it is predicted that the bomb cyclone will become stronger and that the duration of rainfall per extreme heavy rain during the rainy season will become longer.

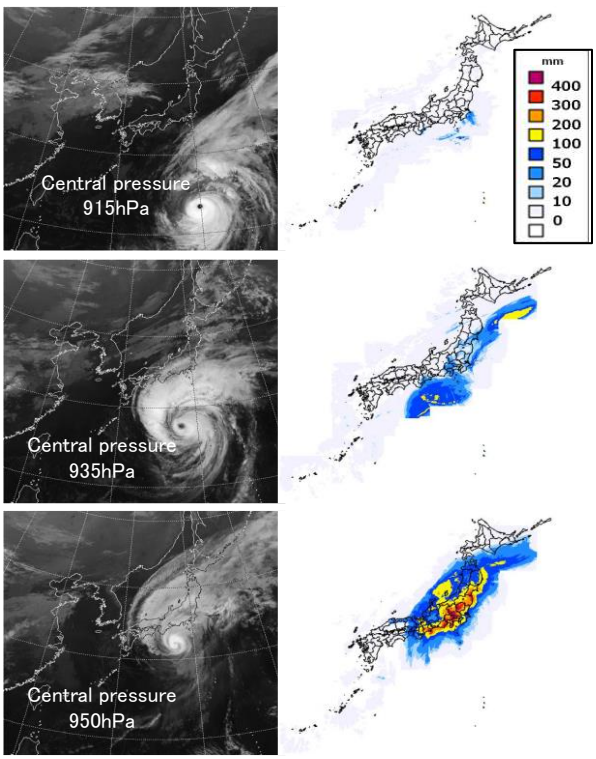
Typhoon

▷There is not small uncertainty regarding the future forecast of the typhoon, but it i s predicted as follows.

・The number of typhoons in Northwest Pacific has generally decreased and the number of typhoons approaching Japan will decrease as the area with the highest number of typhoons will move from the current waters near the Philippines to the east in the future[1].

・As the sea level rises, the intensity of the typhoon near Japan increases and reaches Japan[3] with the intensity called Super Typhoon[2].

・As for rainfall associated with typhoons, the annual total amount of precipitation associated with typhoons does not change because individual typhoons increase in rainfall intensity and increase in rainfall, while typhoons approaching Japan decrease[3].



Meteorological satellite images (Infrared) and daily rainfall distribution chart (Analyzed rainfall) of the 2019 East Japan Typhoon
(Processed from the figure published in the Japan Meteorological Agency "Report on Natural Phenomena in Disasters, 2020, No. 3")

Sea Level[4]

Assuming a 4° C rise at the end of the 21st century relative to the end of the 20st century as the base, the annual average sea level in the coastal area around Tokyo is estimated to rise by 0.70 m at the end of the 21st century.

1: "Integrated report on Climate Change observation, prediction and impact assessment 2018 - Climate change in Japan and its impacts -" (February 2018)

2: Super Typhoon: This is the maximum intensity class set by Joint Typhoon Warning Center (JTWC) in the United States, and the maximum ground wind speed in 1 minute average is equivalent to 130 knots (about 67 m/s) or more.

3: “Details of Climate Change Impact Assessment Report” (December 2020)

4: "Climate Change in Japan 2020 — Observation and prediction assessment report on the atmosphere, land and ocean — (Detailed edition)“ (December 2020)

3. Basic Concept to Adaptation

Basic concept

As the impacts of climate change intensify, it is essential to promote "mitigation" to reduce CO2 emissions. It is also necessary to promote adaptation in order to avoid and mitigate the impacts of climate change that remain even after strict “mitigation” efforts.
Therefore, based on “TOKYO Resilience Project,” we will make every effort to realize a city that continues to be chosen by people and businesses by protecting the lives and property of Tokyo residents.

Basic strategy

① Adapt to Climate Change across Metropolitan Government's measures

The impacts of climate change adaptation are being felt in a wide range of fields, including natural disasters, health, agriculture, forestry and fishery. We will incorporate climate change adaptation into all relevant measures to address the impacts of current and future climate change.

② Promote Climate Change Adaptation based on Scientific knowledge

Scientific knowledge, including future predictions of climate change and climate change impacts, is constantly updated in accordance with the progress of research and study. We will promote adaptation measures based on the latest scientific knowledge. We will also actively utilize the latest technologies related to climate change adaptation.

③ Support Local initiatives in cooperation with Municipalities

Since the impact of climate change varies greatly depending on area characteristics, it is important to develop measures that are appropriate to the actual conditions of each area. We will support local initiatives by actively providing information so that municipalities can develop measures rooted in their communities.

④ Promote Information on risks and Understanding among Tokyo residents

In order to promote measures for climate change adaptation, it is essential to gain the understanding of Tokyo residents, and it is necessary to actively raise awareness and inform of climate change adaptation. We will establish systems for collecting and providing information on climate change and actively disseminate it.

⑤ Promote International cooperation with C40[1] and Other partners to accelerate cooperation between Cities

The impact of climate change and its measures are global issues. We will accelerate cooperation between cities by sharing knowledge through the use of organizations that Metropolitan government participates in, such as C40.

1: C40... World cities climate lead group. It was established in 2005 as a network of cities around the world working together to reduce greenhouse gas emissions. Tokyo joined in December 18 (2006).

Vision for 2050

▶ Minimize risks from climate change impacts

- Protect the lives and property of Tokyo residents, and realizing a city that continues to be chosen by people and businesses -

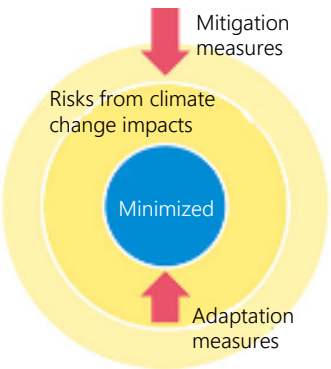
The environment is in place to avoid or reduce such as flood damage and sediment disaster caused by torrential rains, typhoons, etc.

Heatstroke and infectious diseases, health effects of rising temperatures, such as health damage from air pollution, are minimized

We realize agriculture, forestry and fishery industry to be also resilient to rising temperatures and disasters such as typhoons.

The risks of drought and deterioration of water quality etc. are reduced, and stable supply of high-quality water and comfortable water environment are realized

The impact on biodiversity is minimized and a rich natural environment is ensured.



< Challenges for 2050 >

■Utilizing innovative technologies such as high-precision climate change forecasting to promote efficient and optimal adaptation measures

■Establishment of Tokyo residents' actions and business activities in consideration of adaptation

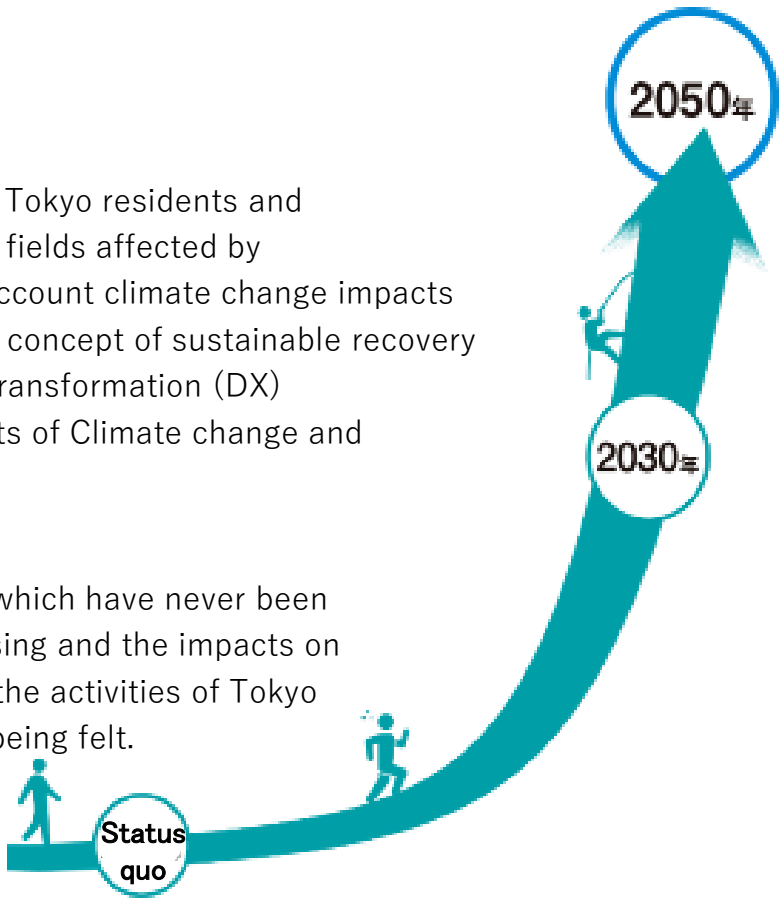
Targets for 2030

Through the activities of TMG, Tokyo residents and businesses, efforts made in all fields affected by climate change will take into account climate change impacts in the future, incorporating the concept of sustainable recovery and the perspective of digital transformation (DX)

※For details, refer to 4. Impacts of Climate change and main efforts in the future

Current situation

Extreme weather phenomena which have never been experienced before are increasing and the impacts on Metropolitan government and the activities of Tokyo residents and businesses are being felt.



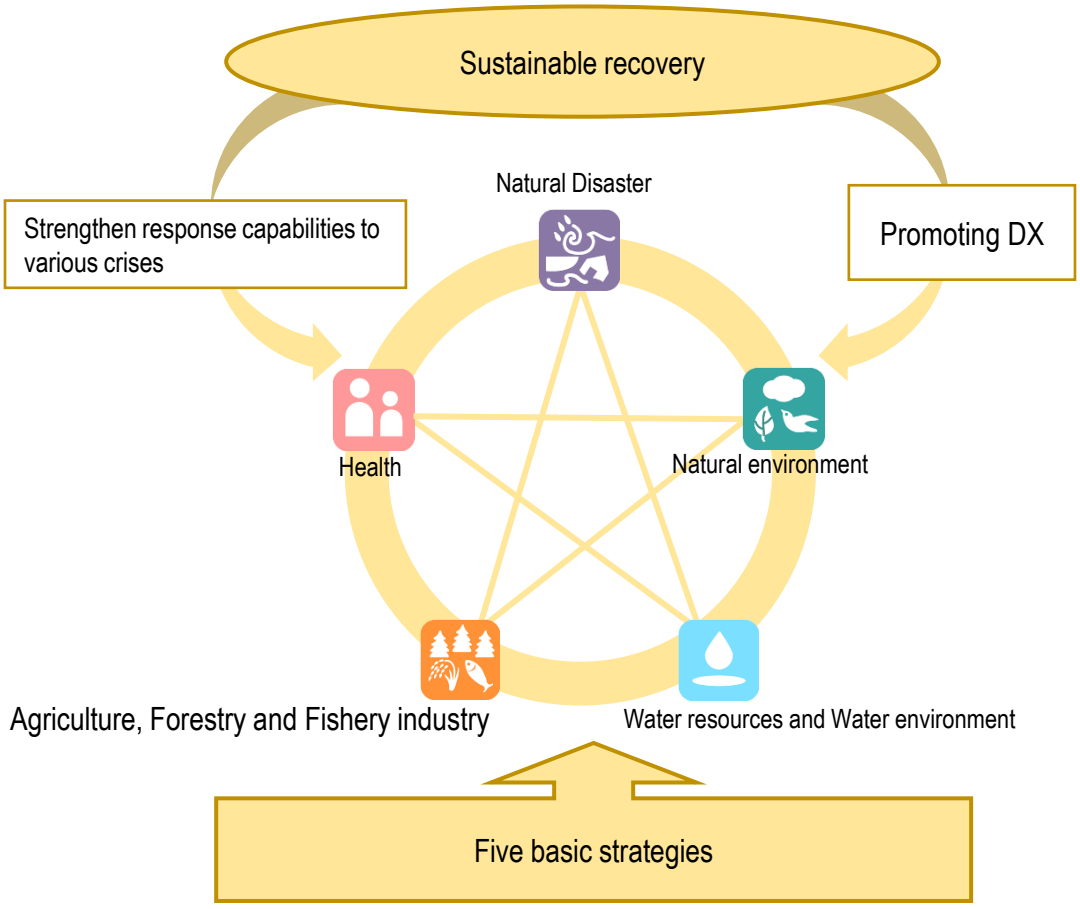
4. Impacts of Climate Change and Main Efforts in the Future

In this chapter, it summarizes the impacts of climate change and main initiatives for the future in each of the five areas: ①Natural disasters, ②Health, ③Agriculture, Forestry and Fishery industry, ④Water resources and Water environment and ⑤ Natural environment.

In responding to the impacts of climate change, in addition to the basic concepts and five basic strategies described in the previous chapter, based on the concept of "Sustainable recovery," we will not only respond to the threats posed by climate change, but also enhance its ability to respond to various crises affecting the lives of Tokyo residents, such as emerging infectious diseases, the economy, and society.

In particular, we will promote measures based on “TOKYO Resilience Project” and incorporating the perspective of digital transformation (DX).

The impact of climate change is based on the nation’s “Climate Change Adaptation Plan” (November 2018) and “Climate change impact assessment report (December 2020).



Icons’ source for each field in this document: Climate change adaptation information platform

※ The action plan for the next three years is published on the homepage of Tokyo Metropolitan Government Bureau of Environment.

Impacts of Climate Change

Flooding and inland water inundation

Flooding damage is expected to become more severe and frequent due to the increase of heavy rain, the rise of sea level, and the intensification of typhoons.

In addition, in low-lying areas etc. near rivers and coasts etc. the frequency of river water level rises and sea level rises will increase and the possibility of inland water inundation will increase due to the difficulty of draining rainwater from sewers etc. This will be expected the flooding time and expand the flooding range[1].

Storm surge and high waves

The risk of flood due to storm surges increases as the scale of storm surges affecting Japan increases due to rising sea levels and intensification of typhoons and changes in their routes[2].

In addition, the possibility of an increase in the risk of high waves in the Pacific coastal area due to an increase in the intensity of typhoons and damage to harbors and breakwaters of fishing ports etc. due to an increase in wave heights and storm surge anomalies are predicted.

Sediment disaster

It is assumed that the frequency of landslide disasters will increase with the increase of heavy rain.

With the increase of sudden and localized heavy rain, there is also a concern about the increase of sediment disasters with short lead times for warning and evacuation and the increase of deep-seated landslide etc. due to record heavy rain caused by typhoons, etc.

In addition, there is a risk of human and material damage caused by the collapse of illegal embankments carried out artificially or improperly constructed embankments.

1: Report on assessment of impacts of Climate change in Japan and future issues (offering opinions)(March 2015)

2: "Integrated report on Climate change observation, prediction and impact assessment 2018 - Climate change in Japan and its impacts -“ (February 2018)

Main Efforts in the Future

In response to natural threats such as flooding, inland water inundation, storm surges and sediment disaster caused by increasingly severe heavy rain and typhoons, we will promote the use of cutting-edge technologies and the development of urban facilities from both hardware and software.

In order to cope with the increasing strength of typhoons and the increasing frequency of heavy rain in the future, we will further upgrade our measures based on “TOKYO Resilience Project.”

●TOPIC● TOKYO Resilience Project

To protect the lives and livelihood of Tokyo residents from the danger of disasters that Tokyo faces, including wind and flood disasters, “TOKYO Resilience Project” promotes a variety of measures to realize the resilient Tokyo we aim to achieve in the 2040s.
As the climate crisis becomes more serious and large-scale disasters occur one after another in Japan and overseas, it is necessary to constantly review measures and strengthen preparedness in order to realize the resilient Tokyo that can be assured 100 years into the future.
In December 2023, we announced "TOKYO Resilience Project *Upgrade* I," which upgraded our efforts to address wind and flood damage in light of climate change.
We will continue to promote this project to realize a resilient and sustainable Tokyo that can ensure the safety and security of Tokyo residents.

TOKYO Resilience Project *Upgrade* I

Storm and flood damage	Earthquake	Volcanic Eruption	Power and other disruptions	Building a Community Resilient to Infectious Diseases
“Furthering Heavy Rainfall Countermeasures in the Context of Climate Change.”	“Strengthening earthquake preparedness in cooperation with Tokyo residents, etc.”	“Fuji eruption, starting with actions that can be initiated.”	“Ensure a renewable power supply and telecommunications that can function in times of disaster”	"Deepening our efforts to anticipate new infectious disease outbreaks
➢Raise target rainfall for heavy rain measures by 10 mm per hour. ➢Initiated efforts to commercialize underground rivers, etc. ➢Promoting stormwater runoff control through green infrastructure. ➢Introduction of a new mechanism for upland community development (high standard dike maintenance) and other measures to make upland projects on three rivers by around 2030.	➢Encourage the development of dedicated maintenance routes through collaborative efforts, including assistance in securing relocation sites. ➢Strengthen support for earthquake resistance of wooden houses and liquefaction resistance of buildings. ➢Improve and strengthen condominium disaster preparedness by securing disaster preparedness equipment and materials, supporting drills, dispatching condominium managers, etc.	➢Deepen the study on the concept of ash removal procedures and the direction of securing materials and equipment, etc., in order to establish a road opening system. ➢Improvement and reinforcement of materials and equipment to ensure police and firefighting activities in the event of ash fall. ➢Organize the concept of selecting temporary storage sites in Tokyo for large amounts of ash. Select candidate sites in cooperation with wards, cities, towns, villages, etc. in the future.	➢Accelerate implementation by promoting the deployment of renewable energy facilities such as photovoltaic power generation, utilizing next-generation technologies, and expanding demand and building supply systems for green hydrogen. ➢Establishment of "Connected Tokyo," including OpenRoaming*-compatible Wi-Fi in all evacuation centers in Tokyo and satellite communications.	➢Promoting the attractiveness of outdoor urban activities at an early stage through spatial reorganization of Nishi-Shinjuku and KK Line revitalization events, etc. ➢Diversify transportation by supporting the implementation of boat transportation and other measures to reduce the risk of infection. ➢Enhance the working environment within walking distance by promoting renovation of existing buildings in the preceding areas.

*OpenRoaming: A universal authentication platform that allows users to register once and use encrypted, secure Wi-Fi.

Key points of the upgrade (excerpt from points of “TOKYO Resilience Project *upgrade* I")

For details, please refer to “TOKYO Resilience Project" homepage.

（1）Hard measures
①　Infrastructure development
i　Improvement of Rivers, Sewers and Coastal protection facilities etc.

Strengthening of comprehensive Flood control measures

・Based on the results of the considerations of the target precipitation etc., in the "Tokyo Metropolitan Government Basic Policy on Heavy rain Measures" revised in December 2023, the division of roles of various measures such as river and sewerage development and installation of storage and infiltration facilities etc. will be clarified and all parties concerned will work together to promote heavy rain measures. =>See TOPIC on page 28, " Tokyo Metropolitan Government Basic Policy on Heavy rain Measures"

Measures against Heavy rain in Rivers

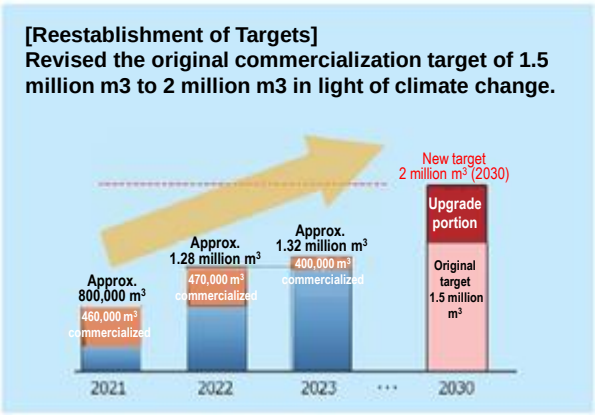
・Along with the maintenance of the revetments, we will promote the maintenance of regulating reservoirs etc., such as under construction of Loop Road No.7 the wide-area underground regulating reservoir.

・In the light of “The ideal way of River Facilities in light of Climate Change” formulated in December 2023 to respond to climate change, such as increased precipitation in the future, We will promote efficient and effective measures using regulating reservoirs etc. =>See TOPIC on page 28, "The ideal way of River Facilities in light of Climate Change”

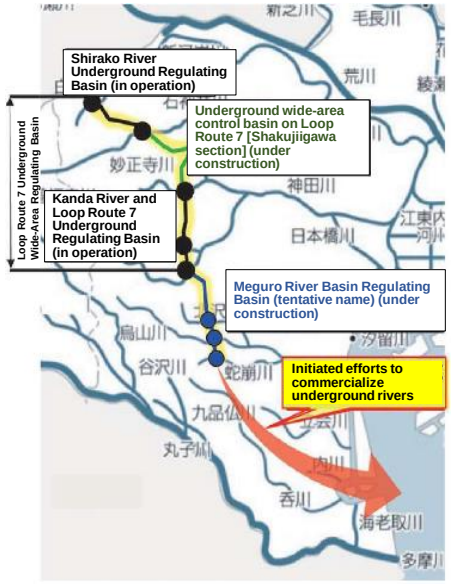
・In light of climate change, we will re-set the target for operationalization of new regulating reservoirs etc. to approximately 2 million m^3 (FY 2030) and consider operationalization.

・Promote initiatives for operationalization of underground rivers

・In the Tama area, which was damaged by 2019 East Japan Typhoon, local improvement will be carried out to improve the ability of rivers to flow down.



Re-set targets for operationalization of regulating reservoirs etc.



Consideration image of underground rivers

Situation of the development of the revetment (Shakujii river)

Left: Before development
Right: After development

Promotion of Strategic maintenance and management of Rivers

・We will steadily implement maintenance and management based on preventive maintenance plans to ensure that our flood control and defense functions against disasters are fully utilized.

・After securing personnel with specialized knowledge, we will utilize ICT to improve the efficiency and sophistication of inspections etc.

Improvement of Sewerage facilities

・Based on Tokyo Metropolitan Government Basic policy on Heavy rain Measures, we will promote flood measures and water-resistant of sewerage facilities.

〇Flood measures

・Improvement of sewerage enhancement trunks and storage facilities etc. in response to increased precipitation due to climate change

(Priority is given to areas with high risk of flooding and prior development)

・Enhancement of support for flood measures by municipalities (support for municipal sewerage business resilience by subsidy for Metropolitan government)

・Improvement of Watershed sewerage and rainwater trunks in the southern area of the upper Karahori river

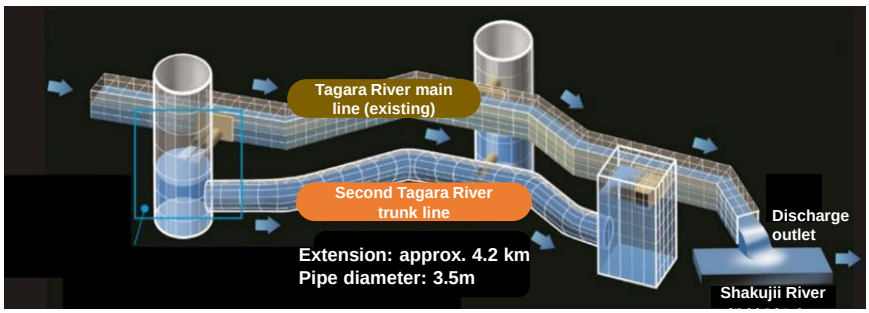
〇Water-resistant of sewerage facilities

・Securing sewerage functions by combining hardware and software measures

・Considering the possibility of flood damage due to rainfall exceeding the target or multiple disasters, etc., we promote water resistance measures at the highest level in each facility against storm surges, tsunamis, floodings and inland water inundations.

・As an emergency preparedness measure, in the event of loss of sewerage functions, improvement software measures such as emergency restoration necessary to restore sewerage functions as soon as possible.

・When flooding depth is high and implement is difficult, water resistance is developed when the facilities are rebuilt.



Sewerage enhancement trunks (Second Tagara river trunks)

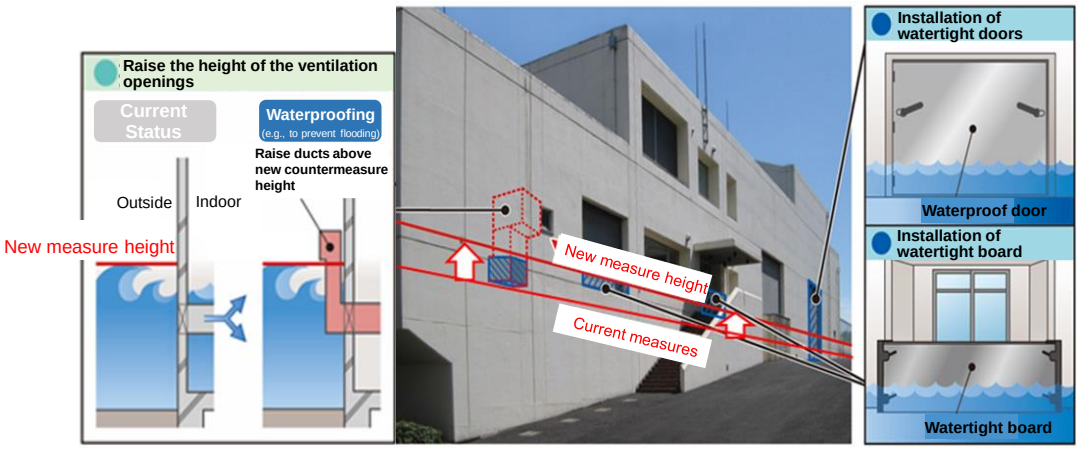


Image of water-resistant improvement

Promotion of Watershed measures

・In order to encourage each ward and city to make voluntary and systematic efforts to control rainwater runoff equivalent to 10-millimeter rainfall per hour, we will set an effort target for the amount of measures and publicize the status of progress.

・A model project will be implemented in cooperation with Local governments to verify effective installation methods of facilities and to raise awareness among Tokyo residents.

・Efforts will be made to create and preserve greenery and reduce flood damage through rainwater Infiltration.

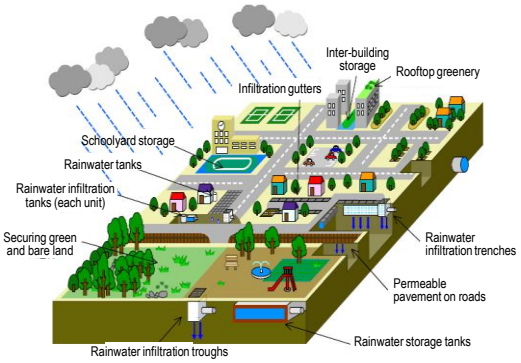


Image of Watershed measures

Control Rainwater runoff etc. using Green infrastructure

・We will promote the introduction of green infrastructure that contributes to the control rainwater runoff in public lands.

Strengthening of Agricultural infrastructure

・We will use digital technology to promote improvement the disaster prevention functions of reservoirs and agricultural waterway head gates.

Storm Surge measures

・In order to protect the lives and livelihood of approximately 3 million people living in the eastern lowlands, we will promote the development of storm surge protection facilities.

・Based on the revision of Tokyo Bay Coastal Conservation Basic Plan [Tokyo metropolitan area] in FY 2022 and the formulation of the Tokyo Bay Coastal Conservation Facility Development Plan, Storm surge barriers will be raised in stages and the function of the drainage station will be strengthened.

・Based on the " The ideal way of River Facilities in light of Climate Change," in FY 2024, we will formulate the "Policy for the improvement of Measures against Storm Surge in Rivers (tentative name)" to determine the optimum improvement methods for each river and promote the improvement to raise storm surge barriers etc.

・Efforts will be made to promote the development of super levees, which can secure the required levee height and improve landscape and hydrophilicity.

・Operation of the floodgates will be based on remote control, and we will continue to prepare for unexpected situations by monitoring camera images and information signals installed at the facilities.

Tatsumi Canal Storm Surge Barrier (Koto Ward)

Tatsumi Floodgate (Koto Ward)

Development of Coastal conservation facilities in Island areas

・In order to protect hamlets etc. behind the coast from storm surges etc. caused by typhoons and low atmospheric pressures in the future, Coastal Conservation Basic Plan will be revised in light of rising sea levels and intensifying typhoons etc. caused by climate change and the development of coastal conservation facilities such as revetments and artificial reefs will be promoted.

・We will use drones and satellites etc. to assess the damage situation and digital technologies to accelerate and improve disaster recovery.

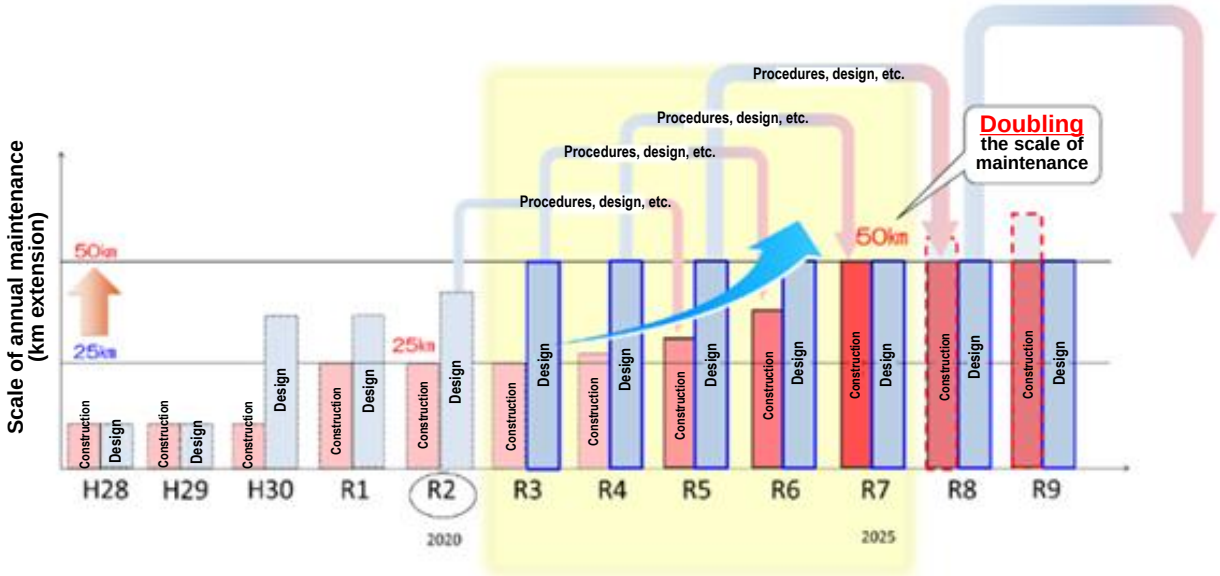
Policy Targets for 2030

Policy targets	Current value	Target value
Operationalization of regulating reservoirs etc.	Total: Approximately 1.28 million m^3 (End of FY 2022)	Total: Approximately 2 million m^3 (FY 2030)
Promote sewerage development by prioritizing areas etc. with high risk of flooding	28 of 67 districts completed (FY 2022)	Start of new projects in 10 districts (Around FY 2030)
Promotion of watershed measures, visualization time 10 mm rainfall equivalent: about 6.54 million m^3	Storage and infiltration facilities approximately 4.32 million m^3 (End of FY 2021)	Achieving efforts targets set by Local governments
Promotion of efforts in watersheds for strengthening measures	Scope of subsidies 10 watersheds (FY 2023)	Promotion of watershed measures through implementation of subsidies in watersheds where measures are strengthened
Model projects for watershed measures	—	Improvement of Tokyo residents' awareness
Creation of good greenery * on private land *It is a combination of green land such as trees and open spaces such as open spaces, grounds and water surfaces.	Lack of good greenery in the city	In line with private development, good greenery has increased throughout the city.
New designation and public ownership of conservation areas	Approximately 760ha (End of FY 2023)	Approximately 1,000ha (FY 2050)
Development of super levees, etc.	Total of 48 districts almost completed (Expected end of FY 2023)	Total of 53 districts almost completed (FY 2026)
Promotion development of Coastal Conservation Facilities at Tokyo port	Outer storm surge barrier almost completed 39.3 km (End of FY 2022) 15 floodgates (End of FY 2022)	Gradually began raising the storm surge barrier of about 24 km (FY 2031)
Development of coastal conservation facilities in island areas	Promotion development of 4 coastals	Completed at 4 coasts (FY 2030)

ii Securing the functions of City facilities

Promoting Undergrounding Power lines

- In order to prevent utility poles from collapsing in the event of an earthquake or flood, and to facilitate a smooth response in the event of a disaster, we will promote undergrounding power lines.
- Based on the "Undergrounding Power lines Plan in Tokyo" and other measures, we will work to strengthen support not only for metropolitan, but also for and municipal roads, and to strengthen town development efforts.
- We will double the annual scale of development for metropolitan roads and aim to complete the first emergency transport road by FY 2035. *25 km/year (FY 2020) ⇒50 km/year (FY 2025)



Annual development scale in metropolitan roads

・For island areas, in order not to cause power outages and communication problems even in the face of natural disasters such as intensified typhoons, we will promote undergrounding power lines in island areas in order to achieve the development targets set out in the "Tokyo Metropolitan island area Undergrounding Power lines Development Plan (Famulated in January 2022)."

・In addition, we will promote the development based on the development plan for Toshima and Mikurajima formulated in FY 2022 in order to become "An island without Utility poles".

[Before development]

[After development]

Undergrounding Power lines in island areas (Oshima town, Sashikiji area)

Development of Roads and Bridges

・We will build trunk road network by developing roads and bridges to ensure redundancy[1] in the event of a disaster.
・We will promote the development of highways to complement and strengthen the emergency transportation network that supports emergency transportation and prompt rescue and relief activities etc. in the event of a disaster, as well as Related continuous grade separated crossing projects.
・We will promote projects such as roads as access routes to wide-area disaster prevention centers.
・By constructing and replacing bridges such as emergency transportation roads, developing roads that serve as alternative routes in the event of a disaster and promoting to widen emergency transportation roads, we will enable reliable rescue activities in the event of a disaster and secure transportation routes for goods and evacuation routes.
・In order to enable wide-area evacuation in the event of a large-scale disaster, we will promote the construction of new bridges on the prefectural border (Chiba Prefecture) where evacuation routes are limited.

Strengthen Disaster prevention functions of Street trees

・In order to strengthen the disaster prevention function of street trees, we will intensively focus on inspecting street trees in areas where there were many fallen trees due to typhoon damage and proceed with the planned renewal.

Inspecting street trees (checking tremors)

(Confirmation of Steel rod penetration[2])

1: Redundancy ... is an English word meaning "redundancy" or "surplus."
In the event of a failure due to natural disasters, etc., a traffic network or lifeline facility is multiplexed in advance or a backup means is prepared so that the interruption of some sections or the destruction of facilities do not lead to the malfunction of the whole.

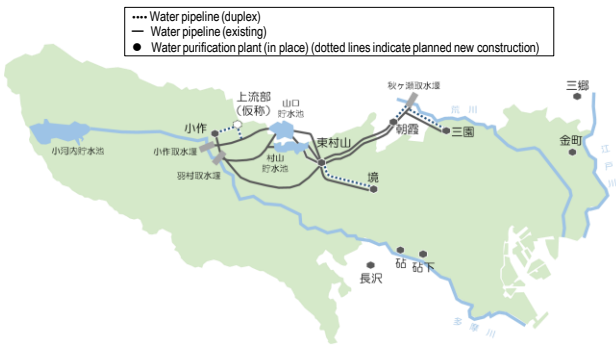
2: Steel rod penetration ... A test method in which the rods are pierced into the shaft from the root to search for the site of decay. The decay part is discovered by the feeling generated when the tip part is penetrated.

Improvement of Water supply stability

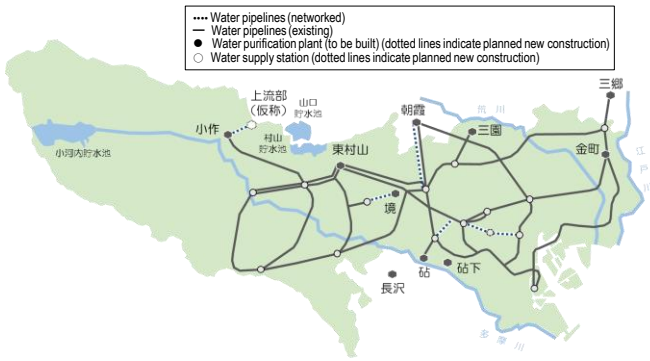
・In order to ensure a backup function not only in the event of disasters or accident, but also in the event of construction work such as renewal, we promote the duplication of water supply facilities.

・In order to ensure backup functions from other systems, we will build a wide-area network of water pipes and promote the two-system system of water supply to water stations.

・As for pipelines that cross the upper part of rivers, there is a concern that they will run out, water will be cut off due to river flooding etc. and other serious damage will occur, so we will proceed with the installation of underground pipelines.



Duplex water supply facilities (image)



Water pipe network (image)

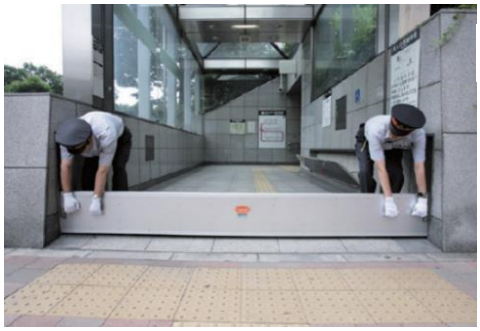
Flooding measures in Toei Subway

・In order to prevent the inflow of water from the ground, we will install water stops at station entrances and inundation prevention devices at ventilation openings. In addition, we will install waterproofing gates in tunnels to prevent the spread of inundation in underground areas.

->Completion of city flood disaster measures (mid 2030s)

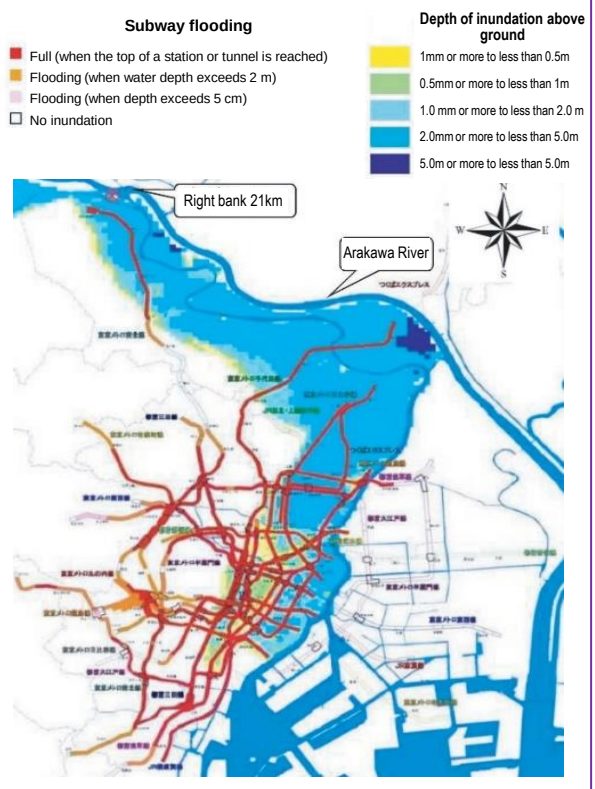
->Completion of measures against Arakawa River flooding (around 2040)

->Completion of storm surge measures (mid 2040s)



Water stops

Waterproof gate in tunnel



Assumption of inundation of subways in case of Arakawa River flooding

*21 km of the right bank of Arakawa River was breached (24 hours after the levee breached).

(Created based on the materials of Central Disaster Prevention Council “Committees for technical investigation On large-scale flood countermeasures”

Policy Targets for 2030

Policy targets	Current value	Target value
Undergrounding power lines by utilizing special city renewal areas	Promoting Undergrounding power lines by taking advantage of city development opportunities	Efforts by private businesses and others expand more than ever before
Undergrounding power lines by utilizing various city development systems	Promoting Undergrounding power lines by taking advantage of city development opportunities	Efforts by private businesses and others expand more than ever before
Undergrounding power lines by centered on disasters prevention living roads	Promoting efforts in each Ward	Efforts in each ward expand more than ever before
Undergrounding power lines by urban area development projects (implemented by Tokyo Metropolitan government)	Operating in 3 areas	Completed in FY 2026
Undergrounding power lines in urban area development projects implemented by municipalities and the private	Undergrounding power lines by taking advantage of urban area development opportunities	Town development without utility poles and electric wires is the standard.
Undergrounding power lines in private residential land development (development permit)	Implement projects to promote undergrounding power lines in private residential land development and construct a mechanism to support the efforts of business operators	Promote efforts aiming at the standardization of undergrounding power lines
Undergrounding power lines of the first emergency transport roads	41% (FY 2022)	Aim for completion in FY 2035
Undergrounding power lines of emergency transportation roads such as harbor roads	56% (FY 2022)	Aim for completion in FY 2035
Development of main highways and related continuous grade separated crossing projects	・Development rate of main highways Ward area radial roads: 72% Ward area loop roads: 78% Tama North-South: 82% Tama East-West: 70% ・Promotion of development on 4 routes at 5 locations in Continuous grade separated crossing projects related to main highways (Results at the end of FY 2022)	・Development rate of main highways Ward area radial roads: 76% Ward area loop roads: 83% Tama North-South: 92% Tama East-West: 79% ・Promotion of development on 5 routes at 5 locations in Continuous grade separated crossing projects related to main highways (FY 2030)
Construct and replace bridges for emergency transportation roads etc.	Land acquisition and construction in progress	Strengthen the functions of rescue and relief activities and goods transportation routes in the event of disasters
Development of roads as alternative routes etc. in the events of disasters	Land acquisition and construction in progress	Improve disasters prevention capabilities preventing isolation etc. by widening existing roads, linear improvement and promoting the development of alternative road routes in Tama mountainous and island areas
widening and improvement of emergency transportation roads	Land acquisition and construction in progress	Strengthen rescue and relief activities in the event of disasters and goods transport routes
Duplication of water supply facilities	Constructed at 1 facility Conducted investigations and designs at 2 facilities (Results at the end of FY 2022)	1 facility completed, 3 facilities under construction (FY 2030)
Water pipes network	Completed at 1 facility and constructed at 1 facility Conducted investigations and designs at 4 facilities (Results at the end of FY 2022)	Completed at 3 facilities and 3 facilities under construction (FY 2030)
Underground river crossing pipelines	Conducted investigation and design Constructed at 1 location (Results at the end of FY 2022)	14 measures will be completed (FY 2030)

iii Promotion of Disasters prevention Town development etc.

Promotion of Upland Town development

・In order to avoid the occurrence of catastrophic damage due to large-scale floods etc., liaison meetings with National government will be continuously carried out and National government, Metropolitan government and Ward governments will cooperate to study and operationalize model districts etc. in order to promote the realization of upland town development.

・We will accelerate the development of high-standard levees through integrated city planning decisions for high-standard levees and town development and through development of land readjustment projects etc. that enable direct relocation.

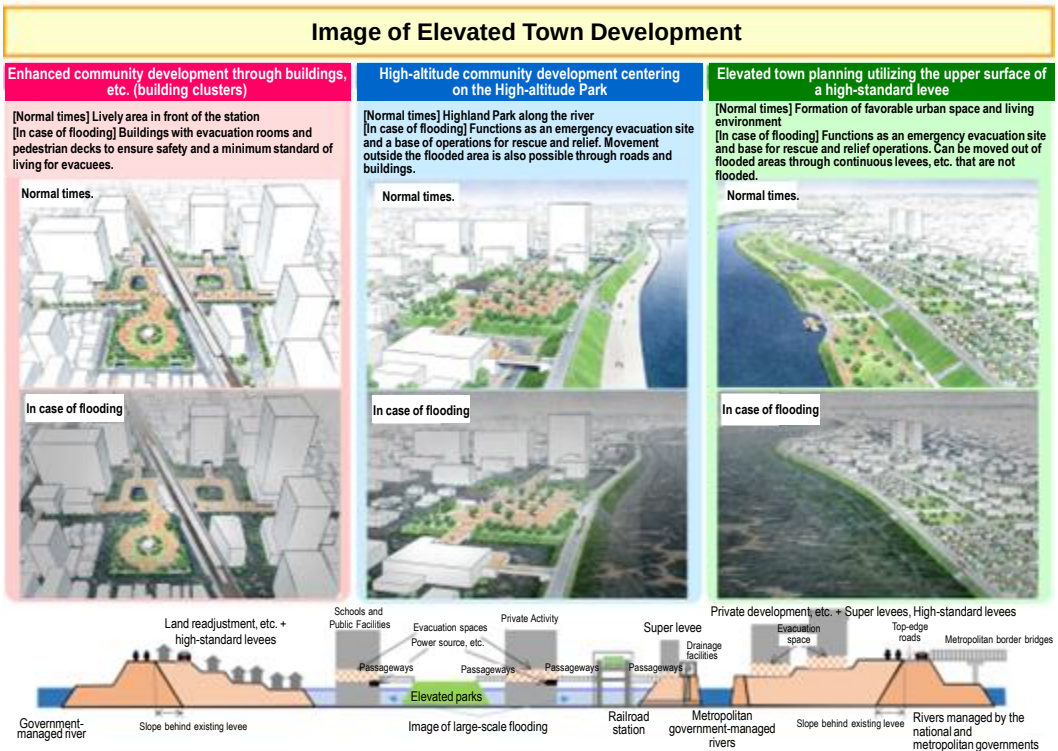
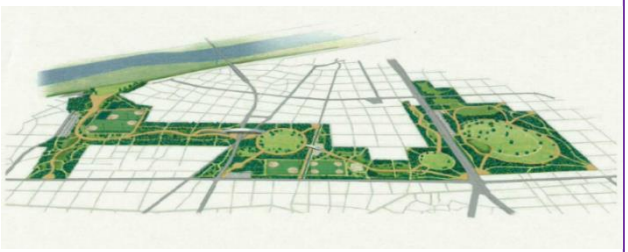


Image of upland town development (Source: Upland town development promotion measures study WG material "Image of upland town development")

Promotion of Upland of Parks

・In Shinozaki Park, we will build a higher ground and at the same time, we will promote to secure an evacuation line to Edo river levee.



Tokyo metropolitan Shinozaki park future image Bird's-eye view

Efforts for Residential land retaining walls etc.

・In order to prevent damage caused by damage to residential land retaining walls etc., we will support municipalities that undertake risk investigations etc.

((Visual investigation) (Ground investigation)

Residential land retaining walls risk investigation

Policy Targets for 2030

Policy targets	Current value	Target value
Promotion of upland town development	Selection of model areas	Operationalization in model areas
Upland of parks (Shinozaki park)	Preparatory work for upland started	Development of Shinozaki park after the upland will be partially completed (FY 2030)
Promotion of disasters prevention measures for residential land	Support for investigations etc. of the degree of risk of cliffs and retaining walls conducted by municipalities (2019.3 Subsidy system established)	Dissemination of disasters prevention measures for residential land

iv Sediment disasters measures

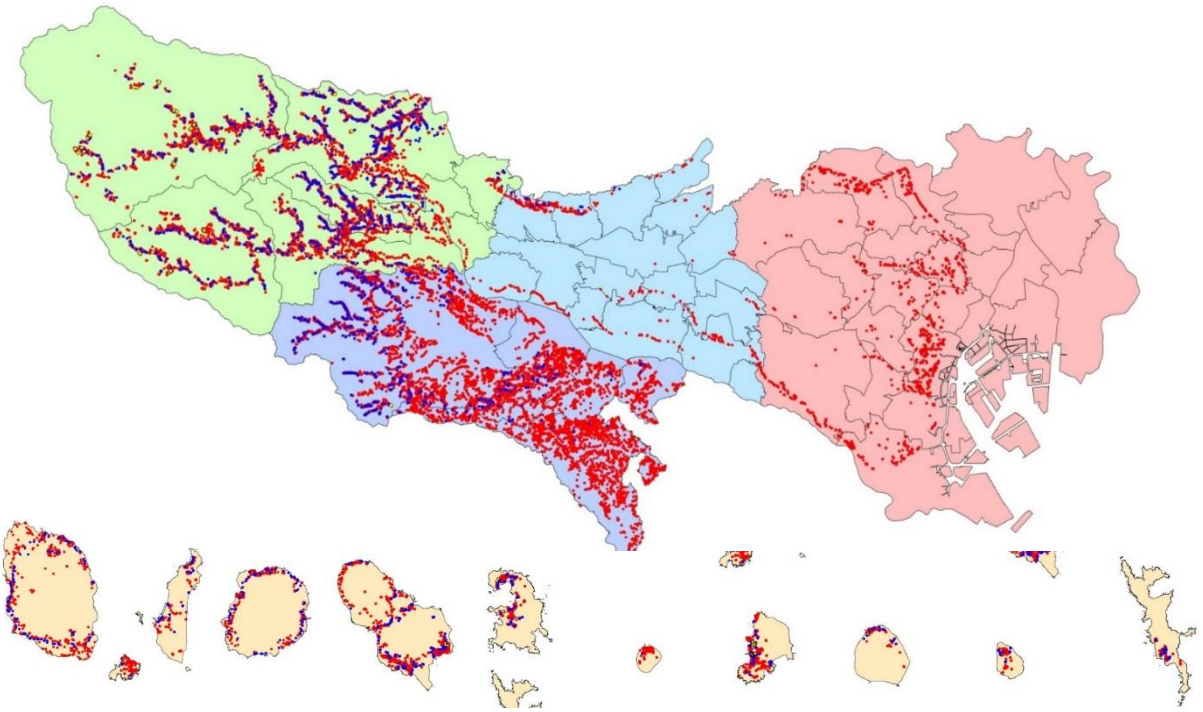
Implementation of Erosion control projects

・ We will examine the priority of measures by utilizing 3D topographic data in the places where evacuation centers exist in the sediment disasters warning zone and where disasters occur.

・In addition, we will promote sediment disasters measures such as the development of erosion control facilities and the implementation of simple measures in mountain streams which are particularly high priority.

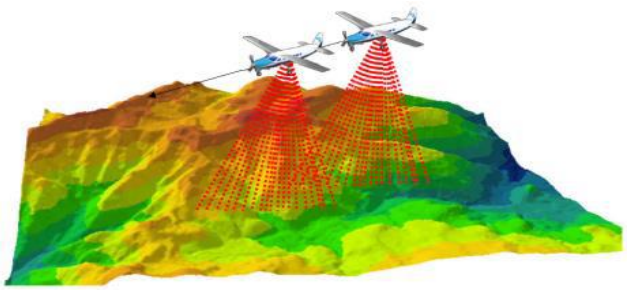
Promotion of Safety measures for buildings in Sediment disasters Special warning zones

・For existing non-eligible buildings (buildings that do not have structural safety against sediment disasters) in the sediment disasters special warning zone, support is provided to municipalities that subsidize the necessary expenses for renovation and relocation of exterior walls.



Sediment disasters warning zone designation map (as of November 2023)

Erosion control facility development(Okanazawa No.2 Dam)



3D laser survey image
(Image courtesy: PASCO CORPORATION)

Improvement of Disasters prevention capability of Mountain roads

・Improve slope inspection of mountain roads by utilizing 3D point cloud data and grasping topography in detail.

・To strengthen the disasters prevention function of mountain roads, we will add new perspectives such as where there are no detours in the event of disasters, select sections for priority measures, and promote measures to prevent the main roads from being washed away.

・In addition to ground anchors, we will expand the scope of measures against aging of existing slopes to include law frames and retaining walls.

Ground anchor

Strengthen Disasters prevention functions of Forests

・In Tama forests and water source forests etc., we will aim to improve the public function of forests by thinning and pruning etc., to prevent sediment runoff and to reduce flood damage through water source cultivation.

・We will cultivate forests that are resilient to disasters through proper management and promotion of forest circulation utilizing advanced technologies such as drones and lasers.

Restructure into an intensive area structure

・In areas where there is a risk of sediment and other disasters, taking into account population dynamics, the government will promote efforts to restructure to an intensive area structure, such as the formulation of location optimization plans by local governments by encouraging residents to move to safer areas.

Policy Targets for 2030

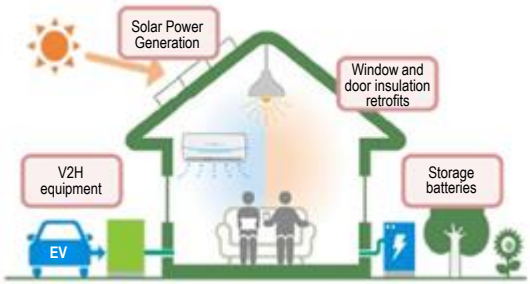
Policy targets	Current value	Target value
Consideration of erosion control facilities (Tama area)	Total 27 locations (Expected end of FY 2023)	Based on studies using 3D topographic data, erosion control measures in high-priority mountain streams Drawing will be formulated (FY 2030).
Improvement of slope inspection by utilizing 3D point cloud data	Arrangement of slope interpretation methods and implementation of slope interpretation work	Improve slope inspection, such as by extracting disasters factors from highly accurate topographical maps using 3D point cloud data.
Strengthen disasters prevention functions of mountain roads	Start construction on 1 route (total) (FY 2022)	Start construction for 10 sections (total) (2026)
Measures against aging of existing slope facilities	14 locations (FY 2022)	Aging deterioration measures construction (63 locations in total) Ground anchor construction etc. (2026)
Conservation and management of water source forests	Appropriate management and conservation of water source forests 1,799ha (3 years from FY 2020 to FY 2022)	Planned conservation of water source forests conduct
Promoting efforts to reconstruct area structures into more intensive ones, such as formulating location optimization plans by local governments	Number of local governments formulating location optimization plans 4 cities	Approximately half of the municipalities in Tama area that are experiencing population decline are considering plans etc.

② Efforts for Electric power in the event of Disasters and the development of Equipment and Materials etc.

Dissemination and development of Emergency Power sources (Promotion dissemination of Residential Photovoltaic power generation and Storage batteries etc.)

・In order to make it possible to use electricity in public facilities, including houses, private facilities and evacuation centers etc., even in the event of disasters, we will promote the use of renewable energy power generation and fuel cells for private consumption, such as photovoltaic power generation and storage batteries etc., to improve regional disaster prevention capabilities.

・New system to make it mandatory to install solar power generation facilities etc. in certain small and medium-sized new buildings such as houses(Enforcement April 2025), we will promote the standardization of the installation of photovoltaic power generation facilities in new buildings.



Resilient to disasters and healthy for existing homes

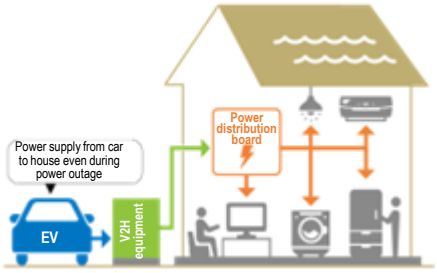
・In order to promote the spread and expansion of heat-insulated and photovoltaic homes that a re resilient to disasters and contribute to health, we will subsidize the installation of storage batteries etc. We will also subsidize the installation of photovoltaic power generation facilities and add subsidies to functional PV.

・We will promote the development of emergency power supplies at important locations such as metropolitan facilities and municipal government buildings.

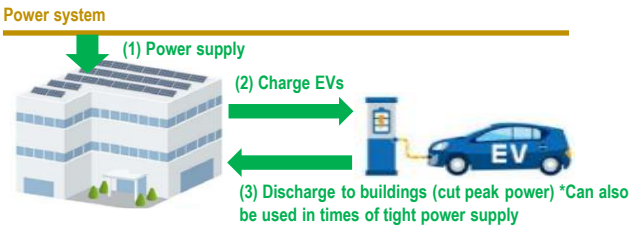
Promotion dissemination of ZEV[1]

・We will promote the dissemination of Zero-Emission Vehicles (ZEV) which are “Moving storage batteries” in order to supply electricity and secure power (V2H, V2B[2] etc.) in evacuation centers and other places in the event of disasters.

・We will promote the development of public chargers and hydrogen stations necessary for popularization and the introduction of external power generators and V2H and V2B equipment necessary for power supply.



V2H (Vehicle to Home)



V2B (Vehicle to Building)

Improve local resilience

・We will improve local resilience by promoting the installation of photovoltaic power generation facilities and storage batteries in island areas.

・In order to utilize local renewable energy without waste, we will promote energy sharing throughout the area as well as our own consumption of renewable energy.

1: ZEV: Vehicles that do not emit exhaust gases such as CO2 while driving (FCV: Fuel Cell Vehicle, EV: Electric Vehicle, PHEV: Plug-in Hybrid Electric Vehicle)

2: V2H: Abbreviation for Vehicle to Home, a function that allows the battery installed in a ZEV to supply power to a home. V2B: Abbreviation for Vehicle to Building, a function that allows the battery installed in a ZEV to supply power to a building.

Project to realize a Hydrogen society

・We aim to ensure that Green Hydrogen[1] is fully utilized in all fields, plays a regulatory role and supports the large-scale introduction of renewable energy and the stable supply of energy.

・In order to promote the introduction of Green hydrogen, we support the installation of facilities by companies.

・Based on "Basic Agreement on Promotion of Green Hydrogen Utilization" concluded with Yamanashi Prefecture, we have started to use Green hydrogen on metropolitan land. In the future, we will promote further utilization in Tokyo.

・Efforts are underway to install Green hydrogen production facilities on metropolitan land.

・We consider hydrogen supply systems including pipelines for the future.
(Cooperate with Kawasaki City and Ota Ward and construct hydrogen supply systems and expand demand in the airport seaside area)

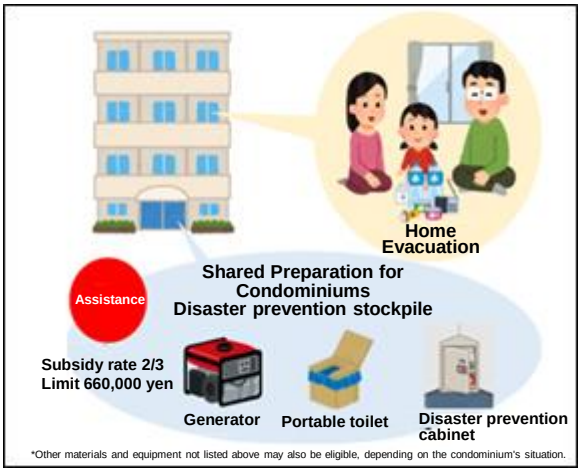
・We will deepen cooperation with overseas cities to build international hydrogen supply chains and expand demand.

Utilization of green hydrogen produced in Yamanashi Prefecture (Tokyo Big Site)

Improvement of Disaster prevention capabilities in Condominiums

・In Tokyo, it is registered and publicized as "Tokyo stay condominiums" as condominiums that make it easy to continue living at home even in the event of a power outage due to disasters to promote its use.

・For the management associations of condominiums and owners of rental condominiums that are registered as "Tokyo Stay Mansions," subsidies are provided for the purchase of disaster preparedness supplies and equipment such as portable toilets and emergency cabinets installed in elevators.



Overview of Tokyo stay condominiums dissemination promotion projects

1: Green Hydrogen … Hydrogen produced by electrolysis of water using electricity derived from renewable energy

Strengthening Disaster response capabilities in Saving and Rescue activities

・We will strengthen the flood prevention systems by improving personal supplies and equipment for flood disasters.

・We will install mini crawler cranes that can remove soil and sand etc. in places where large cranes cannot enter and rubber boats etc. with electric outboard motors that speed up rescue activities in flooded areas.

・In order to rescue people in need of rescue more quickly, vehicles etc. that can suck accumulated earth and sand will be installed.

・In preparation for large-scale flood disasters, materials and equipment such as wire ladders and drainage pumps will be prepared to maintain police station functions.

Mini crawler crane

Rubber boat with electric outboard motor

Project for Improvement of Business continuity facilities in Disaster

・By developing energy conduits etc. that contribute to ensuring the safety of people who have difficulty returning home and the stable supply of energy necessary for the continuation of business and administrative functions in the event of a disasters, we will promote the improvement of city disaster prevention and the strengthening of Tokyo's international competitiveness.

Policy Targets for 2030

Policy targets	Current value	Target value
Amount of installed photovoltaic power generation facilities in Tokyo	Total 674,000 kW (FY 2021)	2 million kW or more
Dissemination of household fuel cells	Approximately 77,000 units (FY 2022)	1 million units
Dissemination of commercial and industrial fuel cells	Total approximately 2,700 kW (FY 2022)	30,000 kW
Securing rate of water supply during large-scale power outages	67% (FY 2022)	92% (FY 2030)
Non-gasoline vehicles as a percentage of new passenger vehicle sales	55.0% * Including minicars 51.9% (FY 2022)	100% gasoline free
Number of public rapid chargers installed	493 units (486 units) (FY 2022)	1,000 units
Number of hydrogen stations	Total 23 locations (FY 2022)	150 locations
Strengthen security command functions and improve materials and equipment utilizing advanced technology	Based on lessons learned from past disasters, we are considering materials and equipment for future disasters.	Strengthen command functions through the use of advanced technologies and such as robots will be further facilitated field activities through innovative materials

●TOPIC●　Revision of Plans related to Natural disasters etc.

①　Tokyo Metropolitan Basic Policy on Heavy rain Measures

In December 2023, we revised "Tokyo Metropolitan Government Basic Policy on Heavy rain Measures " in order to respond to incredible severe and frequent heavy rain due to climate change, review the targets and division of roles etc. of heavy rain measures and build a resilient city.

The directions for accelerating and strengthening 5 measures against heavy rain, “River development," “Sewerage development," “Watershed measures" “Housing and Town development," and “Evacuation measures" are indicated.

For details, please refer to our homepage.

Tokyo Metropolitan Government Basic Policy on Heavy rain Measures (revised)

②　The ideal way of River Facilities in light of Climate Change

In December 2023, we formulated "The ideal way of River Facilities in light of Climate Change," taking into account the increase in rainfall, sea level rise and intensification of typhoons etc. caused by climate change.
We will promote measures for river facilities based on basic concepts such as "flood measures for small and medium rivers," "storm surge measures for lowland rivers etc." and "strengthening soft measures" etc.

For details, please refer to our homepage.

The ideal way of River Facilities in light of Climate Change

(2) Software measure

① Advance preparation

i Raising awareness of Disaster prevention etc.

Awareness raising

・The disaster prevention book "Disaster prevention in Tokyo life" and "Disaster prevention in Tokyo" which were renewed in September 2023 will be used to promote disaster prevention dissemination awareness.

・Through the dissemination of the Tokyo Metropolitan Disaster prevention Application and other means, we will implement detailed disaster prevention dissemination awareness tailored to each generation so that each household can be fully prepared.

・"Tokyo My timeline" will be distributed as a content within the Tokyo metropolitan disaster prevention application, linking the created My Timeline with disaster prevention weather information and supporting appropriate evacuation actions through a notification function etc. that prompts people to check My Timeline.

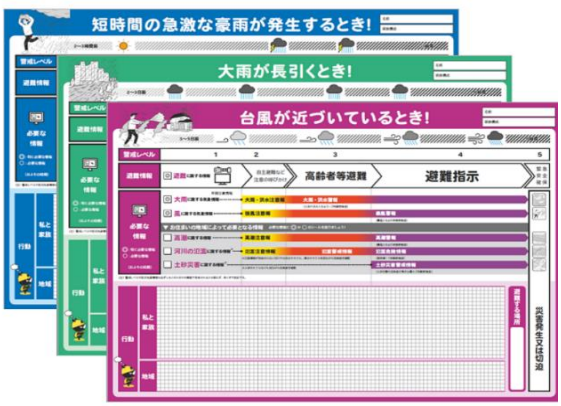
・We will carry out flood disaster dissemination awareness such as distributing flood risk maps that can easily visually confirm the risk of wind and flood damage in various areas of Tokyo and VR video "TOKYO VIRTUAL HAZARD-wind flood damage" about river flooding etc.

・To ensure that foreigners living in Tokyo can live in peace and safety, we will continue to conduct disaster drills for foreigners and strengthen the dissemination awareness of disaster prevention knowledge using "easy Japanese."

・We will disseminate information through the condominium portal site, hold seminars and make use of the "Condominium management guidebook" etc. which contains disaster prevention measures etc.

・In addition to promoting awareness of disaster prevention through events, experts such as condominium managers etc. will be dispatched to management associations and owners of rental condominiums to disseminate practical knowledge and know-how on disaster prevention in condominiums.

Tokyo Metropolitan Disaster prevention Application



Tokyo My timeline
(3 types of My timeline sheet)

Disaster prevention in Tokyo life
and
Disaster prevention in Tokyo

Promotion of Disaster prevention Education

・In the event of natural disasters such as an earthquake directly beneath Tokyo metropolitan area that is expected to occur in order to enable children and students to act appropriately based on the spirit of "self-help" and "mutual assistance," we will further promote the use of "disaster prevention notebooks" and set up opportunities for students to experience disaster prevention with their parents.

Disaster prevention Education portal site and Disaster prevention Notebook

Strengthen the functions of Tokyo Residents Disaster Prevention Education Center

・We will promote the use of Tokyo residents disaster prevention education center (Disaster prevention hall) as a facility where everyone can casually experience disaster prevention.

・In order to provide more effective disaster prevention experience learning opportunities for foreigners, we will promote multilingual facilities.

VR Disaster prevention experience corner
(Ikebukuro, Honjo, Tachikawa)

City Flood experience corner
(Honjo)

ii Establishment of Systems

Evacuation measures

・we will support to municipalities through timely and appropriate revisions of the Guidelines for management and operation of Evacuation centers and Guidelines for measures for persons requiring consideration based on the perspectives of emerging infectious disease countermeasures and women and persons requiring consideration, we will strengthen the support system for welfare specialists in the event of disasters in cooperation with relevant organizations.

・We will promote the training of female disaster prevention personnel.

・In order to realize a smooth evacuation in the event of disasters etc., wide-area evacuation measures in the event of large-scale flood disasters will be considered in cooperation with national government, relevant local governments and relevant organizations etc.

・In order to secure as many places as possible to evacuate, we will support coordination for the utilization of metropolitan facilities and the utilization of hotels, inns etc. in municipalities.

・We will support Local municipalities in directly to inform flood risk information and appropriate evacuation actions to residents.

Strengthen the dissemination of flood risk information

・In order to raise awareness of flood risk and strengthen the dissemination of disaster prevention information, we will operate systems that allows easy access to hazard information such as flood risk and flood damage records. In addition, with a view to using it for the development of flood-resistant town etc., we will work on the preparation of inundation maps using multiple (multi-stage) rainfall events that occur frequently.

・We will promote the updating of hazard maps prepared by municipalities to maps that use Flooding assumption area map due to the largest possible rainfall and storm surge.

Flood Inundation assumption area map (Kanda river basin)

Flooding measures in Large-scale Underground Malls etc.

・Through the consideration of measures by The councils for flood prevention measures for underground shopping areas in Tokyo and the formulation of measures plans for each district, related private managers and the government will cooperate to further enhance flooding measures in underground spaces by strengthening cooperation among managers of underground malls, subways, adjacent buildings etc.

・As flooding measures, we will enhance evacuation guidance measures to ensure the safety of many and unspecified users, we will promote measures in order, giving priority to areas where we are concerned about serious human damage.

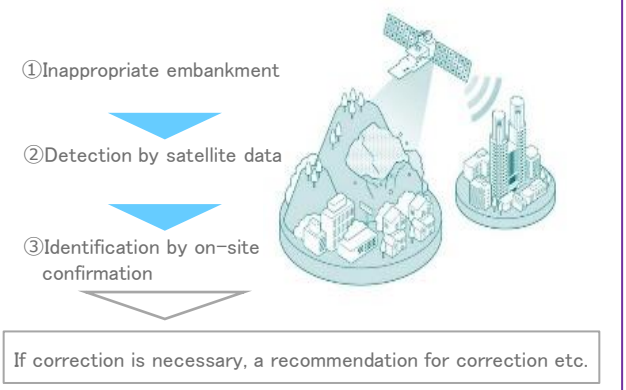
Sediment disaster measures

・Regarding sediment disaster warning zone s etc., A basic survey is conducted about every five years to review the designation of such zones and technical support will be provided to municipalities etc. to develop warning and evacuation systems.

・In order to prevent disasters caused by embankments, we will use satellite observation data etc. to identify areas where landforms have been altered and efficiently identify inappropriate embankments in a wide range of areas.

・We will work with startups to create a posting app and AI automated detection system for inappropriate and existing embankment risks and build monitoring systems that utilize the power of Tokyo residents as well.

Image of inappropriate Embankment detection using Satellite data



Digitization of Disaster measures

・By utilizing digital signage that can transmit disaster information and smart poles equipped with charging facilities for smartphones etc., we will work to secure information dissemination and communication environments during disasters.

・Through “Tokyo Data Platform (TDPF)” which promotes the public and private data distribution, we will promote the digitalization of disaster prevention by forming a community that connects diverse entities and creating examples of data utilization.

・ Simulates flood and Sediment disaster damage on a digital twin 3D city model. It will be used in training and other activities to lead to more effective disaster response operations by administrative agencies.

Smart poles

Ensure Business continuity

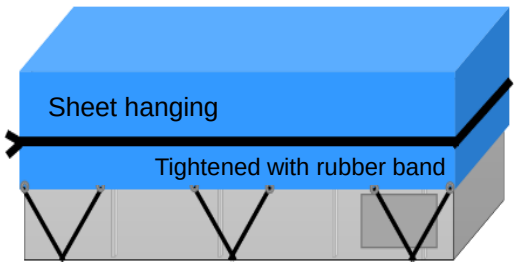
・We have formulated All-hazards metropolitan government BCP for our employees that can respond flexibly to various disaster events and sizes, and we will continue to consider remote disaster response in the event that employees are unable to attend.

・In addition to supporting the formulation of BCPs and crisis management measures by SMEs, we will promote the introduction of telework to maintain the industrial base supported by SMEs.

・We will ensure the continuity of market operations by continuously verifying “Disaster measures manual (Central market BCP)” of Central wholesale market which is the base of fresh food distribution and supporting the formulation of BCP by market related companies.

Company support etc.

・In order to promote flooding disaster measures by chemical substance handling businesses etc., technical support will be provided for flooding disaster measures implemented by SMEs based on Tokyo metropolitan government's guidelines for the proper management of chemical substances and voluntary efforts by businesses to prevent outflows will be promoted.



Measures to prevent chemical substance outflow

Policy Targets for 2030

Policy targets	current value	Target value
Promotion of flooding measures in large-scale underground malls etc.	・Scrutiny of evacuation routes (11 areas) ・Implementation of information transfer training (Continued) ・Practical training with users (1 area)	By the first half of the 2030s, the enhancement of evacuation security was completed in 12 areas including large-scale underground shopping malls, enabling evacuation within 8 minutes.
Review of the designation of Sediment disaster warning zones etc. (all areas of Tokyo)	Completed designation based on 1st round survey (FY 2019)	Review of areas (2nd round survey: FY 2026) (3rd round survey: FY 2031)
Telework installation rate of Tokyo companies	Installation rate: 62.9% (FY 2022)	Installation rate: 80% (FY 2030)

② Disaster response

i Information collection, Analysis and Dissemination

Strengthening the Systems for collecting and sharing Disaster information

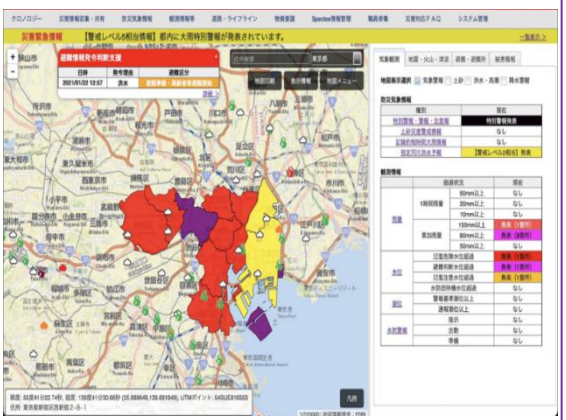
・In order to collect information quickly in the event of a disaster and to operate etc. the disaster response headquarters smoothly, we will conduct surveys and verification of the use of digital technology and promote initiatives for operationalization.

・Disaster information system (DIS) which is an important core information system related to disaster response in Tokyo will be utilized to promote the sharing of disaster information within the agencies and with related organizations and to enhance disaster information provided to Tokyo residents such as disaster prevention websites and disaster prevention maps.

・Metropolitan government collects information on congestion conditions at evacuation centers in municipalities in DIS and it will be sent via the disaster prevention website, Tokyo metropolitan government disaster prevention app and L-Alert.

・We will enhance the initial response system by considering mechanisms for disaster information collection etc. using SNS analysis tools and drones etc.

・We will re-develop of disaster prevention administrative radio systems, including the introduction of closed LTE[1], which will enable stable communications even in the event of disasters and strengthen the information communication systems between administrative agencies.



Disaster information system (DIS)

・For metropolitan roads, road monitoring systems that centrally grasps rockfalls, flooding, slope changes etc., we will promptly provide road users with information on metropolitan road regulations.

Utilization of AI and Other technologies at Disaster sites

・We will promote information collection using AI and other technologies to strengthen our security command function.

・In order to strengthen the fire brigade's operational environment, command activities in the event of disasters and the ability to collect information, we will improve the digital environment, collect and share information and conduct web conferences and provide training guidance.

・We will consider utilization of drone videos at disaster sites.

・In order to quickly grasp a wide range of damage situations, such as large-scale floods and the collapse of buildings due to earthquakes, the system automatically flies to preset areas and points and transmits video information and we will deploy drones that transmit video information in real time.

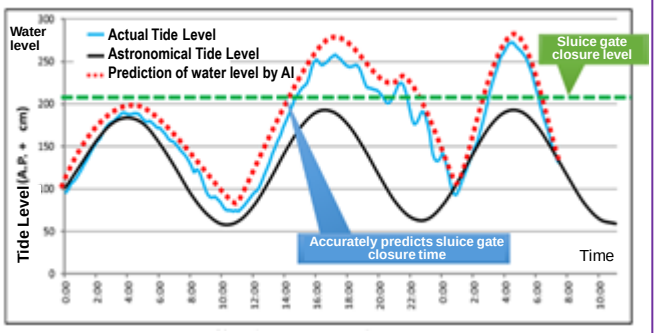
Automatic navigation drone for collecting disaster information (image)

1: LTE... One of the technical standards for cellular phones and mobile data communications, which is an advanced version of 3G (third-generation) technology to integrate voice calls into data and to speed up data communications

Use of AI in Water level prediction etc.

・AI analyzes various big data such as water levels, typhoon tracks and atmospheric pressure and the construction of systems to support operation of floodgates etc. by predicting water level fluctuations will be advanced.

・With regard to the operation of rainwater pumps, we will develop technology that supports the appropriate operation of rainwater pumps by predicting changes in the amount of water that AI inflows based on rainfall data etc.



Water level prediction by AI when typhoons approach (image)

Strengthening Dissemination of Disaster prevention information

・In order to realize the smooth implementation of flood prevention activities and prompt evacuation, the government will promote the expansion of the designation of Water level notification river[1] etc. and the construction of systems to support the announcement of flood risk information using AI.

・We will strengthen the dispatching of disaster prevention information through the enhancement of dispatching information through the flood disaster prevention comprehensive information system and the expansion of sea surface live cameras in the storm surge disaster prevention comprehensive information system and lead to accurate evacuation actions by Tokyo residents.

・We will continue to provide rainfall information using Tokyo Amesh.

・In order to improve the convenience of checking site conditions at island ports and harbors, we will develop tools to collect and utilize information such as the installation of live cameras and the acquisition of structure shapes by drones and satellites. In addition, we will build platforms to consolidate such information and strengthen our initial disaster response capabilities by enabling rapid disaster response and remote and efficient facility management.

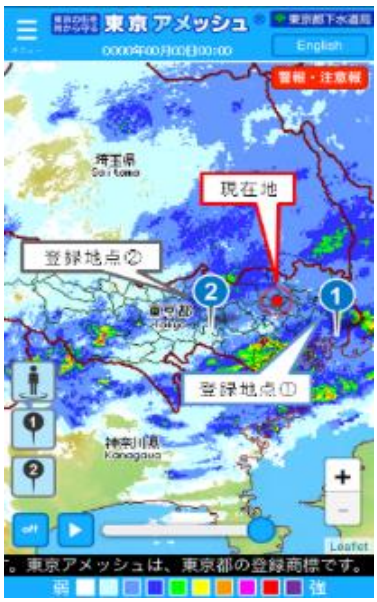
=>See the column on page 39, "Island Disaster Prevention DX"

[Smart device version]

[PC version]

← Flood prevention comprehensive information system

← Image of the monitoring camera of Flood prevention comprehensive information system



↑ Tokyo Amesh

1: Water level notification river ... designated when there is a risk of causing considerable damage due to flooding and when it is found that there is a risk of flooding, the river to be notified the situation to the general public (rivers designated pursuant Article 13 of the Flood Prevention Act)

Policy Targets for 2030

Policy targets	Current value	Target value
Strengthen security command functions and improve materials and equipment utilizing advanced technology	Based on lessons learned from past disasters, we are considering materials and equipment for future disasters.	Strengthen command functions through the use of advanced technologies and such as robots will be further facilitated field activities through innovative materials
Strengthen disaster prevention functions through metropolitan roads by monitoring system (tentative name)	Partial operation of road monitoring systems (expected end of FY 2023)	Operation of road monitoring systems (partially implemented start since FY 2023) and function improvement
Inspection of coastal conservation facilities by drone	Establishment of facility inspection systems by flight control in the event of disasters Conducted investigation for public inspection by autonomous flight in the future	Maintenance of inspection systems by flight control Operation for facility inspection by autonomous flight
Support for operation of floodgates etc. based on water level prediction using AI etc. (Coastal conservation facilities)	Utilization of external water level prediction for flood prevention activities started Accuracy verification of internal water level prediction	Utilizing the floodgate etc. operation support system for flood prevention activities and accurate and prompt floodgate operation etc. *Operation support system for floodgates etc. started (FY 2026)
Operation support of floodgates by water level prediction using AI etc. (rivers)	System design and development (Expected end of FY 2023)	Start of system operation (FY 2025)
Strengthen the dissemination of flood prevention information	・Start system operation ・Operational study of flood occurrence information	・System operation ・Operation of flood occurrence information
Expansion of installation of river observation equipment ・Number of river monitoring cameras released ・Published number of water level meters	・Approximately 150 locations (total) (Expected end of FY 2023) ・Approximately 155 locations (total) (Expected end of FY 2023)	・Approximately 200 locations (total) (FY 2030) ・Approximately 280 locations (total) (FY 2030)
Expansion of designation of Water level notification rivers etc.	Number of designated Water level notification rivers: 19 rivers (total) (Expected end of FY 2023)	Number of designated Water level notification rivers: Approximately 30 rivers (total) (FY 2030)
Support for the announcement of flood risk information utilizing automated analysis etc. of videos from river monitoring cameras by AI	Detailed review (requirements definition)	Start of system operation (FY 2025)
Strengthen the dissemination capacity of disaster prevention information through Storm surge disaster prevention comprehensive information system	Implement appropriate modifications based on operational conditions Seven live cameras on the sea open	Appropriate improvements will be made to the live cameras (Total of 9 locations to be installed by FY2024) based on their operational status

ii Strengthening of Systems

Strengthen cooperation with Related organizations

・We will strengthen a seamless disaster response systems by establishing systems to dispatch information liaison personnel to all municipalities in Tokyo as needed before disaster occur and by establishing environments for quick communication of information between the disaster areas and Metropolitan government disaster prevention center after disasters occur.

・Through practical training etc. on the assumption of large-scale wind and flood disasters etc., cooperation with relevant organizations and municipalities and the operation of Disaster control headquarters will be verified and PDCA cycle will be actively implemented to reflect this in various plans and manuals.

Strengthen the Transportation systems for Goods

・We will strengthen our goods transportation systems through practical trainings on the operation of logistics bases with related organizations.

・In order to establish systems for transporting goods using drones, we will strengthen the operation systems through training and other activities with partner companies.

・Through the construction etc. of systems that enables two-way information transmission between Metropolitan government and goods transport vehicles, we will develop an efficient goods transport system.

Operation of Emergency Water supply systems to protect Tokyo Residents in the event of Disasters

・In the event of a water outage due to disasters, we will continue to operate an emergency water supply systems so that we can provide swift water supply to life-saving medical institutions etc.

・Comprehensive training is conducted throughout the year to strengthen the crisis response capabilities of organizations and employees.

Holiday disaster response training (damage information collection)

Operation of Rapid response Units

・We will continue to operate “Rapid response unit” which was established to respond to large-scale disasters caused by extreme weather etc., to promptly grasp the actual situation of disasters and carry out saving and rescue activities.

Improvement of Operation skills for Disaster heavy Equipment

・In addition to providing various types of heavy equipments that can demonstrate great power at disaster sites, in order to effectively utilize these heavy equipments, the government will expand the number of police officers who are qualified to operate heavy equipment. In addition, the government will implement guidance and joint training by operators from private companies to improve their skills and promote disaster emergency measures in cooperation between the public and private.

Disaster heavy equipments

Consultation Systems etc.

・In the event of disasters, a temporary consultation counter for disaster victims will be established and systems will be developed to respond appropriately to consultations and requests from disaster victims.

Strengthen the Support function for Volunteer activities in the event of Disasters

・In order to support the activities of volunteers and NPOs in the event of disasters, we will cooperate with Tokyo volunteer and citizen activities center during normal times. we will train disaster volunteer coordinators, conduct regular training and build networks with various entities through coordination meetings and planning and implementation of disaster prevention and mitigation programs.

・In the event of disasters, in cooperation with Tokyo volunteer and citizen activities center and we will establish “Tokyo disaster volunteer center” to support disaster volunteer activities in areas of disasters.

Support for Foreigners

・We will establish systems to quickly provide disaster information in multiple languages on Tokyo metropolitan government disaster prevention homepage etc.

・Training will be conducted for disaster prevention (language) volunteers and matching work will be systematized to speed up and improve efficiency in the event of disasters.

・If disaster response headquarters are established, Disaster information centers for Foreigners will be established to collect and provide information needed by foreigners and provide interpretation and translation support at evacuation centers and other places using Tokyo metropolitan disaster prevention (Language) volunteers.

・In addition to providing multilingual consultations in person and online for legal and other specialized matters, we also provide daily life consultations that are expected to be common after disasters.

・"Disaster prevention hall tours for Foreigners" accompanied by interpreters are held in cooperation with three disaster prevention halls in Tokyo to provide opportunities for foreigners living in Tokyo who have different languages and lifestyles and have no experience of earthquakes or knowledge of disaster prevention to learn and experience disaster prevention and mitigation so that they can take appropriate actions in the event of disasters.

・"Disaster prevention awareness videos for Foreigners" are posted in multiple languages on Tokyo metropolitan multicultural coexistence portal site and we will continue to expand the site by creating videos on wind and flood damage in the future.

Efforts for early Recovery and Reconstruction

・In order to properly, smoothly, and promptly dispose of disaster waste, we will support the formulation of disaster waste disposal plans and manuals by municipalities and will work together and cooperate in wide areas.

・We will promote the establishment of systems to provide temporary housing in the event of disasters by providing emergency temporary housing and carrying out emergency repairs.

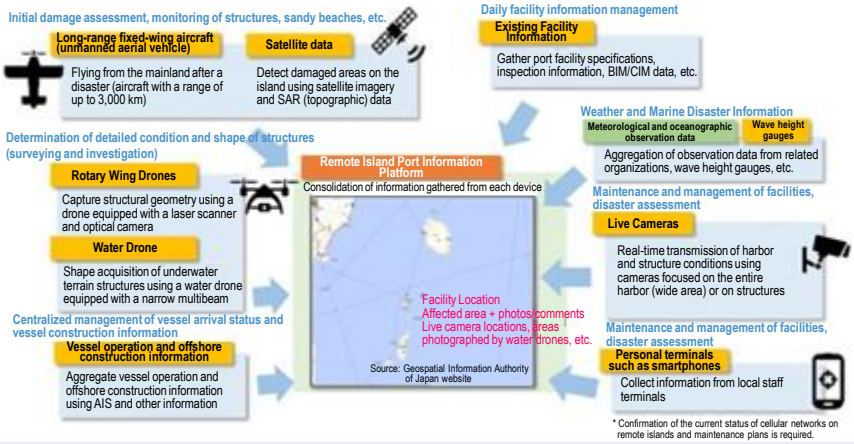
Staff dispatch in the 2024 Noto Peninsula Earthquake

■ Island Disaster prevention DX

① Remote Island port DX Business promotion Project

In order to protect the lives and properties of Tokyo residents living in island areas from the intensification of disasters caused by climate change in recent years, we will build a remote island port information platform that will streamline disaster recovery operations by rapidly aggregating local data on the Internet using satellites, drones, live cameras etc. and spreading and sharing it in real time with relevant parties.

<Image of Remote Island Port DX>



Providing Information to TMG Citizens and Related Organizations

- Providing information on the status of facilities and the surrounding area to Tokyo residents through live cameras
- Disseminating information on decisions regarding the operation of scheduled vessels, etc.

Prompt disaster response

- The amount of deformation of the structure is determined using 3D data before and after the damage. After determining whether or not restoration is necessary, we begin the design and construction of the restoration.

Remote and efficient port facility management

- Gathering information on determining the feasibility of offshore construction work
- Analysis of wave simulation
- Security in the area, etc.

② Tsunami Detection system construction Project

In order to reduce tsunami damage in coastal and island areas, support will be provided for projects to build a tsunami detection system (System for early detection of the occurrence of a massive tsunami and accurate communication to Tokyo residents), which is being led by Tokyo metropolitan university.

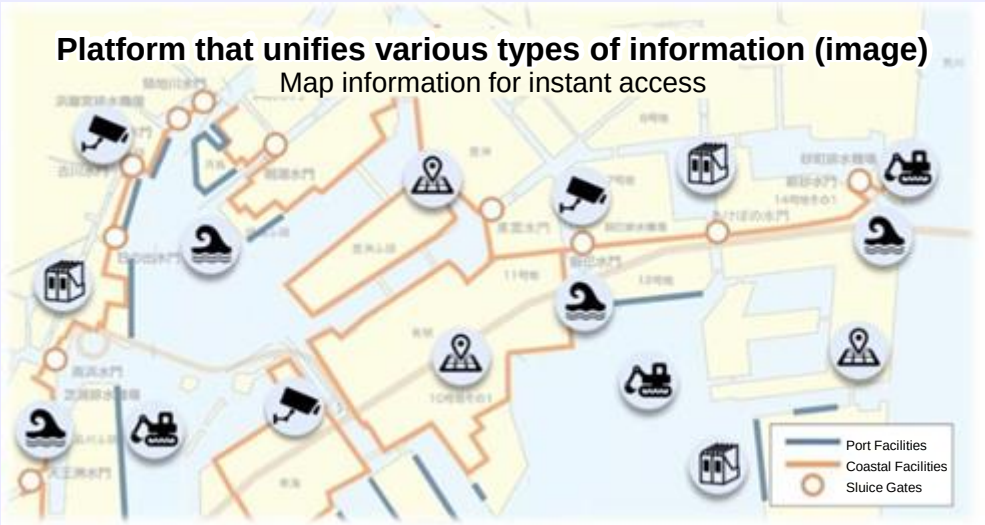
■ Tokyo Minato DX promotion Project

By centralizing information on the Tokyo Port on a platform, we can improve business productivity, respond quickly to disasters, and open data.

• We will establish the Tokyo Minato DX system to centralize Tokyo port and coastal information stored in various departments and systems and we will also strengthen cooperation with “Remote Island port DX Project.”

• Business productivity is improved by providing instant access to the information you need during normal times. In addition, by consolidating disaster prevention information in the event of disasters, rapid disaster response is realized.

• New services for Tokyo residents will be created through open data of centralized information etc., which improve QOS.



Impacts of Climate Change

Heat

It has been reported that the number of deaths due to heat is on the rise, especially among the elderly. Regarding heatstroke, although there are variations from year to year, the number of people transported by ambulance, the number of people seen at medical institutions and the number of heatstroke deaths are on the rise. Although the impact on the elderly is significant, the risk of developing heatstroke during outdoor activities among young people is increasing due to the increase in the number of midsummer and extremely hot days, the impacts of heat also affect health impacts such as poor sleep quality, sluggishness and fatigue and mental and physical stress etc.

As heat stress increases due to rising temperatures, the number of heatstroke patients is expected to increase in the future and the risk of heatstroke is predicted to increase particularly among the elderly.

In the 2090s, the number of hours that can be worked outdoors during the day in Tokyo and Osaka will decrease by 30-40% from the current level, the number of days that are unsafe for outdoor work will increase and the number of days that require high alert for strenuous outdoor exercise will increase.

Infections etc.

Rising temperatures and changes in space-time distribution of precipitation due to climate change may alter the distribution range and activity period of arthropods (such as mosquitoes) that transmit infectious diseases and the rate of invasion and colonization by non-native species that cause human damage, thereby increasing the risk of arthropods transmit infectious diseases.

Combined impacts of Global warming and Air pollution

With regard to the combined impacts of global warming and air pollution, it has been reported that the concentration of various pollutants has changed due to the promotion of the formation reaction by the temperature rise, there is a risk of increased health damage due to rising concentrations of Fine particulate matter (PM2.5) and photochemical oxidants.

Main Efforts in the Future

We will strengthen appropriate prevention measures and countermeasures to minimize patients with Heatstroke and infectious diseases and health effects of rising temperatures such as health damage from air pollution.

●TOPIC●　Revision of Climate Change Adaptation Act

The number of deaths from heatstroke continues to increase and in recent years there have been more than 1,000 deaths a year. As global warming progresses in the future, As the risk of extreme high temperatures is expected to increase, more proactive measures against heatstroke will be necessary. Therefore, it is necessary to take more active measures against heatstroke. Therefore, Climate Change Adaptation Act was revised in order to strengthen measures against heatstroke, which is an area of climate change adaptation (June 1, 2023 (partial), fully enforced on April 1, 2024).

The revised act aims to halve the number of heatstroke deaths (5 year moving average number of deaths) from the current level[1] of as a medium-term target (2030).

[Points of revision]

①The existing action plan for heatstroke measures was upgraded to a statutory cabinet decision plan as "Action plan for Heatstroke measures."

②Establish heatstroke alerts as "Heatstroke warning information" in the act and establish a higher level of "heatstroke special warning information" in case of more serious health hazards.

③The mayors of municipalities designate facilities that meet the requirements of having air-conditioning facilities as "designated heat evacuation facilities (Cooling shelters)" and open them to the public during the period of the announcement of the special warning information.

④The mayor of the municipality designates a private organization etc. engaged in the promotion and awareness of heatstroke measures as heatstroke measures promotion organizations and ensures the preventive action of the heatstroke vulnerable persons.

Action poster for preventing heatstroke

1: The 5-year moving average in 2022 (approximate number) is 1,295 people

（1） Measures against Heatstroke and Heat island

Promotion of Heatstroke prevention Actions

・We will promote initiatives across the agency to achieve zero heatstroke fatalities, including information dissemination through Tokyo Metropolitan Heatstroke measure Portal site, awareness raising through TOKYO Cool Share campaign and information dissemination through Tokyo Water Drinking Station.

・We will use Smart poles to effort dissemination awareness through DX, such as distributing warnings on heatstroke prevention based on real-time observation data.

・In addition to soliciting ideas from Tokyo residents on how to use their ingenuity in their daily lives to prevent heatstroke, we will promote behave oral changes to prevent heatstroke by conducting detailed public relations etc. in cooperation with organizations etc. that have knowledge of heatstroke among vulnerable people.

TOKYO Cool Share Poster

Strengthen support for Municipalities based on Revised Climate Change Adaptation Act

・Preparation of Cooling shelters by municipalities in view of possible extreme high temperatures and we will support dissemination awareness etc. of heatstroke measures.

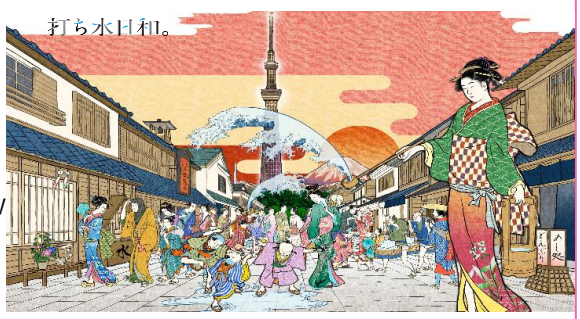
・We will continue to support measures to prevent heatstroke, such as raising awareness of heatstroke prevention, watching over the elderly and establishing evacuation sites in extreme heat.

・In cooperation with Tokyo metropolitan Climate change adaptation center, we will work to provide wide-area information, such as creating and publishing maps of all areas of Tokyo concerning Cooling shelters designated by municipalities.

Building Momentum for Heat measures through the participation of Tokyo Residences and Businesses

・In addition to building momentum through Sprinkling water etc. at local events etc., we will collect and disseminate examples of excellent efforts by businesses.

・We will disseminate knowledge and know-how on heat measures gained at the Tokyo 2020 Games to Tokyo residents, companies and organizations etc.



A perfect day for sprinkling water.

Promotion of Heat measures in Housing

・In order to prevent heatstroke at home which accounts for the highest proportion of heatstroke cases, we will promote the appropriate use of air conditioners and promote the spread of houses with high insulation and energy-saving performance that can enhance the effectiveness of air conditioners such as the introduction of high-insulation windows and high-efficiency air conditioners to prevent heat from entering in summer. In addition, we will support the efforts of municipalities to promote the installation of thermal barrier coatings and solar control films on houses.

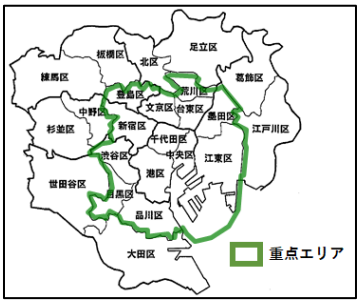
Creation of Cool Spots etc.

・In cooperation with municipalities, we will promote the installation of heat measures facilities such as fine mist.

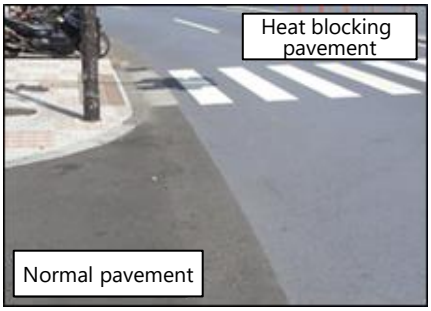
Example of installation of fine mist (Oase Shibaura, Minato Ward)

Development of Thermal barrier Pavements etc.

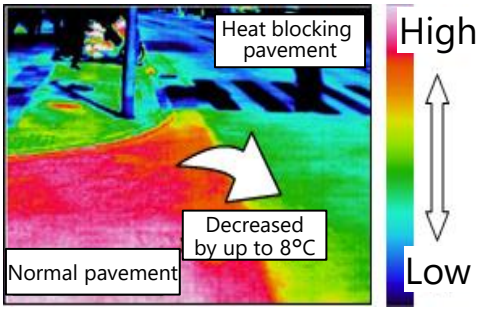
・Approximately 245 km (total) of thermal barrier pavement and water retaining pavement will be installed by fiscal year 2030 in Metropolitan roads in priority areas centering on Center core areas.



Priority areas



Heat blocking pavement



Heat blocking pavement (infrared thermal imaging)

Promotion etc. of City Greening

・In order to create high-quality greenery in all areas of the city, we will steadily operate the greening plan system for greening in development plans and building plans etc. and work to secure greenery by promoting active efforts by the private through the utilization of various city development systems etc.
・With regard to farmland in urbanization areas, which is showing a significant decline, we will promote the designation of productive green areas and specified productive green areas in cooperation with local governments and promote conservation.
・In order to ensure the quality of street trees, which doubled as a result of the street tree enhancement project, we will utilize digital technology in the street tree business to develop quick and efficient management. At the same time, we will carry out appropriate management of street trees, including planned pruning to secure shade to block the summer sun and disaster prevention assessment for street trees.

（2）Infectious Disease measures etc.

Measures against Mosquito-borne Infectious Diseases

・We are working to reduce the risk of infectious diseases by disseminating the occurrence of mosquito-borne infectious diseases etc., infection prevention measures and appropriate mosquito source measures.

・We will conduct surveillance of mosquitoes that transmit infectious diseases and ensure systems for testing pathogens.

Collection device

Survey site map (priority and wide area)

Measures against Non-Native species etc. causing Human damage

・Since there is concern about the increased risk of invasion and establishment of non-native species such as fire ants native to South America, we will cooperate with National government and municipalities and reduce the risk to the lives and health of Tokyo residents by conducting surveys to identify fire ants etc. and dissemination awareness to Tokyo residents.

Fire ant
(Source: Ministry of the Environment)

（3）Air pollution measures

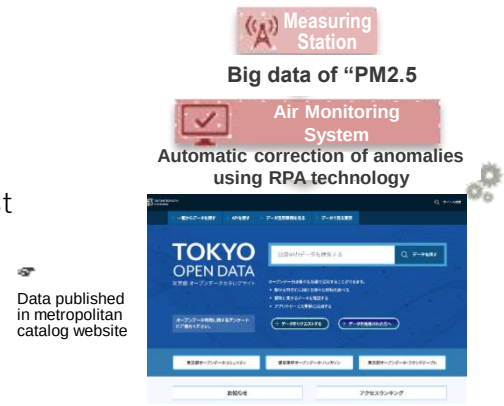
Reduction of air pollutant emissions

・In order to reduce the concentration of PM2.5 and photochemical oxidants, we will promote the reduction of the emission of causative substances through various methods, including measures at factories, environmental measures for cars and the promotion of voluntary efforts by businesses.

・Since air pollutants and their causative substances move across prefectural borders, we will work with nine prefectures and cities to clarify the mechanism an d implement measures.

・We will promote open data for air quality data in order to promote air pollution measures utilizing the latest technologies such as 5G and AI for air pollution measures.

・We will use RPA[1] technology to determine air quality measurement data and accelerate the provision of air quality monitoring information.



Accelerate publication of PM2.5 and other data using RPA technology

Policy Targets for 2030

Policy targets	Current value	Target value
Implementation of thermal barrier pavements on Metropolitan roads	Approximately 180 km (as of the end of FY 2022)	245 km (FY 2030)
Create good greenery on private land (Republished)	Run short of good greenery in the city	In line with private development, good greenery has increased throughout the city
PM 2.5 concentration	Achievement rate 89% (FY 2022)	Annual average of each monitoring station, stable concentrations of 10 $\mu g/m^3$ or less (FY 2030)
Photochemical oxidant concentration	Achievement rate 0% (FY 2022)	At all monitoring stations, 0.07ppm or less (FY 2030)

1: RPA… stands for Robotic Process Automation, which automatically processes input, collation, and other operations performed by humans on personal computers according to preset programs.

Impacts of Climate Change

Horticultural crops (Vegetables and Flowers)
Among open-air vegetables, leafy vegetables such as mustard spinach and root vegetables such as radish tend to be harvested earlier due to high temperatures. In addition, due to the influence of high temperature and drying, poor growth in the early stage of growth tends to increase. Fruit failure and sunburn caused by high temperatures also occur in fruits and vegetables, especially in tomato cultivation at facilities.

Fruit tree
Fruit trees, such as Japanese pear, have been damaged by frost damage, such as death of flower buds and new treetops, due to earlier germination and flowering due to global warming from winter to spring. In addition, due to high temperatures in summer, problems such as coloring disorder of grapes and sunburnt fruits have occurred in Japanese pear and kiwifruit. flesh fruit Disorders (Water core, fruit cracking etc.) due to high temperature and low rainfall after the fruit enlargement stage also occurs.

Livestock production
Although it is possible to reduce the impacts of global warming by measures such as blowing air and sprinkling water in the barn, it is predicted that milk production will decrease in dairy cows and egg production rate will decrease and soft eggs will increase in hens.
In addition, the areas where the growth of beef, pigs and meat chickens will decline will expand and the extent of the decline is expected to increase.

Pests
As for pests, there are many pests that prefer high temperatures such as spider mites, snow beetles and thrips and the generation period tends to be prolonged. Although there has been no clear increase in diseases due to climate change, there is a possibility that damage to agricultural crops will expand due to the increased occurrence of pests and the expansion of their distribution ranges.

Agricultural production base
The increase in extreme weather events such as heavy rains and droughts and impacts are predicted on farmland, which is the base of agricultural production, nationwide. In recent years, there have been frequent torrential rains and it is predicted that the risk of flooding of farmland will increase.

Forest and Forestry
Climate change including changes in the growing environment such as rising temperatures and drying, may result in reduced growth and death of trees.

Fisheries industry
Changes in fish distribution ranges and loss of seagrass beds, which are thought to be mainly due to rising sea temperatures, have become apparent, leading to a decline in the number of rocky shores and an overemphasis on a single species of fish.

Main Efforts in the Future

In response to concerns about changes in cultivation areas, deterioration in quality and damage from typhoons due to the impacts of climate change, we will implement technical support and dissemination measures for switching to products and varieties suited to rising temperatures, improve agricultural facilities and investigate the impacts of changes in the marine environment to realize a strong agriculture, forestry, and fishery industry.

Fostering island agriculture resilient to weather disasters

・We will promote the development of wind-resistant pipe houses and other agricultural facilities so that stable agricultural production can be maintained in island areas where large typhoons frequently strike.

・Utilizing digital technology, we will promote support for irrigation reservoirs and agricultural water facilities and improve disaster prevention functions.

Guidance on agricultural technology in response to climate change, such as measures against summer heat

・Agricultural development and extension center, which provides technical guidance to farmers and production organizations, will address technical issues in regional agriculture such as measures against high temperatures in agricultural products.

Cultivating forests that are resistant to mountain disasters

・A forest management support system will be operated to support the preparation of forest management plans that serve as guidelines for forest management by municipalities, forest owners, forestry management bodies etc.

・In addition, we will promote proper forest management and forest recycling by improving the efficiency of work, such as by surveying standing trees using drones and introducing forestry equipment utilizing the latest technology.

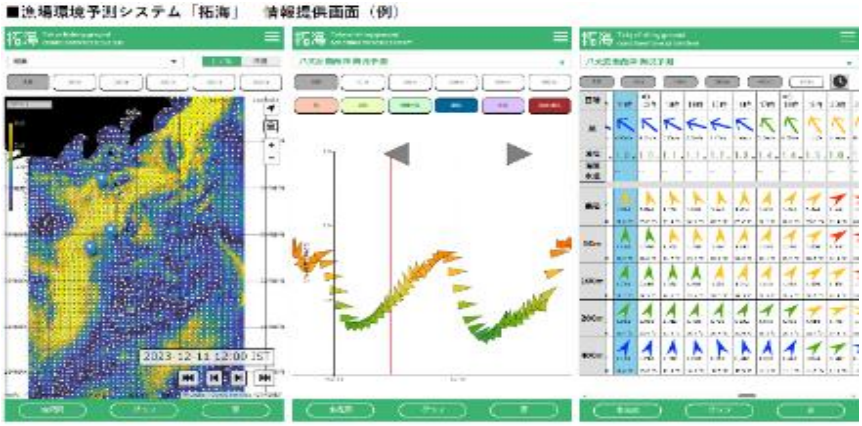
Cultivating forests that are resistant to disasters

Advanced forestry machinery equipped with remote control function (Tower yarder)

Main Efforts in the Future

Improvement of fishery product supply infrastructure

・Using fishing ground environment observation services utilizing state-of-the-art systems etc., we provide forecast information on sea conditions such as sea temperature, current direction and current velocity for each fishing ground and reduce the impact on fishing operations by fishers' own judgment and choice.



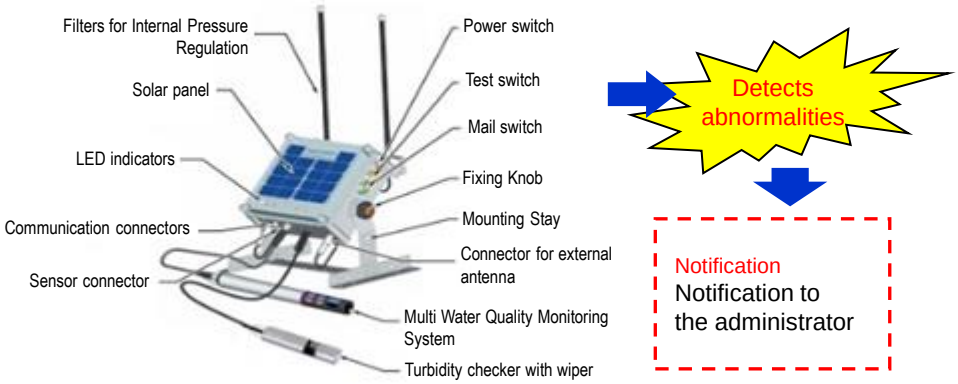
Fishing ground environment prediction system

Verification and support for introduction of smart inland water aquaculture

・In order to respond to natural disasters such as heavy rain, we will verify the effectiveness of a breeding environment control system etc. that constantly monitors the amount of water used for breeding and detects abnormal situations and aim to transfer the technology to the private.

- A camera image showing the condition in the pond
- Feeding optimized by determining timing and amount from the behavior of fish schools

Existing automatic feeder and data check screen of AI-equipped model



Breeding environment control system

Policy Targets for 2030

Policy targets	Current value	Target value
Increase output per farm	4.35 million yen (FY 2021)	8 million yen (FY 2030)

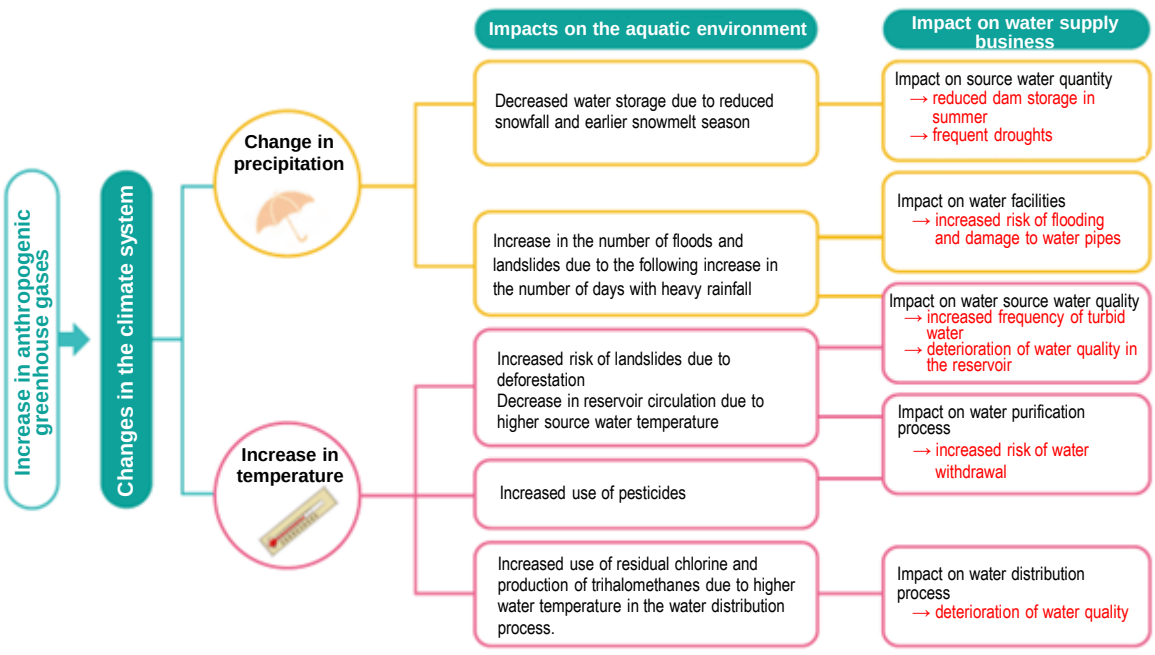
Impacts of Climate Change

Water resources

Drought has occurred even Heisei era or later in the Tone river system which is the main water source of Tokyo.
In the future, annual variations in annual and seasonal precipitation are expected to increase, the frequency of low rainfall is expected to increase, and the availability of water resources is expected to decrease due to changes in seasonal precipitation patterns, decreases the amount of snow and earlier snowmelt periods.
In addition, changes in precipitation and rising temperatures due to climate change may have various impacts on water services.

Water environment

Changes in water temperature, changes in water quality and changes in the runoff characteristics of nutrients salts etc. from watersheds due to climate change is expected.
With regard to rivers, an increase in heavy rain and short periods of heavy rain may lead to an increase in sediment runoff, resulting in an increase in turbidity. In addition, a decrease in the amount of dissolved oxygen due to a rise in water temperature, a promotion in the decomposition of organic matter by microorganisms and an increase in algae are also predicted.
A rising trend in surface seawater temperature has been reported in closed waters. In addition, as the sea level rises, the saltwater run-up area in the coastal area is expected to expand.



Impact of climate change on water supply business

Source: Bureau of Waterworks Tokyo Metropolitan Government
Five-Year Environmental Plan 2020-2024

Main Efforts in the Future

In order to maintain stable water supply in Tokyo metropolitan, Metropolitan government will make maximum use of the water sources it has secured so far, taking into account the impact of future climate change.
In addition, in order to provide a stable supply of high-quality water, we will reduce the risk of severe droughts and deterioration etc. of raw water quality as much as possible.
We will create a comfortable water environment through the improvement of combined sewerage systems, the improvement of water quality through the development of advanced treatment facilities and the maintenance and improvement of water quality in rivers and canals. We will also conduct continuous monitoring.

（1） Stable supply of High-quality Water

Securing appropriate water sources

・We will continue to work with National government and other relevant organizations to ensure that systems can be implemented appropriately about water sources such as the Tone river and Arakawa river systems etc. can be used as valuable water sources for Tokyo in the future to the maximum extent possible.

・In order to operate the Ogouchi reservoir for the future, in addition to repairs and dredging etc. based on inspections, a comprehensive preventive conservation project will be developed that includes upgrading facilities to enable more appropriate facility management and efficient operation.

・We will use raw water efficiently by making use of raw water connection pipes to facilitate mutual communication between water systems.

Conservation and Management of Water source forests

・In order to further improve the functions of the water source forest, we will carry out conservation work such as thinning and pruning and take measures against deer damage.

・In order to restore private forests, we will purchase degraded private forests and promote cooperation with local governments.

・Drones will be used to check forest conditions in normal times and to conduct on-site surveys in the event of disasters, thereby promoting efficient conservation and management of water source forests.

Water source forest in the upper reaches of the Tama river

Pruning

Securing accurate and Effective water treatment in response to changes in Raw water Quality

・In the development of water treatment plants, we will consider the introduction of new water treatment technologies, reduction of environmental impact and efficient maintenance and management by introducing the latest technologies such as ICT.

・In the maintenance and management of existing water treatment plants, we will strive for efficient management by utilizing AI to support the operation and management of chemical injection.

（2） Water quality conservation measures in Public waters

Reforming Combined Sewerage systems

・In order to reduce the amount of pollution discharged into rivers and the sea, we will continue to promote the reformation of combined sewerage systems such as the development of storage facilities for particularly dirty sewage in the early stages of rainfall in river sections where water tends to stagnate and the promotion of partial decentralization in public facilities and redevelopment areas.

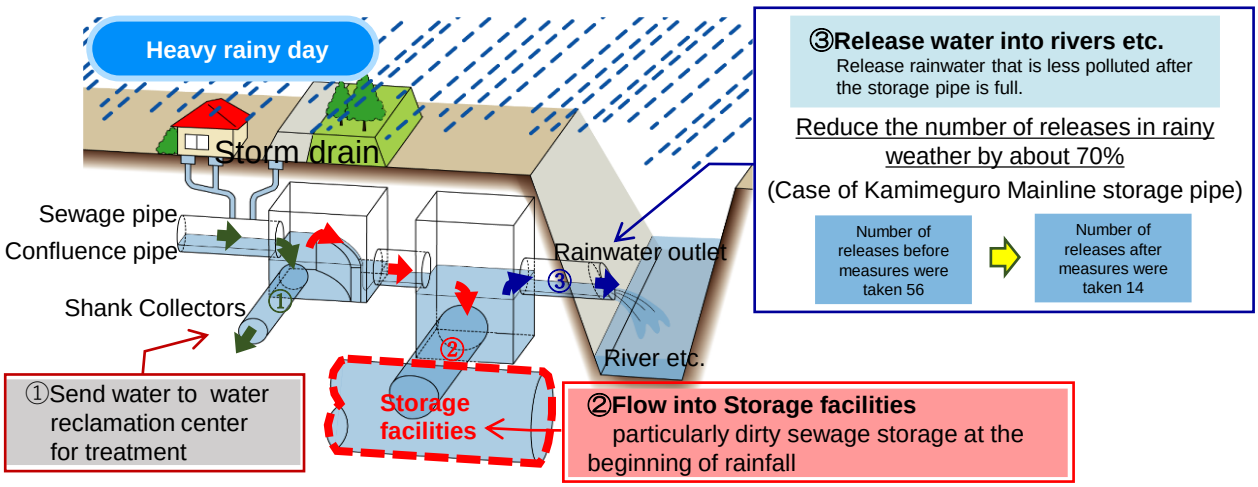
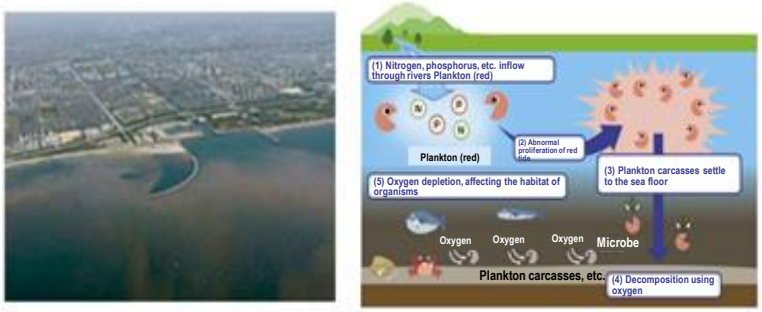


Image of particularly dirty sewage storage at the beginning of rainfall

Improvement of Treated water Quality

・When red tide occurs due to an increase in nitrogen and phosphor us concentrations, a large amount of oxygen is consumed to decompose plankton carcasses etc., which adversely affects living organisms. To reduce the number of days that red tides occur in Tokyo Bay,
we will promote the introduction of advanced and semi-advanced treatment facilities etc. at each water recycling center in order to further reduce nitrogen and phosphorus in treated sewage water which is one of the causes of red tides.



Red tide occurrence in Tokyo Bay and examples of effects on marine organisms

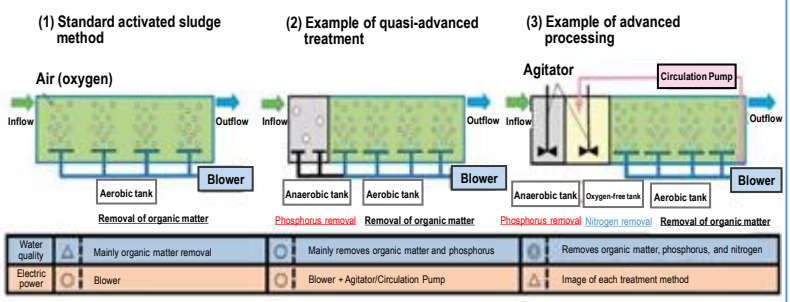


Image of each treatment method

Implement Planned dredging etc. of Sediment (Sludge) in Rivers and Canals

・In order to improve water quality and prevent offensive odors in tidal rivers and canals such as Sumida River, we will implement planned dredging etc. of sediment (sludge).

Water Quality monitoring and Aquatic life Research

・By continuously monitoring water quality and conducting research on aquatic life, we will verify the effects of these measures and understand the state of improvement of the riparian environment and use them in future measures.

Research on aquatic life

Policy Targets for 2030

Policy targets	Current value	Target value
Ogouchi reservoir preventive conservation project	Formulation of the Ogouchi reservoir preventive conservation project plan (FY 2022)	Implement conservation project of Ogouchi reservoir
Conservation management of Water source forests (Republished)	Appropriate management conservation work of water source forests 1,799ha (3 years from FY 2020 to FY 2022)	Implement planned conservation work of water source forests
Storage at storage facilities etc.	1.5 million m^3 (FY 2022)	2.8 million m^3 (Medium to long-term)
Combined advanced and semi-advanced capabilities	5.33 million m^3/day (FY 2022)	7.82 million m^3/day (Medium to long-term)

Impacts of Climate Change

Terrestrial ecosystem

As for natural and secondary forests, most of the component species in cool-temperate forests are expected to move to higher latitudes and higher elevations, resulting in a decrease in the optimal distribution range. On the other hand, most of the component species in warm-temperate forests are expected to move to higher latitudes and higher elevations, resulting in an increase in the optimal distribution range.

It is also predicted that the habitat of wild birds and animals such as Japanese deer will expand due to higher temperatures and shorter periods of snow cover etc. as well as soil runoff and a decline in water source cultivation functions.

Freshwater ecosystem[1]

In lakes and rivers, the production rate of algae increases due to temperature rise and CO_2 increase but in freshwater ecosystems where nutrient salts supply are poor, the higher order production is expected to decrease because the increase in algae decreases the quality of their food.

Coastal and marine ecosystems

In subtropical areas, coral bleaching has already occurred due to rising sea temperatures. In the future, it is predicted that the area suitable for reef-building corals may disappear by 2040 due to rising water temperatures and ocean acidification.

In Tokyo Bay, a case of the southern green mussel native to Southeast Asia overwintering has been confirmed. In addition, changes have occurred, such as the southern butterflyfish, previously seen only in summer being able to be seen from autumn onwards.

Phenology

The impact on various species such as the earlier flowering date of Yoshino Cherry is predicted. Furthermore, it is expected that the impacts will not only affect individual species but also affect various interactions among species.

Distribution and population changes

In addition to changes in distribution ranges and life cycles etc., there is a research case that changes in interspecies interactions caused by species migration and local extinction have further adverse effects, habitat fragmentation prevents migration in line with climate change, and changes in weather conditions such as wind, which may reduce survival rates and cause species extinction.

It is assumed that climate change will lead to changes in the rate of invasion and establishment of non-native species.

1:Urabe J., J. Togari, and J. J. Elser, 2003: Stoichiometric impacts of increased carbon dioxide on a planktonic herbivore, Global Change Biology, 9, 818-825

Main Efforts in the Future

Minimize impacts on biodiversity such as changes in the distribution of life due to climate change. In addition, in order to improve resilience, efforts will be made to utilize and restore the functions of the natural environment.

Promotion of initiatives based on Local Biodiversity Strategy

・Based on “Tokyo Biodiversity Local Strategy” revised in April 2023, We will promote efforts to solve social issues by utilizing nature (NbS[1]), such as disaster prevention and mitigation through rainwater infiltration and mitigation of the heat island effect.

→See TOPIC on page 58, "Tokyo Biodiversity Local Strategy"

Tokyo Biodiversity Local Strategy

Expansion of Designation of Conservation areas to protect Precious Biodiversity

・By designating good natural areas as conservation are as and properly conserving and managing them, we will maintain them as a base for biodiversity in Tokyo and reduce flood damage through rainwater infiltration.

・We will improve the quality of conservation areas by working with policy-linked organizations and experts on the formulation of work plans for the implementation of the Coordinating projects[2] and concrete measures such as measures against rare species, wetland environment improvement work and measures against oak wilt.

Reforestation in Tama

・Regarding artificial cedar and cypress forests in Tama which are being degraded, in order to restore the public interest functions of forests, we will steadily regenerate them through thinning and pruning.

Forest degraded by poor management

Good forests after two to three years of reforestation projects

1 :NbS... stands for "nature-based solutions" and refers to solutions that utilize nature. Approaches that respond to social challenges including climate change and natural disasters and contribute to both human well-being and biodiversity conservation.

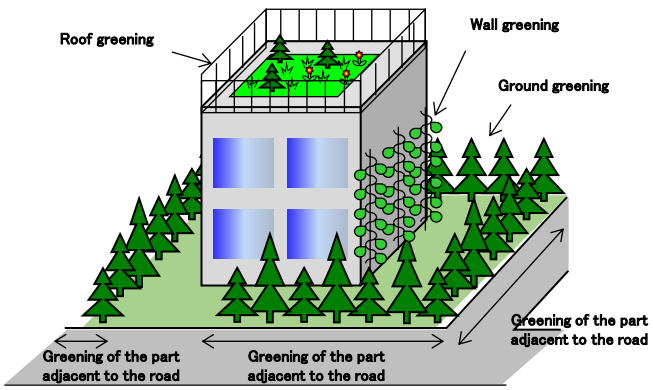
2 :Coordinating projects in conservation areas ... Promote "biodiversity improvement measures such as measures to conserve rare species and non-native species" and "measures to improve the attractiveness of PR etc. by updating facilities and promoting each conservation area" through the PDCA cycle in cooperation with each entity involved in the management of conservation areas and experts with the necessary knowledge.

Creation and Conservation of Greenery

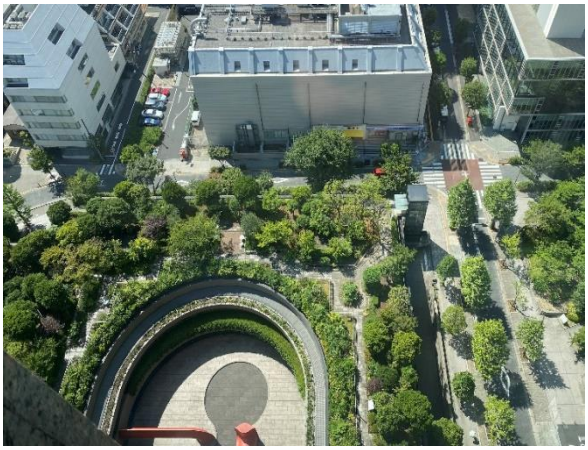
・In order to create high-quality greenery in all areas of the city, we will steadily operate the greening plan system for greening in development plans, building plans etc. and work to secure and improve the quality of greenery by promoting active efforts by the private through the utilization of various city development systems etc.

・With regard to farmland in urbanization promotion areas which is on a declining trend, the government will promote the designation of productive green areas and specified productive green areas in cooperation with local governments and promote conservation.

・In the case of development involving alteration of natural areas, we will steadily operate the development permit system and secure green areas.



Promoting greening of urban areas by creating new greenery



Examples of corporate green spaces (Mitsui Sumitomo Insurance Company, Limited. Surugadai green spaces)

・We will systematically promote the greening of rivers which are valuable waterfront spaces in the city and implement measures to improve the quality of river facilities utilizing the natural environment.

・To improve the comfort and safety of park forests, we will promote appropriate maintenance and management according to the characteristics of each park. We will also improve the quality of greenery through efficient maintenance and management of street trees.

Nakagawa (before greening)

Nakagawa (after greening)

Cover concrete embankment with soil and greening with grass.

Promoting greening of rivers and waterfront spaces

Environmental improvement of Metropolitan Parks and Marine Parks

・In the 31 metropolitan parks that serve as the base of the local ecosystem, we will implement Adaptive management[1] through the implementation of focused environmental improvement and monitoring of species and cooperation and information sharing among related parties. In marine parks etc., we will promote the improvement and expansion of seashores and tidal flats and conduct monitoring to ensure the growing environment for wild birds and aquatic life.

Improvement of reservoirs in metropolitan parks

Checked in the reservoir
Japanese brown frog
(Rare species)

Examples of Tidal flat restoration and conservation (Artificial tidal flat in Kasai Marine Park)

Promotion of Conservation and Sustainable use of Natural Parks

・We will promote the conservation and proper use of natural parks through the deployment of rangers and deepen users' understanding of the value of nature through the use of digital technology.

TOP Screen　Route Selection　Trail Information　Route Information

← Digital guide to Mt. Takao (route guidance): Access to safe climbing information by scanning a two-dimensional code installed on a signboard in the mountain using a smartphone etc.

↑ Representative life AR:
Using the same method to promote understanding of the attractiveness of Mt. Takao and the importance of the natural environment

1: Adaptive management ... A management method that flexibly responds based on consensus building among various actors, taking into account in advance the possibility that natural uncertainties may lead to situations

Conservation of rare Wild Animals and Plants, measures against Non-Native species and Conservation and Management of Wild Animals

- By formulating a policy for the conservation of wild animals and plants that takes into account the characteristics of Tokyo's natural environment, we will promote measures for the conservation of rare species and measures against non-native species based on priority and aim to conserve and restore biodiversity in Tokyo.
- In order to prevent damage to agriculture, forestry and ecosystems caused by deer, we will conduct monitoring surveys and install and manage vegetation protection fences etc. based on the deer management plan. We will also promote measures to strengthen capture and control damage while verifying the progress and effectiveness of the project.

Policy Targets for 2030

Policy targets	Current value	Target value
New designation and public ownership of conservation areas (republished)	Approximately 760ha (The end of FY 2023)	Approximately 1,000ha (FY 2050)
Creation of good greenery on private land (republished)	Lack of good greenery in the city	In line with private development, good greenery has increased throughout the city.
Promotion of greening of river and waterfront spaces	Approximately 4.4ha (Total) (Expected end of FY 2020 to FY 2023)	Promoting greening of approximately 17.7 ha (FY 2030)
Improvement of waterfront environment in marine parks	3 Parks development (FY 2020)	5 Parks development (FY 2028)
Conducting regular monitoring surveys on tidal flats	1 park in surveying (FY 2023)	Continuation of regular surveys
Strengthening measures against rare species in conservation areas	45 areas (expected end of FY 2023)	All areas (50 areas) (FY 2024)

●TOPIC● Tokyo Biodiversity Local Strategy

In April 2023, Metropolitan government revised Tokyo Biodiversity Local Strategy (Hereinafter referred to as "Local Strategy".) as a basic plan for the conservation and sustainable use of biodiversity. The Local Strategy sets out the targets for Nature Positive 2030 and the direction of efforts by all entities related to biodiversity.

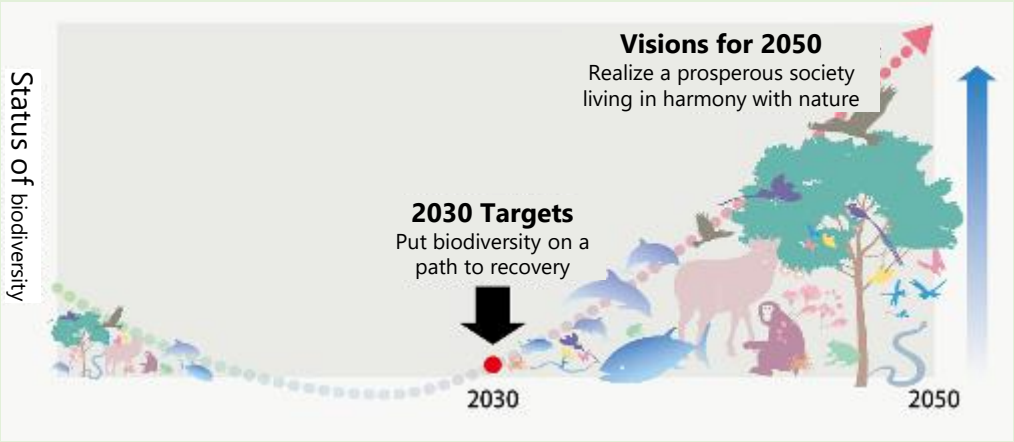
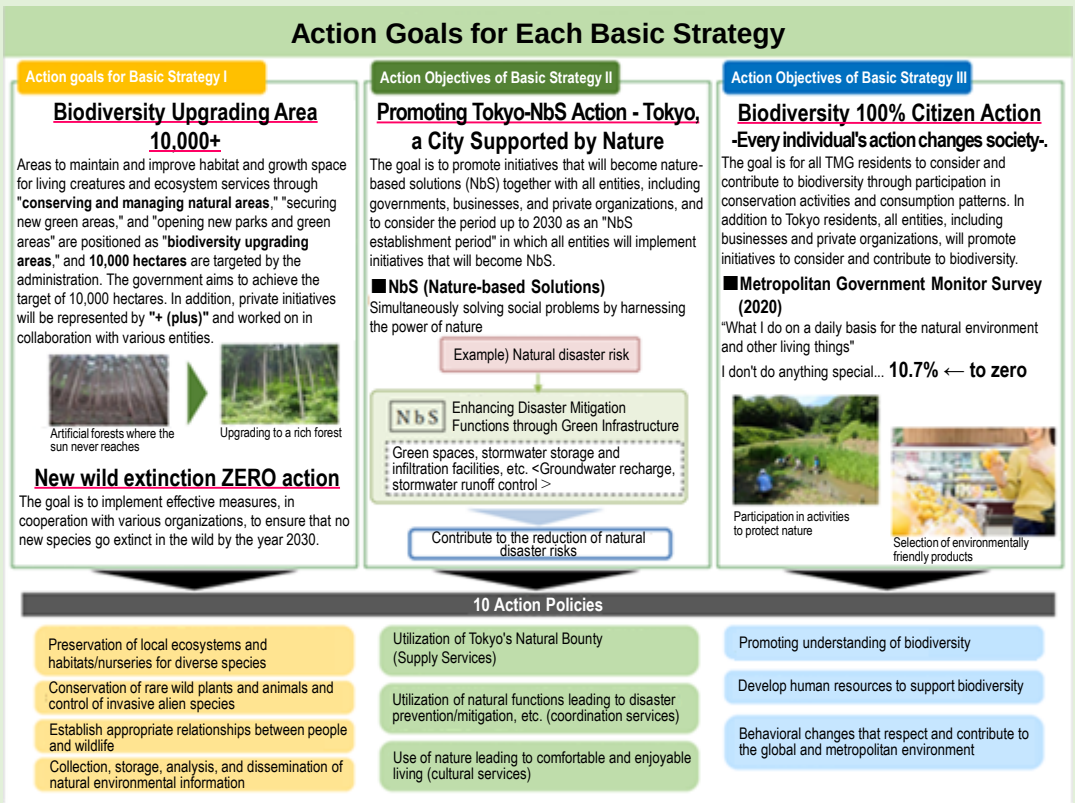


Image of achieving a nature-positive framework



3 basic strategies and action targets
(from Tokyo Biodiversity Local Strategy Summary)

For details, please refer to our homepage.

●TOPIC●　Tokyo Green Biz (1/2)

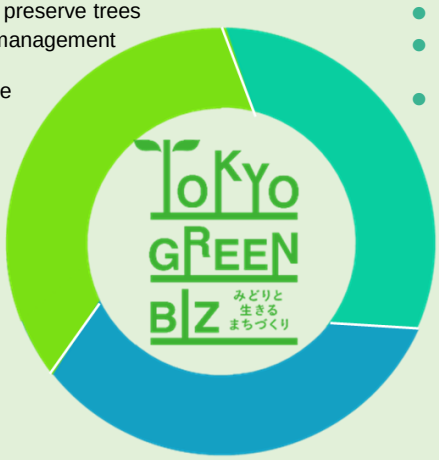
In response to social issues such as climate change and the growing need for open and green spaces, Tokyo Metropolitan Government will promote a new green project “Tokyo Green Biz” to enhance the value of green and pass on to the future.
Looking 100 years into the future, we will strengthen greenery initiatives in cooperation with various entities and make Tokyo
We will evolve into a sustainable city in harmonv with nature.

"Protect" Initiative

- Preserve green spaces (e.g., household forests) that are rooted in the community.
- Preserve areas rich in nature
- New mechanism to preserve trees
- Conservation and management of riparian forests
- Promote sustainable forest circulation

"Utilizing" Initiatives

- “Green infrastructure" using the functions of greenery and nature
- Enhance the attractiveness of the park and make it the face of TOKYO
- Utilize greenery as a local landmark
- Communicating the richness of natural attractions
- Utilizing the multiple values of greenery



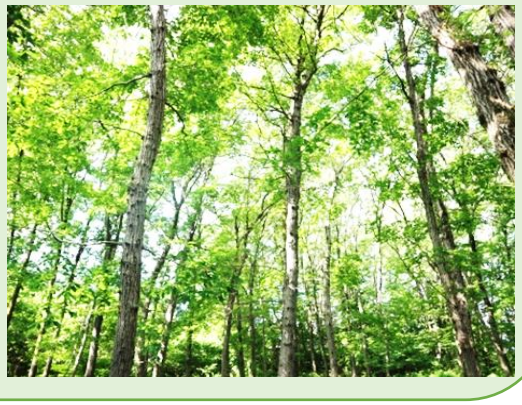
"Nurturing" Initiatives

- “Tokyo Green Biz Movement” to grow greenery together
- Creating green spaces in conjunction with urban development
- Creating lush greenery and marine-like plazas
- Create a network of green spaces and water
- Create a green space as a symbol of the city

○Main Effort in the Future

・Examples of "Conserve" efforts: Maintaining and improving the quality of conservation areas

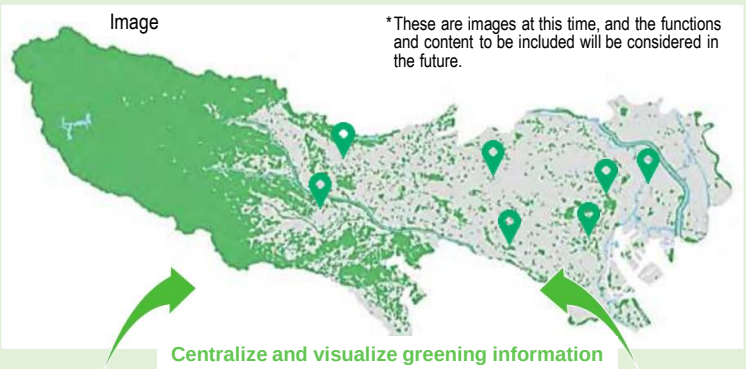
In order to make the forest floor brighter and younger, we are intensively promoting the restoration of vegetation and reforestation in conservation areas. We will also promote measures to conserve local rare species and to prevent invasive species.



●TOPIC●　Tokyo Green Biz (2/2)

・Examples of "cultivate" initiatives: Creation of “Tokyo Green Biz Map”

We will disseminate information about greenery in an integrated manner. We will post event information and promote the participation of various people through the map.



Centralize and visualize greening information

Tokyo Metropolitan Government, Corporations, etc.

Open disclosure of information

- Show parks and other green spaces
- View information about street trees and trees on a map
- Show seasonal flowering locations, green infrastructure locations, etc.
- Showcase tree planting events, community greening and other initiatives that allow for participation and hands-on experience.

Citizens of Tokyo, etc.

Promotion of participation

- Get information about green spots in Tokyo (parks, street trees, temples and shrines, private facilities, etc.)
- TOKYO Story Tree (tentative name) Registration and photo submission of your favorite tree row
- Attend green events

・Examples of "Utilizing" Efforts: "Green Infrastructure" utilizing the functions of green and nature

In order to utilize the functions of the natural environment to solve social issues such as heavy rain and extreme heat, we will promote the introduction of green infrastructure at Metropolitan and private facilities etc.

Rain Garden

Installed in parks, squares, roads etc.

- Storage and infiltration functions of rainwater
- Landscape through greenery Improvement functions etc.

are combined and improve the city environment in a comprehensive manner.

Greening of the old riverbed (image)

Greening and greenery in the old riverbed

Development of greenways etc. on old riverbeds

- Rainwater infiltration function
- Heat island measures

Landscape preservation etc.

みどりと生きるまちづくり
TOKYO GREEN BIZ

For details, please refer to our homepage.

5. Promotion of Adaptation measures

Implementation Systems

Cooperation within the Agency

The impact of climate change will reach many fields. Since it is necessary to consider and implement adaptation measures for the impact of the disaster on a sector-specific and cross-sectoral basis, we are strongly promoting adaptation measures in cooperation with each department and thoroughly managing the progress through the PDCA cycle under an agency-wide promotion system.

Establishment of Local Climate Change Adaptation Centers

Regarding Local Climate Change Adaptation Centers based on Article 13 of the Climate Change Adaptation Act,
Tokyo Metropolitan Climate Change Adaptation Center has been established at Tokyo Metropolitan Institute of Environmental Science which has conducted research on city heat island measures.
Metropolitan government will cooperate with the Center to collect, organize, analyze and provide information on climate change impacts and adaptation.

Tokyo Metropolitan Institute of Environmental Science

< Role of Center >

▷ Information collection, Organization and Analysis

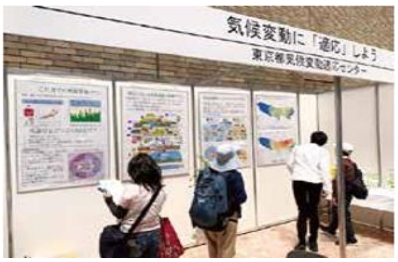
It collects, organizes and analyzes information on the actual conditions of temperature and other factors in areas centering on Tokyo, the impacts of climate change and examples of climate change adaptation measures in Japan and overseas.
In addition, we will promote cooperation with related organizations by participating in the national council and sharing information with National Institute for Environmental Studies Climate Change Adaptation Center and related research institutions.

Tokyo Metropolitan Climate Change Adaptation Center Homepage

▷ Provision of information, Dissemination awareness and Advice

It provides information and advice on climate change to local governments in Tokyo, promotes the formulation of Local climate change adaptation plans, holds Seminar for municipal officials in Tokyo and dispatches experts on climate change adaptation. In cooperation with Metropolitan government, we will promote dissemination awareness among Tokyo residents by making videos and disseminating information about climate change adaptation through exhibitions.

Seminar for municipal officials in Tokyo



Event exhibits

Role of each Entity

Role of Metropolitan government

In order to promote adaptation efforts by Tokyo residents and businesses, Metropolitan government will actively disseminate information on climate change impacts and adaptation measures in cooperation with National government, National Institute for Environmental Studies and Local Climate Change Adaptation Center etc. In addition, we will incorporate the perspective of adaptation into all measures taken to respond to the current and future impacts of climate change. At the same time, we will strengthen cooperation with municipalities that are developing measures rooted in local communities and support their efforts.

Role of Municipalities

Municipalities are required to formulate a regional climate change adaptation plan, incorporate climate change adaptation into relevant measures in accordance with the natural, economic and social conditions of the areas and promote climate change adaptation measures in each field under the cooperation of relevant departments.

Role of Tokyo Residents

Tokyo residents are expected to deepen their understanding of the impacts of climate change by utilizing information provided by National government and Tokyo metropolitan government, collect information on the impacts themselves and make efforts to cope with the impacts.

Role of Business operators

Businesses are required to use the information provided by National government and Tokyo metropolitan government to deepen their understanding of the impacts of climate change on their business activities and their adaptation measures and to develop their businesses with an eye toward future climate change and incorporating the perspective of adaptation.

Tokyo Climate Change Adaptation Plan

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