Zero Emission Tokyo Strategy 2020 Update & Report

TIME TO ACT

CLIMATE ACTION

Overcoming the COVID-19 Crisis and Accelerating Climate Actions for the Future

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TOKYO METROPOLITAN GOVERNMENT

Tokyo Tokyo Old meets New

Zero Emission Tokyo

Zero Emission Tokyo Strategy 2020 Update & Report

A little over a year has passed since **the Tokyo Metropolitan Government (TMG)** announced the Zero Emission Tokyo Strategy aiming for net zero CO_2 emissions by 2050 with the purpose of starting actions against the clear and present crisis of climate change together with all of Tokyo residents and businesses to fulfill our responsibility as one of the world's largest cities.

During this time frame, society has undergone a drastic and rapid transformation in the face of two major crises: the threat of infectious diseases and the climate crisis.

The world is stepping up its pace toward building a decarbonized and sustainable social system. A range of actors, such as nations, cities, and businesses, are competing with each other to take on the challenge of ambitious efforts that contribute to decarbonization. The world, from the business scene to every aspect of social life, is truly in an age of mega competition for decarbonization.

To achieve the **2050** goal of a Zero Emission Tokyo, actions taken during the decade leading up to 2030 are extremely important.

In this strategy, we have advocated 2030 Carbon-Half Style as a new vision for social change in Tokyo by 2030 to show the approaches and directions of the change in each policy area in order to accelerate effective efforts for decarbonization by keeping up with the trends of the world.

Halve greenhouse gas emissions in Tokyo by **2030**.

People tend to focus only on short-term numbers or efforts. To achieve this extremely challenging goal, we need to continue showing a vision of the decarbonized social system Tokyo should aim for, how our lifestyles should fit in it, and how we can reach it.

What kind of measures will be needed for the next 10 years? We will share this issue with a variety of actors, including Tokyo residents, businesses, and organizations, to take action in cooperation with all of them in addition to mobilizing a broad range of policies throughout TMG.

Even given the **COVID-19 crisis**, the climate crisis cannot wait.

To take action against the climate crisis that has become more serious, I announced the Climate Emergency Declaration: TIME TO ACT recently.

To avoid catastrophic damage caused by climate change and resolutely protect Tokyo residents, and

To keep Tokyo an attractive city that draws investment and business partners by calling attention to decarbonization,

In the spirit of the "TIME TO ACT" slogan, we will promote further collaboration to achieve the global common goal of decarbonization by calling on, at every opportunity, all actors in Japan and overseas to accelerate their actions.

"TIME TO ACT" – Now is the Time to Accelerate Effective Actions

For a Zero Emission Tokyo, Let's realize 2030 Carbon-Half Style

March 2021

KOIKE Yuriko
Governor of Tokyo

Zero Emission Tokyo 2020 Update & Report

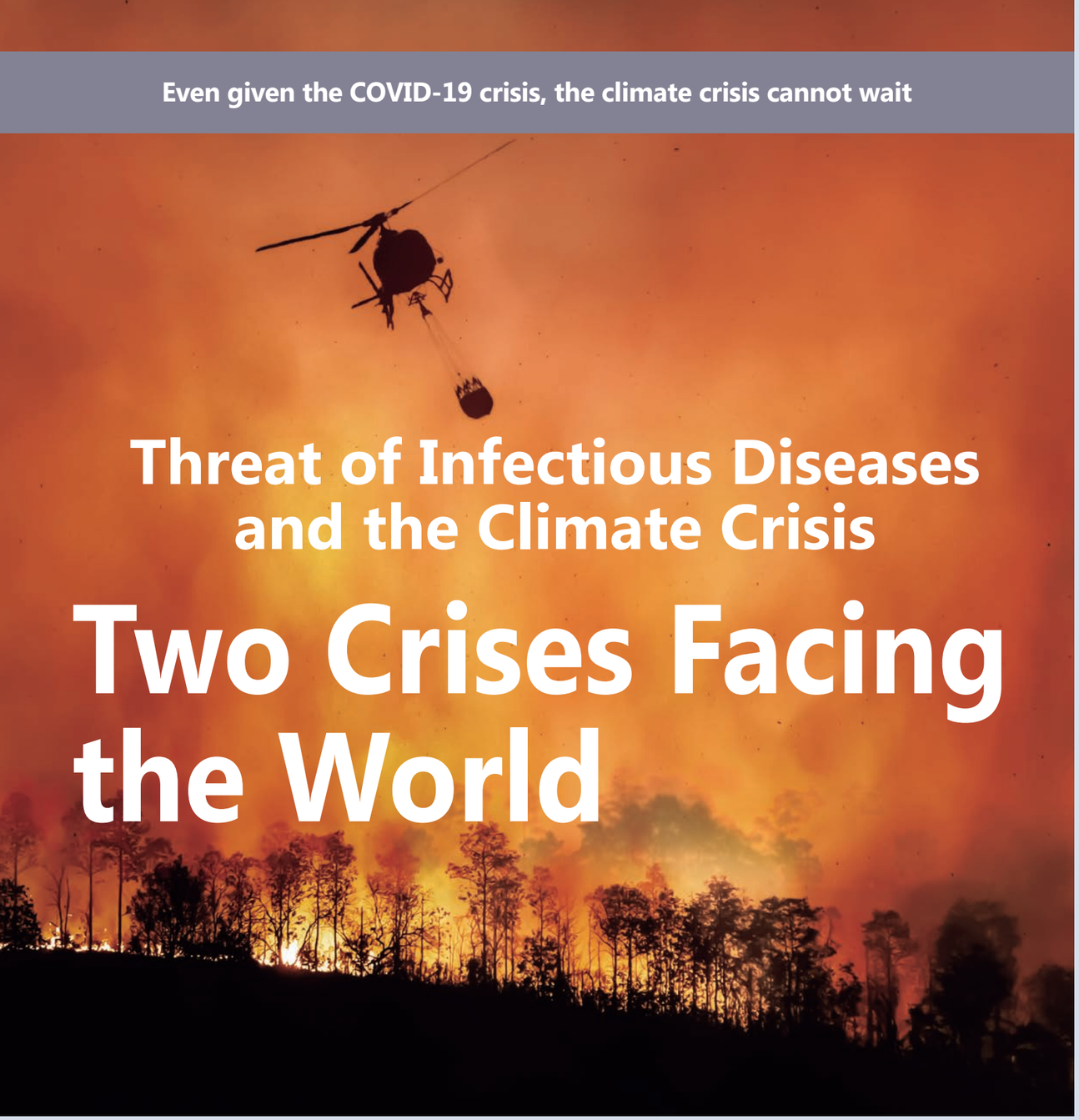
01

CHAPTER 01

TRENDS IN CLIMATE CHANGE

Clear and Present Crises and the World Is Reacting

Even given the COVID-19 crisis, the climate crisis cannot wait



Threat of Infectious Diseases and the Climate Crisis

Two Crises Facing the World

Two crises threatening our future

Since first being discovered in December 2019, COVID-19 has spread very quickly all over the world, becoming a major crisis and having a tremendous impact on people's health and daily lives, socioeconomics, and other aspects. There are no signs of containment even after more than a year has passed since the outbreak.

Even in the midst of the fight against this pandemic, another crisis, that of the climate, relentlessly strikes us. Global warming continues to rage around the world, bringing about unprecedented natural phenomena and life-threatening disasters.

We must overcome the struggle with COVID-19, clearly acknowledge the climate crisis that has become more serious, and continue to stand against the climate crisis.

* Greenhouse gases cause global warming. CO_2 accounts for approximately 90% of greenhouse gases emitted from Tokyo. Other greenhouse gases, such as fluorocarbons, account for approximately 10% in CO_2 equivalent.

Impact of major weather disasters in recent times

Melting glaciers

India (February 2021)

- Collapse of Himalayan glaciers resulting in river flooding
- More than **200 people** dead or missing

Forest fires

California, USA (2020)

- **Approx. 17,000 km²** burnt, equivalent to the area of the Kanto Plain
- **Over 30** deaths
  Approx. 10,000 buildings damaged

Crop damage (Desert locusts)

Africa and the Middle East (2020)

- Large outbreak attributed to heavy rains of a cyclone
- **USD 8.5 billion** estimated losses
  (JPY 902.7 billion *calculated using ¥106.2)
- Over **35 million people*** facing food insecurity
  *Total in the most affected countries - Ethiopia, Kenya, Somalia, the Sudan, and Yemen

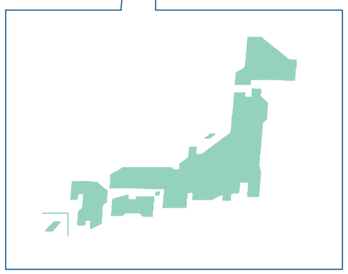
Source: Food and Agriculture Organization of the United Nations

Forest fires

Southern and eastern Australia
(July 2019 - March 2020)

- **Approx. 190,000 km²** burnt, affecting **approx. 3 billion** animals
- Over **AUD 2 billion** estimated insurance losses
  (JPY 166.4 billion *calculated using ¥83.2)

Tokyo Shimbun, March 1, 2020



Heavy rains

Throughout Japan (July 2020)

- **84** deaths
  16,599 houses damaged
- **JPY 220.8 billion** damage to agriculture, forestry, and fisheries

Kurume City, Fukuoka Prefecture (photographed on July 8, 2020)

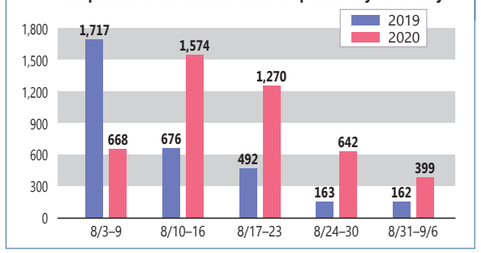
Source: Website of the Geospatial Information Authority of Japan

Extreme heat

Throughout Japan (August 2020)

- **41.1°C** in Hamamatsu City, Shizuoka Prefecture, on par with the highest temperature in Japanese history
- **43,060 patients** seeking emergency care for heatstroke throughout Japan in August
  *Record high for August since the survey started in 2008

Comparison of the number of above patients by FY in Tokyo



Source: Heat Stroke Information, Fire and Disaster Management Agency, Ministry of Internal Affairs and Communications

* The foreign exchange rate used in the above captions is the closing price at the end of February 2021

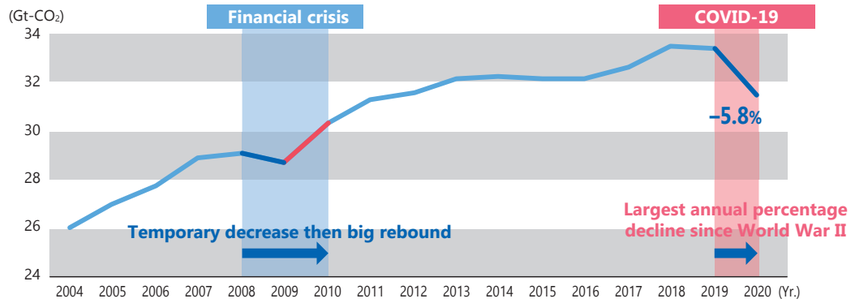
Changes brought about by COVID-19

Environmental changes due to the stagnation of socio economic activities

Global CO_2 emissions have fallen sharply due to the worldwide stagnation of socio economic activities caused by the spread of COVID 19, resulting in an improved air environment. On the other hand, there is concern about rebound from these changes with the resumption of activities.

Considering the post-corona era from a medium- to long-term perspective, we should not return to our previous state but aim for a sustainable society by increasing our resolve to take action against the climate crisis.

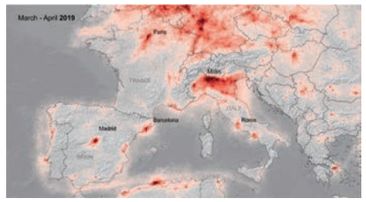
Global CO_2 emissions decreased by 5.8% from 2019



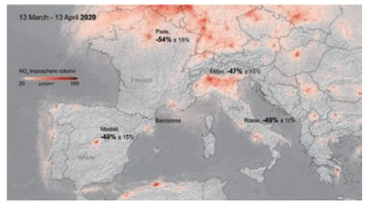
Source: Global Energy Review: CO_2 Emissions in 2020, IEA (https://www.iea.org/articles/global-energy-review-CO2-emissions-in-2020)

Global air pollutants decrease during lockdown periods

Comparison of NO_2 concentrations in Europe



March - April 2019

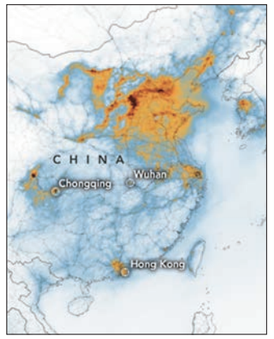


March 13 - April 13, 2020

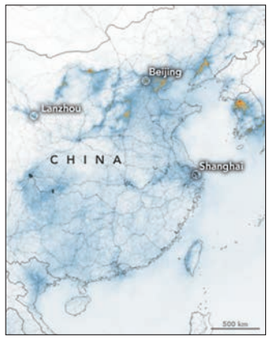
© Contains modified Copernicus Sentinel data (2019 - 20), processed by KNMI/ESA

Comparison of NO_2 concentrations in China

January 1 - 20, 2020



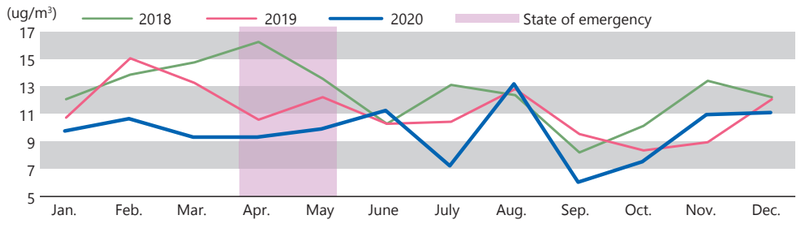
February 10 - 25, 2020 (Lockdown period)



Source: Website of National Aeronautics and Space Administration (NASA) (https://earthobservatory.nasa.gov/images/146362/airborne-nitrogen-dioxide-plummets-over-china)

PM2.5 concentration tends to improve year-on-year

Changes in PM2.5 concentrations at monitoring stations (46 general stations) in Tokyo



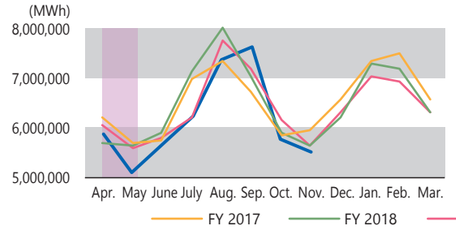
* Preliminary results are shown for April to December 2020

Various changes in society during the COVID-19 crisis

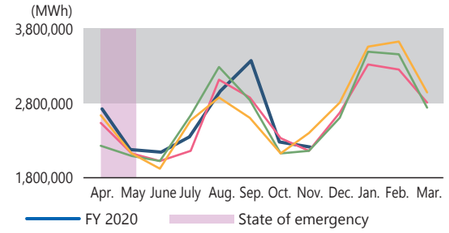
Various changes have appeared during the COVID-19 crisis, such as longer periods spent at home and the use of digital technology. To realize a sustainable society, we have to strengthen our efforts in light of these changes.

Electricity demand in Tokyo decreased overall but demand for low voltage electricity for households etc. increased

Total of extra high voltage, high voltage, low voltage



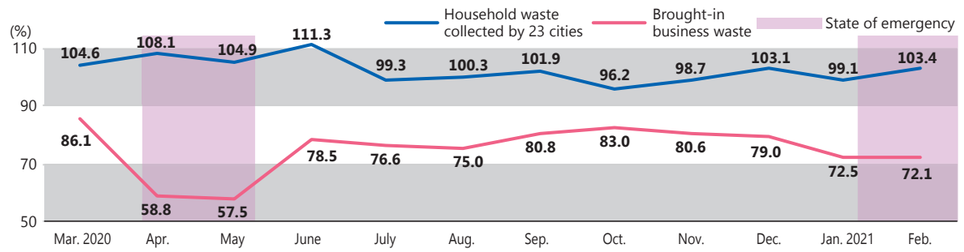
Low voltage



FY 2017 FY 2018 FY 2019 FY 2020 State of emergency

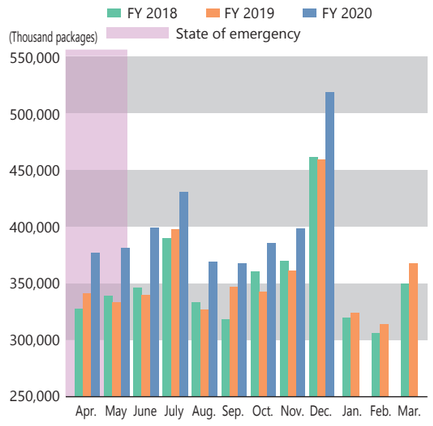
Source: Electricity Survey Statistics, Agency for Natural Resources and Energy (https://www.enecho.meti.go.jp/statistics/electric_power/ep002/results.html)

As for the amount brought into 23 cities' incineration plants, household waste increased but business waste decreased from 2019



Source: Trend of the Amount of Waste Brought into Incineration Plants, Clean Authority of TOKYO (https://www.union.tokyo23-seisou.lg.jp/kanri/documents/influence-of-covid19.pdf)

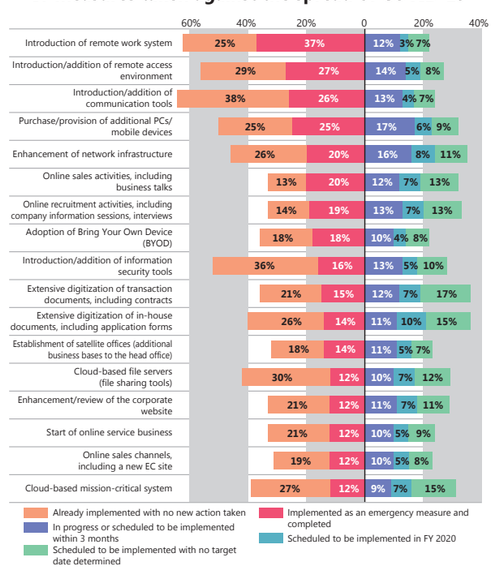
Package delivery volume increased



Source: Truck Transport Information for December 2020, Ministry of Land, Infrastructure, Transport and Tourism (https://www.mlit.go.jp/k-toukei/content/001388225.pdf)

More businesses use digital technology

IT measures taken against the spread of COVID-19



Source: Survey of the Impact of the COVID-19 Crisis on Corporate IT Trends (April 2020), ITR Corporation (https://www.itr.co.jp/company/press/200512PR.html)

We need to strengthen efforts toward the realization of a sustainable society, taking into account changes brought about by COVID-19

The Dawn of the Era of Mega-Competition—Zero Emissions Becoming Mainstream in the World

Trend of decarbonization expanding around the world

■ The world powers make a big shift to decarbonization

With many nations aiming for decarbonization, the United States and China, two of the world's largest economic powers with the largest CO_2 emissions, as well as Japan have begun to make a big move toward decarbonization.

USA announced net zero GHG emissions by 2050, rejoining the Paris Agreement (Feb. 2021)

China announced net zero CO_2 emissions by 2060 (Sept. 2020)

Japan declared net zero GHG emissions by 2050 (Oct. 2020)

■ 124 countries and one region have announced the goal of carbon neutrality by 2050 (as of January 20, 2021)

Source: Website of Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry

■ Worldwide trend of a green recovery

In European and other countries, there is a movement aiming for a green recovery to "build back better" from the COVID-19 crisis while coping with the climate crisis, strongly promoting the transition to a decarbonized society.

EU considered climate change measures as one of core elements in the recovery fund, allocating more than 30% of the entire budget to this end

UK mobilized GBP 12 billion (approx. JPY 1.7 trillion) of government funds through the Ten Point Plan for a Green Industrial Revolution (Nov. 2020)

Germany utilized more than EUR 33 billion (approx. JPY 4.1 trillion) for climate change measures through the Comprehensive Economic Stimulus Package (June 2020)

South Korea appropriated KRW 73.4 trillion (approx. JPY 7.3 trillion) for environmental measures through the Korean New Deal (July 2020)

Source: Material for the 146th Global Environment Subcommittee, Ministry of the Environment

Expansion of frameworks developed by cities and businesses

■ The world's largest framework formed by non-state actors: Race To Zero

The UNFCCC (United Nations Framework Convention on Climate Change) launched an international campaign, Race To Zero, to bring together ambitious efforts of non-state actors toward a shift to a decarbonized society.

RACE TO ZERO
Climate Ambition Alliance

Participants consist of 471 cities including Tokyo, 22 regions, 1,675 businesses, 85 major investors, and 569 universities (as of March 22, 2021)

■ International initiatives of businesses aiming for decarbonization

SBT (Science Based Target)

615 certified businesses including 91 Japanese businesses

* GHG emission reduction targets set by businesses to hold the temperature rise to 1.5°C

RE100 (Renewable Energy 100%)

291 participating businesses including 50 Japanese businesses

* Efforts aimed at covering all business operations with renewable power alone

Source: Website of the Ministry of the Environment (Mar. 9, 2021)

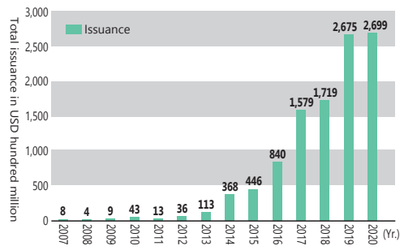
Expanded decarbonization movement in economic activities

Mainly at global businesses, there is a growing movement that requests decarbonization efforts from business partners to decarbonize the entire supply chain.

In addition, there is an active movement to raise funds to promote decarbonization. Green or sustainability bonds are actively used to promote business that contributes to environmental improvement, resulting in an increase in the amount issued worldwide.

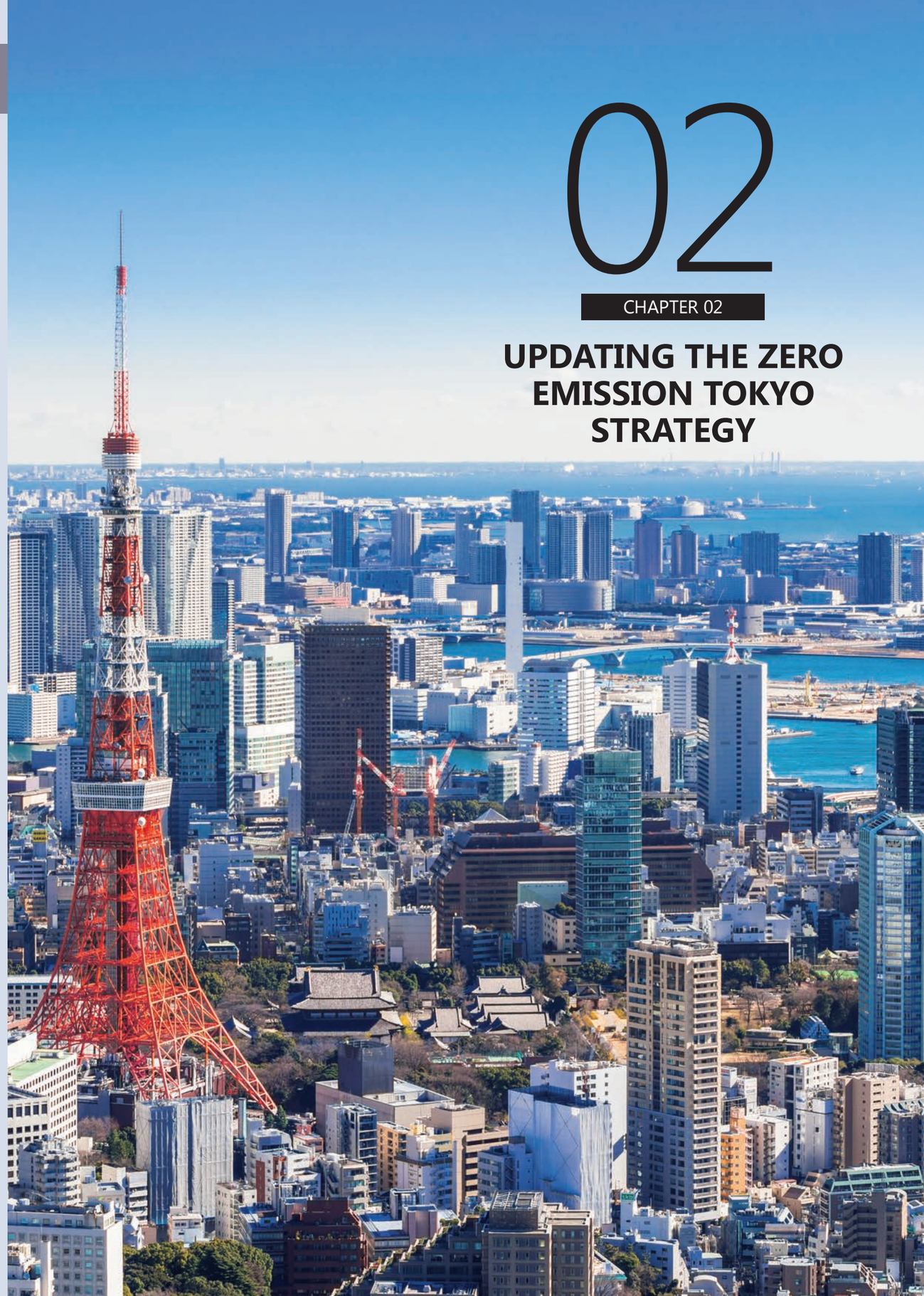
In this way, the promotion of decarbonization has become a major premise for all businesses to continue their economic activities.

■ Changes in the issuance of green bonds in the world



Source: Changes in the Issuance of Green Bonds in the World, Ministry of the Environment

The world is in the era of mega-competition for decarbonization
Tokyo needs to continue its efforts in light of this trend



02

CHAPTER 02

UPDATING THE ZERO EMISSION TOKYO STRATEGY

2030 is an important milestone for the realization of a Zero Emission Tokyo

Accelerating actions against exacerbated climate crisis

- The climate crisis has become even more serious as the world faces an unprecedented crisis due to rampant COVID-19 spread.
- Actions taken during the decade leading up to 2030 are extremely important for the realization of net zero CO_2 emissions by 2050. This is our last chance to safeguard the future of planet Earth.
- As the world makes rapid progress toward decarbonization, Tokyo must further accelerate its actions as one of the world's largest cities.

TIME TO ACT: Tokyo Takes the Lead in Accelerating Actions

Necessity of accelerating actions toward the extremely important next decade

Formulation of the Zero Emission Tokyo Strategy in December 2019 Clarifying net zero CO_2 emissions by 2050 to start taking action

To pursue efforts to limit the temperature increase to 1.5ºC and realize a Zero Emission Tokyo that will contribute to achieving net zero CO_2 emissions worldwide by 2050, TMG formulated the Zero Emission Tokyo Strategy in December 2019.

We started a range of policies, sharing awareness of the climate crisis facing us, clarifying what we should aim for by 2050, practical efforts to be made, and roadmaps for the future, and calling on Tokyo residents, businesses, and organizations to assist in decarbonization actions.

For details, visit the website of the Bureau of Environment, Tokyo Metropolitan Government.

Sustainable recovery from the COVID-19 crisis

COVID-19 has spread all over the world very quickly, damaging socio-economic situations, changing people's lives and behaviors, and causing a change in the mindset for climate change.

In European and other countries, there is a movement aiming for a green recovery to "build back better" from the COVID-19 crisis while coping with the climate crisis. TMG is promoting sustainable recovery that expands the perspective to a more sustainable lifestyle as well as protecting the environment by making full use of digital technology.

During the decade up to 2030, which is a critical date on the way to net zero CO_2 emissions by 2050, the movement toward decarbonization is accelerating around the world

Even given the COVID-19 crisis, the climate crisis cannot wait.

According to the Special Report of IPCC (Intergovernmental Panel on Climate Change), limiting the rise in global average temperature to 1.5°C

- Requires global CO_2 emissions to be approximately halved by 2030 and net zero by 2050,
- Which, in turn, requires a rapid and extensive transition to net zero in energy, urban, infrastructure, and industrial systems.

Many nations are competing with each other to promote climate change measures toward decarbonization by raising targets or developing pioneering initiatives.

Global GHG emission reduction targets

2030 targets	
EU	**55%** from 1990
London	**60%** from 1990
Paris	**50%** from 2004
New York	**40%** from 2005

(As of the end of Feb. 2021)

For a sustainable society and economy in the future

To fulfill its responsibility as a major consumer of energy and resources, TMG announced the Climate Emergency Declaration: TIME TO ACT to accelerate actions against the climate crisis that has become more serious.

Actions against the climate crisis also contribute to solving social issues, such as health and livelihoods, security of resources and food, and are important factors for achieving the Sustainable Development Goals (SDGs).

For a brighter future, Tokyo will take the lead in accelerating actions.

Sustainable Development Goals (SDGs)

(Website of United Nations Information Centre)

Announcing a 50% reduction in greenhouse gas emissions in Tokyo by 2030

Ambitious target to accelerate actions— Announcing "Carbon Half" to halve GHG emissions by 2030

In January 2021, the governor of Tokyo announced that TMG will reduce GHG emissions in Tokyo by 50% compared to 2000 by 2030 in order to accelerate and strengthen actions taken during the decade up to 2030.

For the realization of "Carbon Half" by 2030, it is indispensable to strongly promote a further increase in energy efficiency and shift to the use of decarbonized energy. To this end, we aim to reduce energy consumption by 50% and increase the percentage of power generated by renewable energy to approximately 50% of the total sourced.

	(Existing targets)
▶ **Reduction of GHG emissions in Tokyo compared to 2000**	**30% ⇒ 50%***
▶ **Reduction of energy consumption in Tokyo compared to 2000**	**38% ⇒ 50%***
▶ **Percentage of power generated by renewable energy**	**Approx. 30% ⇒ Approx. 50%***

* TMG will discuss further these targets and initiatives for these aspects in the Tokyo Metropolitan Environmental Council

The trend toward zero emission vehicles is also accelerating

In countries and cities around the world, the trend toward zero emission vehicles is accelerating rapidly.

In December 2020, TMG announced that it will phase out the sale of new gasoline-only passenger cars and motorcycles in Tokyo to stay in line with world trends, demonstrate its commitment to being a leading eco-friendly city, and connect its excellent environmental technology to the sustainable growth of the Japanese economy.

- **Phasing out the sale of new gasoline-only passenger cars in Tokyo ⇒ 100% (by 2030)**
- **Phasing out the sale of new gasoline-only motorcycles in Tokyo ⇒ 100% (by 2035)**

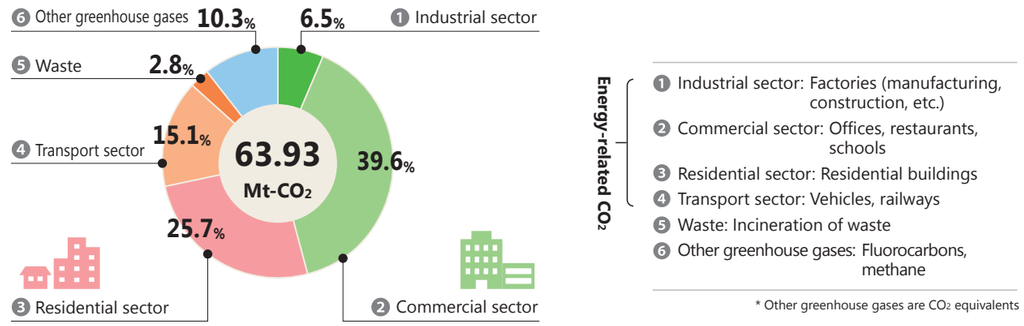
Considering FY 2021 as the starting point for phasing out gasoline-only vehicles, TMG will promote the spread of zero emission vehicles by subsidizing vehicle purchases and infrastructure development as well as fostering momentum. In addition, by accelerating proactive actions in collaboration with the national government and automobile manufacturers, TMG will strive to make vehicles zero emission.

* Non-gasoline-only vehicles include ZEVs, such as electric vehicles (EVs), plug-in hybrid vehicles (PHVs), and fuel cell vehicles (FCVs), and hybrid vehicles (HVs)

Accelerating action in all areas is essential to reduce greenhouse gas emissions

Greenhouse gases are composed of energy-related CO_2 emitted from the final energy consumption including electricity, CO_2 from the incineration of waste, and other greenhouse gases, such as fluorocarbons and methane. To achieve "Carbon Half" by 2030 and net zero CO_2 emissions by 2050, we need to accelerate decarbonization actions in all fields.

■ **Sector breakdown of greenhouse gas emissions in Tokyo** (preliminary results for FY 2018)



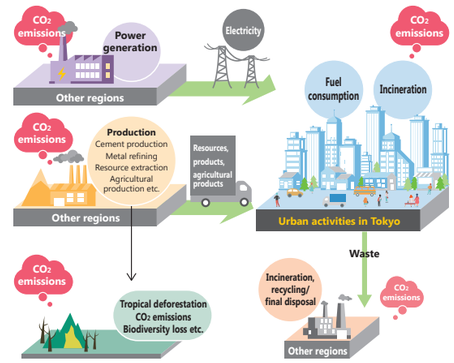
* Other greenhouse gases are CO_2 equivalents

Responsibility of the metropolis of Tokyo: Contribution to reducing CO_2 emissions in other regions

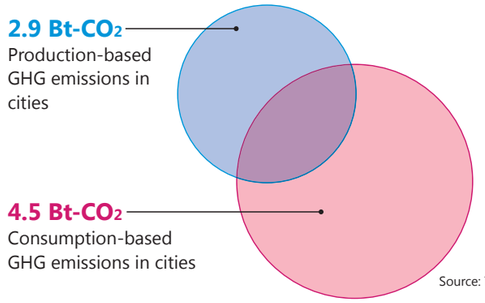
Activities and lifestyle choices in Tokyo lead to CO_2 emissions in other regions at home and abroad

In Tokyo, a huge amount of energy, resources, and products are consumed and then discharged as waste. Most of the energy, products, and resources used in Tokyo are produced or extracted in other regions of Japan or overseas. Tokyo also relies on other regions for the recycling and final disposal of its waste. As one of the largest cities in the world, Tokyo needs to take the initiative in reducing CO_2 emissions in Japan and overseas.

■ **CO_2 resulting from urban activities**



■ **Greenhouse gas emissions from 96 C40 member cities based on production and consumption**



In its report published in 2019, C40 (C40 Cities Climate Leadership Group) indicates the importance of considering consumption-based greenhouse gas emissions.

- Greenhouse gas emissions based on production in the C40 member cities are 2.9 Bt-CO_2, and those based on consumption are 4.5 Bt-CO_2
- Greenhouse gas emissions based on consumption in the C40 member cities are projected to nearly double by 2050

Source: The Future of Urban Consumption in a 1.5°C World, C40 Cities Headline Report

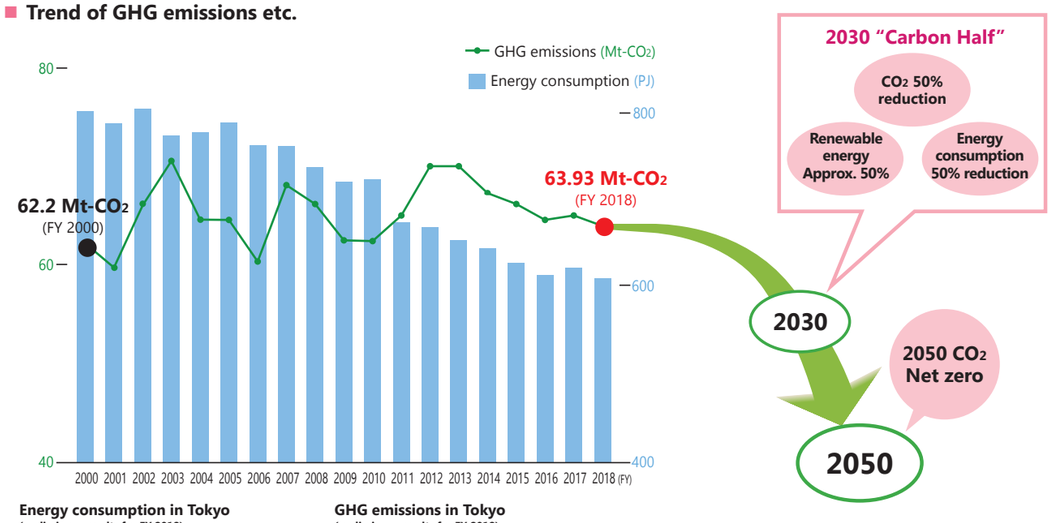
Reconstruction of the socio-economic structure is inevitable to achieve "Carbon Half" by 2030

A vision of social change toward 2030
Carbon-Half Style

- The path to realize "Carbon Half" by 2030 is by no means smooth, and it cannot be reached with merely gradual changes.
- We need to implement reconstruction and redesigning that will decarbonize the socio-economic structure in all fields, including business, civic life, and urban development, in addition to strengthening existing efforts.

TMG advocates "2030 Carbon-Half Style" as a vision for social change for "Carbon Half" by 2030

Trend of GHG emissions etc.



Energy consumption in Tokyo
(preliminary results for FY 2018)

Sector	Results (PJ)	From 2000
Total	608.3	–24.2%
Industrial	49.6	–48.6%
Commercial	244.0	–7.1%
Residential	186.8	0.7%
Transport	127.8	–50.3%

* Secondary energy equivalents are used for electricity calculation

GHG emissions in Tokyo
(preliminary results for FY 2018)

Sector	Results (Mt-CO2)	From 2000
Total	63.93	2.8%
Industrial	4.17	–38.6%
Commercial	25.30	23.6%
Residential	16.46	28.3%
Transport	9.64	–45.4%
Waste	1.79	49.3%
Other gases	6.57	102.5%

- Energy consumption passed its peak around FY 2000
- Greenhouse gas emissions increased due to worsening CO_2 emission factors of electricity after the Great East Japan Earthquake, but have decreased since FY 2012 because of reduced energy consumption and improvements in the emission factors

* The CO_2 emission factors of electricity are calculated by applying an emission factor for each fiscal year

Realizing Carbon-Half Style will bring about a sustainable city

Society in 2030 will define the future

The 2030 Carbon-Half Style advocated by TMG is not only a vision of social change that will be realized by 2030, but also actions or behaviors toward "Carbon Half."

What we are in 2030 virtually defines what society will look like in 2050. We need to turn the entire social system, including lifestyles and business models, in 2030 into a sustainable version capable of halving our carbon output.

TMG's visions of change include:

2030 Carbon-Half Style (Excerpt)

Renewable energy
- Expansion of solar power generator installation and self-consumption in Tokyo in collaboration with private businesses and others
- Urban development premised on the use of renewable energy, including the use of electricity from renewable energy generated outside Tokyo and the utilization of decarbonized heat

Hydrogen
- Accelerating the use of hydrogen energy while expanding the supply and demand of hydrogen in the Tokyo metropolitan area
- Building the foundation for the use of hydrogen generated from renewable energy etc. from 2030 onward

Buildings
- Progress in the standardization of zero emission buildings at the time of construction and the transition of existing buildings to zero emission buildings
- Buildings forming cities to be decarbonized to attract sustainable investments etc.

Houses
- Progress in the standardization of zero-emission specifications for new houses and the provision of high thermal insulation for existing houses
- Resilient and healthy houses acting as a safety net for the life of Tokyo residents

Civic life
- Shift to a sustainable and prosperous lifestyle through the review of energy use and consumption behavior

Mobility
- Establishment of environmentally friendly multi-energy stations as social infrastructure
- Widespread ZEVs, from small to large sizes, due to diversified vehicle types; progress in mobility reform to deliver a society using autonomous driving and MaaS capable of meeting diverse needs
- Larger market for zero emission motorcycles accelerating the phaseout of gasoline-only motorcycles

Resources
- A resilient waste treatment system established based on the system with no manual operation and various 3R routes
- Mainstreaming 2R (reduce & reuse) businesses, including selling by weight, sharing, and reusable containers
- Shift to a sustainable circular society focusing on curbing food waste

Fluorocarbons
- Progress in non-fluorocarbon air conditioners and freezer refrigerators, resulting in more products of such kind on the market
- Expansion of efforts to eliminate fluorocarbon leakage

By establishing a social foundation for decarbonization through these changes and going beyond the target of halving GHG emissions in 2030, TMG will realize
- **a more resilient, affluent, and livable city and**
- **an attractive city that encourages decarbonized business activities and attracts investment and business partners, which will lead to urban development that takes into account SDGs, including health and sustainable consumption**

Let's start efforts and actions to halve CO_2 right now!

TIME TO ACT for Carbon-Half Style

To realize "Carbon Half," each and every participant, including citizens, businesses, and administration, must work on halving CO_2 right now.

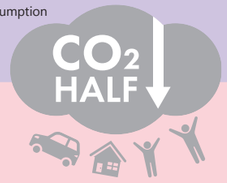
Please find your own

2030 Carbon-Half Style*

you can start working on to halve CO_2 right now toward 2030. Let's take action!

* Action aimed at realizing not only CO_2 reduction but also SDGs, including health and sustainable consumption

For your reference: Status quo in Tokyo



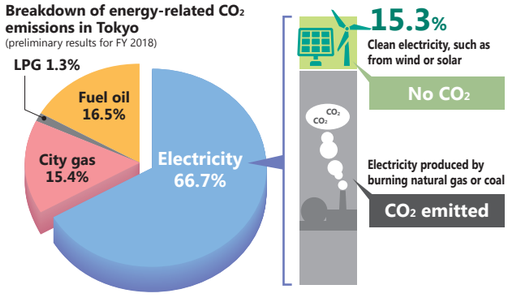
Examples of efforts	Life	Business
Energy efficiency (Improving energy efficiency)	● Use of high-efficiency home appliances ● Thermal insulation of house/rooms ● Use of ZEVs	● Construction and supply of ZEBs and highly insulated houses ● Promotion of zero emission district development ● Realization of zero emission facilities ● Development, supply, and sale of non-gasoline-only vehicles
Renewable energy (Equipment installation, power use)	● Solar panel installation and self-consumption ● Selection and purchase of renewable power (Participating in the Renewable Electricity Together campaign)	● Business activities using 100% renewable energy ● Supply of houses with solar panels and storage batteries
Resource efficiency, use of recycled resources, etc.	● Selection and purchase of sustainable products ● Proper disposal of air conditioners (fluorocarbon recovery)	● Higher resource efficiency, more use of secondary raw materials

● Reduction of food waste, selection of sustainable food, water efficiency, reduction of plastics, etc.

● Reductions in supply chains
● Sustainable products/services

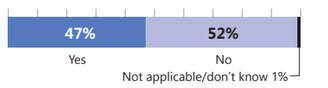
Approximately 70% of CO_2 comes from electricity, most of which is produced by burning fossil fuels.

Breakdown of energy-related CO_2 emissions in Tokyo
(preliminary results for FY 2018)



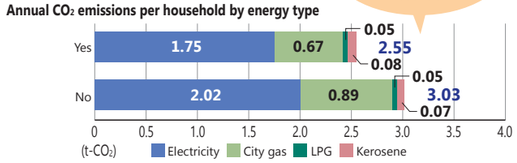
A refrigerator uses electricity 24 hours a day, 365 days a year.
Half of households do not have power saving measures.

Refrigerator temperature is set between "Normal" and "Colder" in summer and at "Cold" in other seasons



Households taking measures for a refrigerator emit less CO_2

Annual CO_2 emissions per household by energy type



Source: FY 2018 Statistics Survey on CO_2 Emissions from the Residential Sector (Final Values), Ministry of the Environment

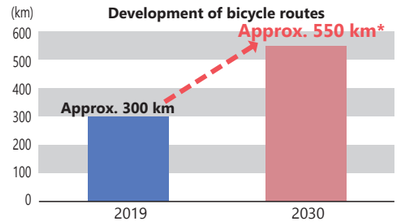
Households that cannot place solar panels on the roof can also use renewably sourced electricity, or "clean" electricity, by switching electricity contracts.

This is an initiative to help use clean electricity as well as lower electricity bills by recruiting prospective purchasers of clean electricity to increase purchasing power. Switching is so easy!

みんなで いっしょに 自然の電気

Think about how you usually move around. Cycling or walking as well as ZEVs can reduce CO_2 emissions.

TMG is developing bicycle routes.



* A total of approximately 900 km will be developed in line with a project to remove roadside utility poles and a city planning road project

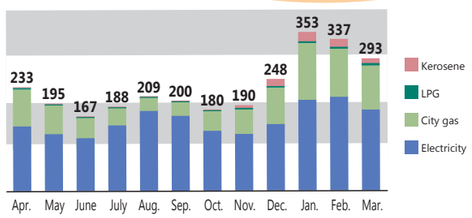
* An additional approximately 45 km will be developed in parallel with the development of coastal and other roads

Source: "Tokyo in the Future" Strategy

CO_2 emissions increase more in winter than in summer. However, only approximately 20% of houses have adequate thermal insulation.

Seasonal changes in CO_2 emissions in FY 2018
(Kg-CO_2/household/month)

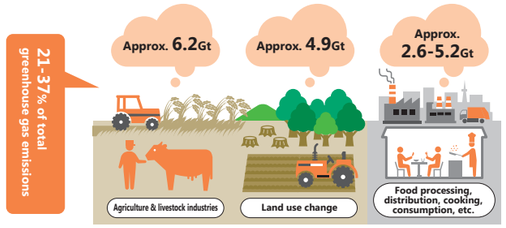
Improved thermal insulation performance of a house is important not only as an energy efficiency measure but also for the health of its inhabitants.



Source: FY 2018 Statistics Survey on CO_2 Emissions from the Residential Sector (Final Values), Ministry of the Environment

Eliminating food waste or purchasing sustainable products will help reduce CO_2 outside Tokyo.

Greenhouse gases are emitted as food goes through the various processes, including production, processing, and distribution, it takes to reach us. They account for 21-37% of global emissions. According to an estimate, approximately half of the world's emissions are related to the production of commodities.



Source: IPCC. Climate Change and Land 2019

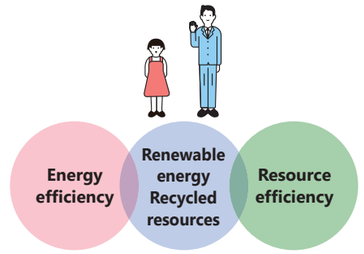
Tokyo is home to many roofs that are suitable for solar power generation.
Moreover, solar power generation equipment can be installed with no setup costs.

By using leasing or other means, solar power generation equipment can be installed with no setup costs incurred by homeowners.

This is a good chance for homeowners to commence using solar panels. Homeowners can rest assured that repair services will be provided in the event of a failure.

Project for Promoting Residential Solar Power Generation with No Setup Costs

In Life, In Business



Create your own "Carbon Half"

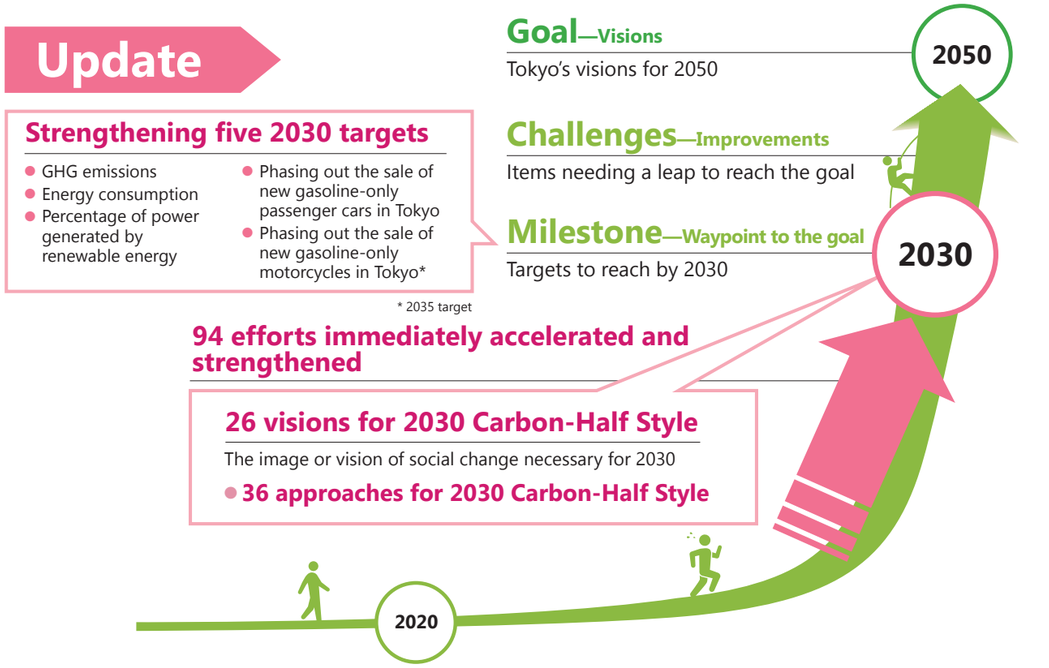
Updating the Zero Emission Tokyo Strategy to accelerate actions toward 2030

Strengthening strategies to realize "Carbon Half" by 2030

The Zero Emission Tokyo Strategy, formulated in December 2019, systematized priorities for TMG into six sectors and 14 policies, and clarified the goals for 2050 and the targets and actions for 2030.

In order to accelerate the actions over the next decade, this update has strengthened the targets (milestones) to be reached. It advocates 2030 Carbon-Half Style as a vision of social change necessary to realize "Carbon Half" by 2030 and shows the approaches toward 2030 Carbon-Half Style and the efforts to be immediately accelerated and strengthened.

TMG will promote the update by considering it as an initiative based on the "Tokyo in the Future" Strategy formulated in March 2021 as a new guiding principle for TMG.



Six sectors and 14 policies to promote specific efforts

I Energy sector	(1) Make renewable energy a major energy source (2) Expand the use of hydrogen energy		
II Urban infrastructure sector [Buildings]	(3) Expansion of zero emission buildings		
III Urban infrastructure sector [Transport]	(4) Promote the spread of zero emission vehicles (ZEVs)		ZEV Promotion Strategy
IV Resource/industry sector	(5) 3Rs (7) Food waste	(6) Plastics (8) Fluorocarbons	Plastic Strategy NEW Food Loss and Waste Reduction Plan
V Climate change adaptation sector	(9) Strengthening adaptation measures		NEW Tokyo Climate Change Adaptation Plan
VI Engagement and inclusion	(10) Cooperate with various actors in movements and reform of social systems (11) Strengthen cooperation with local municipalities (13) Strengthen cooperation with cities and non-states actors around the world		(12) TMG's initiatives for its own sustainability (14) Promote sustainable finance NEW Zero Emission TMG Action Plan

Realizing a Zero Emission Tokyo

* Individual plans and strategies have been formulated for sectors requiring prioritized measures. In FY 2020, three new plans were formulated: Tokyo Food Loss and Waste Reduction Plan, Tokyo Climate Change Adaptation Plan, and Zero Emission TMG Action Plan.

CHAPTER 03

03 ACCELERATING AND STRENGTHENING POLICY DEVELOPMENT

Policy 1

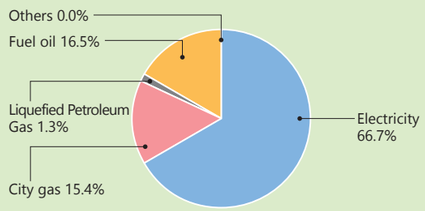
Make renewable energy a major energy source

* Renewable energy is part of the earth's resources, such as sunlight, wind, and geothermal heat, and always exists in nature.

Necessity of making renewable energy a major energy source

- Tokyo is a major consumer of energy. To realize a decarbonized society, it is essential to maximize energy consumption efficiency and switch to decarbonized energy.
- Approximately 70% of CO_2 emissions in Tokyo are related to power consumption. Since almost all electricity is supplied from other regions, decarbonizing the electricity supplied from the power grid is crucial. We also realize the need to promote the decarbonization of thermal energy at the national as well as local level.
- Considering the future era of massive introduction and supply of renewable energy, local production and consumption of renewable energy, which does not impose a heavy load on the power grid, is important for improving local resilience.

Breakdown of energy-related CO_2 emissions in Tokyo by fuel type
(preliminary results for FY 2018)



Status quo of making renewable energy a major energy source

Status quo

Percentage of power generated by renewable energy	15.3% (FY 2018)
Energy consumption compared to 2000	Reduced by 24.2% (preliminary results for FY 2018)
Installation of solar power generation equipment in Tokyo	572-MW (total in FY 2018)
Renewable power used at TMG facilities (governor's bureaus/departments)	Approx. 3% (FY 2019)

- The use of electricity from renewable energy and the installation of solar power generation equipment is expanding year on year in Tokyo. TMG facilities have started using power entirely from renewable energy, including a 100% renewable power purchase policy at the TMG city hall and post-FIT electricity generated in Tokyo
- TMG is promoting the introduction of equipment by residents and businesses in Tokyo through its financial support, helping introducing equipment locally producing/consuming renewable energy in buildings and solar power generation on home roofs with no setup costs
- TMG is also promoting the use of renewable power by Tokyo residents through a renewable electricity group buying project, and the use of renewable energy by businesses in Tokyo through a mechanism to encourage the use of renewable power with the Tokyo Cap & Trade Program

Renewable electricity group buying project "Renewable Electricity Together" campaign logo

Trends in renewable energy

Local production and consumption of renewable power contributing to improvements in resilience

More frequent heavy rains and other natural disasters further emphasize the importance of sustainable urban development that can maintain urban functions even in a disaster or emergency. That is why the local production and consumption of renewable energy is attracting more attention, and contributes to securing a stable lifeline even in such a natural disaster.

Installation of solar power generation equipment in Tokyo is at the beginning stage

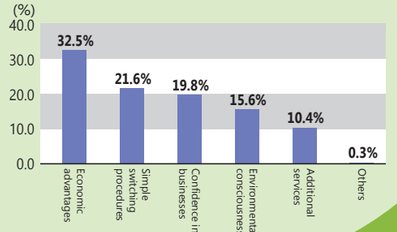
Solar panels have been installed on approximately only 4% of buildings deemed "suitable (including conditionally suitable)" for the installation in the Tokyo Rooftop Solar Register (potential map) etc. As the purchase price under the national FIT system* decreases or the quantity of equipment for which the purchase period of FIT has ended increases from 2019 onwards, we need to expand the introduction of renewable energy based on the characteristics of Tokyo.

Shift to the use of renewable power is at the beginning stage

Some large facilities in Tokyo are introducing equipment by themselves, but only approximately 9% of them have renewed their contract to that for renewable power and only approximately 5% of households have done the same. A survey conducted by TMG shows that approximately 50% of Tokyo residents are interested in the use of renewable power, citing prices and other economic advantages as well as simple switching procedures as considerations for shift to renewable power.

Tokyo rooftop solar register (potential map)

Considerations for shift to renewable power answered by households interested in switching to renewable power



Source: Survey by the Bureau of Environment, Tokyo Metropolitan Government in October 2020

2020

* The national government's system for purchasing renewable power from a power generator at a fixed price for a certain period

TIME TO ACT CLIMATE ACTION

Accelerating Actions

Visions for 2050

2030

All energy used to be decarbonized

- Supply of fully decarbonized electricity using renewable energy as a major power source
- Standardization of local production and consumption of renewable energy and energy sharing

Key targets toward 2030

Percentage of power generated by renewable energy	Energy consumption compared to 2000	Installation of solar power generation equipment in Tokyo	Renewable power used at TMG facilities (governor's bureaus/departments)
NEW	NEW		
Approx. 50%	50% reduction	1.3 GW	100%

* Expanding the number of 100 declaration businesses

Efforts immediately accelerated and strengthened

Promoting local production and consumption of renewable power generated in Tokyo
- Further promote the introduction of solar panels with no initial costs and support captive uses of solar power by the installation of storage batteries

A corporate power procurement agreement leading to the introduction of new renewable energy equipment outside Tokyo (Corporate PPAs in collaboration with regions outside Tokyo*)
- Almost all power is supplied from outside Tokyo. Therefore, start subsidizing the installation of new renewable power equipment in other regions for consumers in Tokyo. Promote actions by consumers to use renewable power in Tokyo via power grid

Promoting a zero emission island
- Prepare a demonstration project to realize a Zero Emission Island aiming for supplying power entirely from renewable energy on Hahajima, Ogasawara islands in Tokyo

Expanding actions for switching to renewable power use at households etc.
- Promote a campaign, which intends to increase the number of people purchasing renewable power at a low price even if it is difficult to install solar panels on the roof top of their houses, throughout Tokyo metropolitan area and Japan

Expanding the use of renewable energy through a program under TMG ordinances and cooperating with businesses
- Further expand the use of renewable energy at buildings and the supply of renewable power in Tokyo through the Tokyo Cap & Trade Program and other policy programs
- Develop movement for expanding the use of renewable power together with RE100 declaration businesses

Adjustment of supply and demand in anticipation of the massive introduction and supply of renewable energy
- Implement a model project based on the VPP* mechanism in the Minami-Osawa district to promote the self-consumption of renewable power and energy sharing centered on local renewable power generation

Full use of renewable power at TMG facilities
- Promote the TMG Renewable Power Plan that will aggressively use power entirely from renewable energy at TMG facilities, including post-FIT electricity generated by Tokyo residents
- Install solar power generation equipment on home roofs, TMG facilities, etc. in the islands area in Tokyo. Use the generated power at TMG facilities in these islands while installing power storage equipment that can be used in a disaster or emergency

2030 Carbon-Half Style - Visions for social change

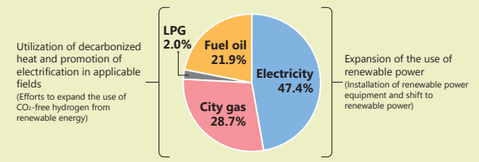
Expansion of solar power generator installation and self-consumption in Tokyo in collaboration with private businesses and others

Urban development premised on the use of renewable energy, including the use of electricity from renewable energy generated outside Tokyo and the utilization of decarbonized heat

Approaches for 2030 Carbon-Half Style

Standardization of the installation of renewable energy equipment in Tokyo and other regions and the use of renewable power in Tokyo
- In collaboration with private businesses, strongly promote the installation of solar panels and the self-consumption of generated power through installation of storage batteries to take full advantage of installation potential
- Expand power purchase that will lead to the installation of new renewable energy equipment outside Tokyo to take advantage of the large demand for electricity in Tokyo (Promotion of Corporate PPAs in collaboration with regions outside Tokyo)
- Further promote the use of electricity and heat from renewable energy used for urban development and existing buildings through programs under the TMG ordinances, such as the Program on Effective Use of District Energy

Breakdown of energy consumption in Tokyo by fuel type
(preliminary results for FY 2018)



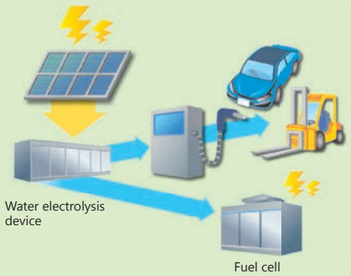
- Consider a new mechanism for fundamentally enhancing the installation of PV equipment on housing/building roofs and the expansion of renewable power use in Tokyo

* Power purchase agreement that promises to purchase electricity from renewable power sources for a certain period of time
* Virtual Power Plant. A mechanism for centrally controlling, as if it were a single power plant, demand, generation, and storage of electricity, utilizing IoT and the cloud

Policy 2 Expand the use of hydrogen energy

Necessity of expanding the use of hydrogen energy

- Hydrogen has many excellent features, such as diversification of energy supply and emergency response, allows energy storage of large amounts and for long periods, and is also prospective as an adjusting power at the time of the massive introduction and supply of renewable power. Utilizing hydrogen is expected to facilitate the decarbonization of thermal energy that is difficult to electrify.
- TMG will actively promote the effective use of hydrogen-related technologies, advance energy efficiency and decarbonization in all fields, and encourage the revitalization of the market and further technological innovation, backing up the market from various perspectives, such as institutional and financial aspects. We will proceed with examination into the utilization of CO_2-free hydrogen from renewable energy and the use of hydrogen energy looking ahead to the era of massive introduction and supply of renewable energy.



Status quo of expanding the use of hydrogen energy

Status quo

▶ Introduction of fuel cell vehicles	1,097 (total in FY 2019)
▶ Expanded use of residential fuel cells	Approx. 62,000 (total in 2019)
▶ Expanded use of commercial and industrial fuel cells	Approx. 2.5 MW (total in 2019)
▶ Introduction of fuel cell buses	43 (total in FY 2019)
▶ Development of hydrogen stations	17 (total in FY 2019)

- Fuel cells have been attracting attention in recent years as devices that also contribute to improvements in resilience, but are yet to become widespread.
- Hydrogen stations need financial support for development as they are expensive at the development phase as well as during operation.
- In addition to subsidizing fuel cells, FCVs, FC buses*, hydrogen stations, and equipment using hydrogen from renewable energy, TMG has encouraged the national government to ease regulations and raised awareness of Tokyo residents in collaboration with businesses.

* FCVs: fuel cell vehicles/FC buses: fuel cell buses

Trends in hydrogen energy

The world accelerates the move toward using CO_2-free hydrogen indispensable for decarbonization

In July 2020, the EU announced its Hydrogen Energy Strategy aimed at significantly expanding the use of hydrogen from renewable energy. Australia and other countries are seeing a movement to manufacture and export CO_2-free hydrogen taking advantage of abundant renewable energy.

In March 2020, in Fukushima Prefecture of Japan, an experimental study was started at one of the world's largest hydrogen production equipment using electricity from solar power generation.

Further promoting the social implementation of hydrogen energy technology is necessary in preparation for a future full scale use of CO_2-free hydrogen from renewable energy

In Japan, hydrogen has been promoted mainly for fuel cells, FCVs, and FC buses. Hydrogen is energy that is related to a wide range of industries and is projected to be used for many purposes, such as power generation and heat utilization. While the demonstration of hydrogen power generation is underway on production equipment, industry organizations and other bodies have raised the need of efforts to decarbonize heat by utilizing hydrogen.

Toward a society fully making use of CO_2-free hydrogen generated from renewable energy, we need to promote the social implementation of hydrogen energy technology in fields with higher potential, such as large vehicles for business use, electricity, and heat utilization, aiming to further expand demand.


Fuel cell bus

Fuel cell heavy truck


Fuel cell garbage truck

2020

TIME TO ACT CLIMATE ACTION Accelerating Actions

Visions for 2050

2030

▶ CO_2-free hydrogen from renewable energy as a pillar for realizing a decarbonized society

- **Supporting massive introduction and supply of renewable energy with hydrogen**
- **Full use of CO_2-free hydrogen in all fields. CO_2-free hydrogen as one of the pillars of energy supporting a decarbonized society**

Key targets toward 2030

Phasing out the sale of new gasoline-only passenger cars	Phasing out the sale of new gasoline-only motorcycles	Expanded use of residential fuel cells	Expanded use of commercial and industrial fuel cells	Introduction of zero emission buses	Market share of ZEVs in new passenger car sales	Development of hydrogen stations
NEW	NEW			ZEV		
100%	100%*	1 million	30 MW	300+	50%	150

* 2035 target

Efforts immediately accelerated and strengthened

- **Supporting the introduction of vehicles and equipment looking ahead to the advent of a hydrogen-powered society**

Vehicles:
- Increase FCV subsidies in collaboration with the national government
- For FC buses, newly subsidize part of fuel cost in addition to vehicle purchase cost

Hydrogen stations:
- Support environment-friendly multi-energy stations by encouraging the installation of a hydrogen station or fast chargers at existing gas stations and the introduction of rented or shared ZEVs to such a station

Fuel cells:
- Further promote the adoption of fuel cells by continuing financial support of the introduction by consumers and reorganizing subsidies for equipment using hydrogen from renewable energy

- **Promoting efforts for technological development and social implementation of hydrogen**
  - Develop fuel cell garbage trucks and carry out test operations in collaboration with universities, a ward in Tokyo, etc.
  - Implement the sharing model project in the Minami-Osawa district, which contributes to the use of hydrogen from renewable power in urban development
- **Enhance dispatch of Tokyo's action on promoting hydrogen to overseas**
  - Provide information on technologies and corporate initiatives implemented in Tokyo to the rest of the world through international conferences and other occasions
  - Raise public awareness and foster movement through visual depictions of hydrogen energy and other activities by the Tokyo Hydrogen Promotion Team
- **Formulating a Tokyo Hydrogen Vision (tentative name)**
  - Formulate a new vision to make CO_2-free hydrogen a pillar for realizing a decarbonized society to accelerate necessary efforts in the Tokyo metropolitan area

2030 Carbon-Half Style – Visions for social change

▶ Accelerating the use of hydrogen energy while expanding the supply and demand of hydrogen in the Tokyo metropolitan area

▶ Building the foundation for the use of hydrogen generated from renewable energy etc. from 2030 onward

Approaches for 2030 Carbon-Half Style

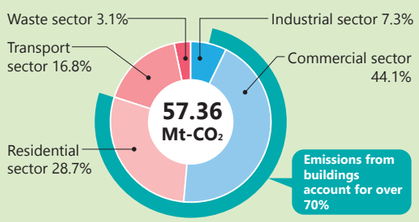
- **Creating more demand for hydrogen in the Tokyo metropolitan area**
  - Stimulate commercial and industrial demand for hydrogen use, such as commercial vehicles and electricity in Tokyo metropolitan area, by promoting inter-business collaboration, and facilitate further social implementation of hydrogen technology
  - In preparation for the upcoming massive introduction and supply of renewable energy, consider a mechanism to support the spread of hydrogen from renewable energy, which is effective for long-term and large-scale storage of surplus electricity
- **Promoting the introduction of fuel cell-based transportation for business use**
  - Promote the early social implementation of fuel cell-based transportation for business use, including buses, based on the consideration of demonstrating the operation of FC trucks and FC forklifts in coastal areas in Tokyo
- **Urban development in the bay area centered on renewable energy and hydrogen**
  - Utilize green technology to promote urban development that uses 100% clean energy centered on renewable energy and hydrogen to cover the energy used in the area

Policy 3 Expansion of zero emission buildings

Necessity of expanding zero emission buildings

- More than 70% of Tokyo's CO_2 emissions come from buildings. Eliminating emissions from buildings with high CO_2 emissions is a common goal of cities around the world, and essential if they wish to attract investment and business partners.
- Buildings are used for decades, and those constructed from now on will define the Tokyo of 2050. It is essential that all buildings, whether new or existing, achieve high energy efficiency, use renewable energy, and fully utilize materials with lower CO_2 emission levels, such as wood.
- It is also necessary to ensure high thermal insulation performance from the perspective of disaster prevention and measures for heat or health, and consider the use of buildings in the future, such as an increased prevalence of telework.

Ratio of building emission in total CO_2 emissions of Tokyo (preliminary results for FY 2018)



Status quo of expanding zero emission buildings

Status quo

- **Greenhouse gas emissions compared to 2000** — **Increased by 2.8%** (preliminary results for FY 2018)
- **Energy consumption compared to 2000** — **Reduced by 24.2%** (preliminary results for FY 2018)
- **Percentage of power generated by renewable energy** — **15.3%** (FY 2018)

- Greenhouse gas emissions had increased due to the deterioration of a CO_2 emission factor of electricity which accounts for approximately half of energy consumption, but have decreased since FY 2012 because of reduced energy consumption and an improved emission factor of electricity
- The reduction rate of energy consumption of the residential sector is smaller than those of other sectors, the efforts need to be strengthened
- To reduce greenhouse gas emissions, it is important to switch to the use of renewable energy for electricity, which accounts for half of energy consumption in Tokyo
- TMG operates the Tokyo Cap & Trade Program and other policy programs for buildings and provides energy efficiency support for small and medium-sized facilities in collaboration with regional financial institutions etc.
- We also provide support for new houses that meet the Tokyo Zero Emission House Standards and thermal insulation renovation of doors and windows of existing houses

Tokyo Zero Emission House logo

Trends in the expansion of zero emission buildings

Increased awareness of decarbonized buildings

An increasing number of businesses and other entities, such as businesses declaring RE100 and institutional investors involved in ESG finance, place importance on climate change measures.There are also increasing calls from tenants for decarbonization, including the use of renewable power

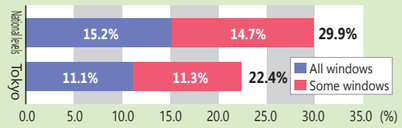
Thermal insulation performance important for energy efficiency at houses

As air conditioning and hot water supply account for more than half of energy consumption at houses, thermal insulation performance is important for energy efficiency. The adoption rate of insulated houses in Tokyo is approximately 22%, which is lower than the national average of approximately 30%. For new detached houses, the adoption rate is estimated to be approximately 10% in total for national ZEHs* and Tokyo Zero Emission Houses Standards.

Changes in consciousness during the COVID-19 crisis

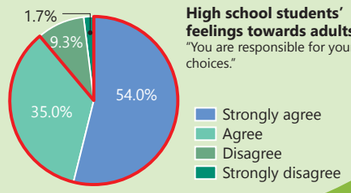
The COVID-19 crisis has brought an increase in citizens' awareness of environmental protection, connection with communities, and social contribution. There is a high level of awareness particularly amongst Generation Z (high school students to new recruits) that you must be personally responsible for making just choices.

Adoption rate of houses with double sash or double glazed windows



Source: Housing and Land Survey of Japan 2018, Ministry of Internal Affairs and Communications

Consciousness of youth in the time of COVID-19



Source: "Consciousness of Youth in the Time of COVID-19 - Wakamon, Dentsu Inc. (June 2020)"

2020

* ZEH: Net Zero Energy House. A residential building that aims to make the balance of annual primary energy generated and consumed to zero. This is done through the introduction of renewable energy, in addition to realizing significant energy efficiency, maintaining the quality of the indoor environment by significantly improving thermal insulation performance of the shell, and introducing high-efficiency equipment systems

TIME TO ACT CLIMATE ACTION Accelerating Actions

Visions for 2050

All buildings in Tokyo to be zero emission buildings

- **All buildings to be zero emission buildings that account for adaptation measures, such as disaster prevention and heat countermeasures**

2030

Key targets toward 2030

NEW	NEW	NEW
Greenhouse gas emissions compared to 2000	Energy consumption compared to 2000	Percentage of power generated by renewable energy
50% reduction	**50% reduction**	**Approx. 50%**

Efforts immediately accelerated and strengthened

Expansion of zero emission facilities

New buildings:
- Promote the construction of buildings with further energy performance by applying a ZEB* Evaluation and mandatory consideration for using renewable power through the Tokyo Green Building Program

Existing large buildings:
- Strengthen energy efficiency measures and expand the use of renewable energy through the Tokyo Cap & Trade Program

Existing small and medium buildings:
- Promote CO_2 reduction and the use of renewable energy through the Carbon Reduction Reporting Program
- Support the introduction of highly efficient ventilation equipment and air conditioning equipment to enable SMEs to ensure ventilation and control an increase in CO_2 emissions in response to the COVID-19 crisis

Expansion of zero emission houses
- Promote the broader adoption of the Tokyo Zero Emission House Standards and the introduction of highly insulated windows etc. at existing houses
- Raise the public awareness of healthy houses (synergistic effect of energy efficiency and health assurance)
- Encourage switching to more energy efficient home appliances
- Support the introduction of solar power generation and storage batteries that are also effective as disaster resilience measures

Lifestyle (civic life)
- Carry out a campaign for renewable electricity group buying project with other prefectures in the Tokyo metropolitan area, and draw attention to the campaign with a view to developing it across Japan
- Promote movement for changing energy use and consumption behavior, including cooperation with pioneering businesses to promote the purchase of sustainable products and services

2030 Carbon-Half Style – Visions for social change

- **Progress in the standardization of zero emission buildings at the time of construction and the transition of existing buildings to zero emission buildings Buildings forming cities to be decarbonized to attract sustainable investments etc.**
- **Progress in the standardization of zero emission specifications for new houses and the provision of high thermal insulation for existing houses Resilient and healthy houses acting as a safety net for the life of Tokyo residents**
- **Shift to a sustainable and prosperous lifestyle through the review of consumption behavior etc.**

Approaches for 2030 Carbon-Half Style

Acceleration of making all buildings zero emission by 2050

- Promote efforts to evaluate better real estate in financial terms, such as by conducting case studies on how to disclose information helpful for investment decisions
- Propose a future vision of buildings to be standardized in the 2030s toward 2050 and promote efforts in collaboration with businesses and financial institutions. Consider a new mechanism to expand the use of such buildings
- Promote the development of zero-emission districts in collaboration with developers
- Further promote the installation of highly insulated houses and energy efficiency/renewable energy equipment with high specifications by introducing multiple levels into the criteria for the Tokyo Zero Emission House
- Accelerate efforts to establish sustainable consumption behavior in collaboration with businesses and organizations

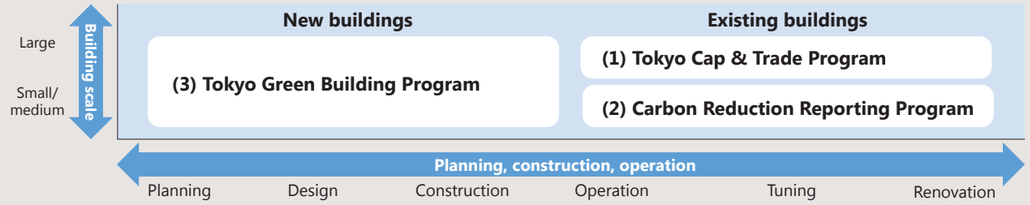
* ZEB: Net Zero Energy Building. A state-of-the-art building that generates energy through means including solar power generation. These buildings significantly reduce annual energy consumption, and realize significant energy efficiency through devising architectural plans that also include the use of sun shields and renewable energy, as well as thermal insulation efficiency

Column 01

Zero Emission Buildings Make Cities More Attractive

Making buildings zero emission not only decarbonizes cities but also contributes to making cities more attractive by strengthening resilience and improving living conditions. Various efforts are underway to keep Tokyo as a vibrant and attractive city which is fun to live in and comfortable to work in.

TMG's major programs for expanding zero emission buildings



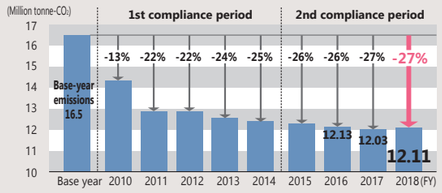
(1) Tokyo Cap & Trade Program

- TMG introduced the Carbon Reduction Reporting Program for Small and Medium-Sized Facilities in FY 2010 to understand the status of CO_2 emissions from small and medium-sized facilities and promote the implementation of energy efficiency measures.
- Items applied in FY 2020 (third compliance period) include:
  - Compliance factors 27% at office buildings etc., 25% at factories etc.
  - Expansion of incentives to use renewable power

(2) Carbon Reduction Reporting Program

- In FY 2010, we introduced the Tokyo Cap & Trade Program that requires large facilities to reduce total CO_2 emissions.
- Items applied in FY 2020 include:
  - Mandatory reporting on the use of renewable energy
  - A mechanism to evaluate excellent facilities, including the status of using renewable energy

Changes in total CO_2 emissions from facilities under the Tokyo Cap & Trade Program



(3) Tokyo Green Building Program

- TMG launched the Tokyo Green Building Program for new buildings in FY 2002.
- Items applied in FY 2020 include:
  - ZEB Evaluation, the highest rank in energy efficiency assessment of equipment systems
  - Program coverage expanded to small and medium-sized buildings (total floor area 2,000 m^2 or more)
  - Start of the evaluation of EV charger installation

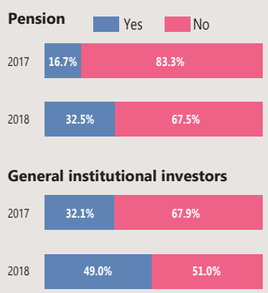
Sustainable finance and real estate

Sustainable finance for realizing a sustainable society is rapidly expanding worldwide. The linkage of real estate to ESG investment is deemed to be important because it has great potential to contribute to solving environmental and social issues as a support of living conditions or economic activities.

While some businesses are actively working on the disclosure of information on ESG investment and SDGs in Japan, only 1% of respondents to an investor questionnaire answered that the disclosure was sufficient.

The spread of ESG real estate investment requires more discussions on how investment should be and how information should be disclosed.

Question to Japanese investors about ESG investment: Are you interested in ESG real estate investment?



Source:
Aggregate results of the 17th "Questionnaire Survey on Real Estate Investment by Institutional Investors," Association for Real Estate Securitization
(From August 25 to October 5, 2017)
Aggregate results of the 18th "Questionnaire Survey on Real Estate Investment by Institutional Investors," Association for Real Estate Securitization
(From September 19 to November 7, 2018)

Sustainable finance

ESG investment (= Sustainable investment)

1. Negative screening
2. Positive screening
3. Norms-based screening
4. ESG integration
5. Sustainability themed investing
6. Impact investing
7. Corporate engagement and shareholder action

Sustainable lending
Example:
Sustainable loans, environment/society-related policies

Sustainable bonds (ESG bonds)
Example:
Green bonds, social bonds

Others
Example:
Blended finance, crowdfunding, impact investing, Pay For Success (PFS)

Sustainable finance encompasses a wide range of financial services, including not only ESG investment but also other financial services, such as sustainable loans, bonds, and so on.

Source: Tokyo Sustainable Finance Week Website, Office for Strategic Policy and ICT Promotion, Tokyo Metropolitan Government

Let all of us—the administration, businesses, and citizens—make the city more attractive.

Column 02

Improved Insulation Performance Results in an Energy-Efficient and Healthy House

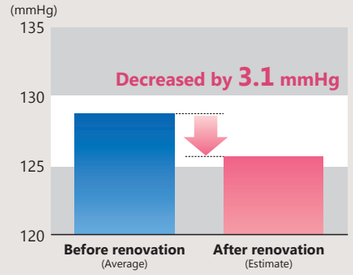
Household energy consumption is particularly high in winter. An effective approach for energy efficiency at houses is to improve thermal insulation performance. Furthermore, it has become clear that maintaining a comfortable thermal environment by improving thermal insulation performance can have a positive effect on human health.

Effects of thermal environment at houses on human health

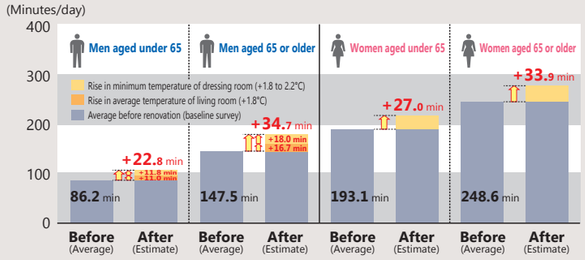
The WHO (World Health Organization) strongly recommends an indoor temperature of 18°C or higher to protect residents from adverse health effects from the cold. It also says that that temperature may be required at houses for the elderly and those with chronic illnesses in particular. Studies have shown that the thermal environment affects health.

Examples of health effects from thermal insulation renovation

- Maximum blood pressure at the time of awakening
  Has been found to be lower due to room temperature rise



- Average time of light-intensity (or heavier) physical activity in a house
  Has been found to be longer due to room temperature rise



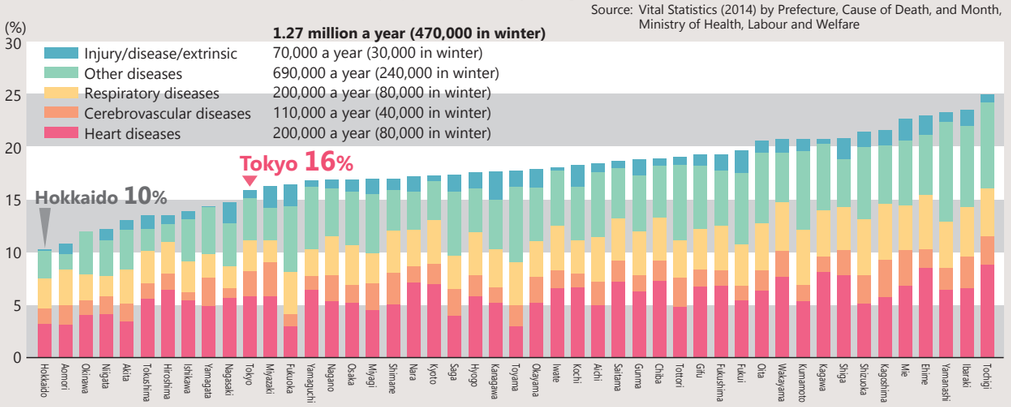
Source: Material provided by Ikaga, Planning Subcommittee of the FY 2020 Fourth Tokyo Metropolitan Government Housing Policy Council
https://www.juutakuseisaku.metro.tokyo.lg.jp/juutaku_kcs/pdf/r02_kikaku04/shiryo_04_12_4_1.pdf

Houses in winter are very dangerous - Are warmer regions actually more dangerous?!

The average death toll of December to March has been found to be greater than that of April to November and this tendency is more obvious in warm regions than in cold regions. This can be attributed to the fact that housing with high thermal insulation performance is not as widespread in warm regions as it is in cold regions, causing room temperatures to be lower. The rate of increase of the winter death toll in Tokyo is 16%, which is 1.6 times that of Hokkaido, the northernmost prefecture of Japan.

Rate of increase of winter death toll (the proportion of monthly average death toll of December to March to that of April to November)

Source: Vital Statistics (2014) by Prefecture, Cause of Death, and Month, Ministry of Health, Labour and Welfare



- Adoption rate of insulated houses (with double sash or double glazed windows) in Tokyo (FY 2018)
  - National average: Approximately 30%
  - **Tokyo: Approximately 22%** with 16-30% in 23 cities, 21-32% in Tama Area

Source: Material provided by Ikaga, Planning Subcommittee of the FY 2020 Fourth Tokyo Metropolitan Government Housing Policy Council
https://www.juutakuseisaku.metro.tokyo.lg.jp/juutaku_kcs/pdf/r02_kikaku04/shiryo_04_12_4_1.pdf

Thermal insulation of a house is critically important to protect our health.

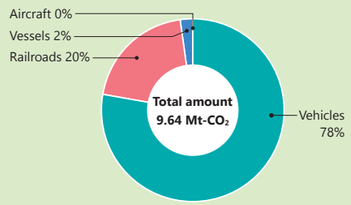
Policy 4 Promote the spread of zero emission vehicles (ZEVs*)

* ZEVs: Electric vehicles (EVs), plug-in hybrid vehicles (PHVs) (in EV mode), and fuel cell vehicles (FCVs) that do not emit CO_2 or other exhaust gases during driving
* Non-gasoline vehicles: ZEVs and hybrid vehicles (HVs) (Both ZEVs and non-gasoline vehicles include buses, cargo vehicles, and motorcycles in addition to passenger cars)

Necessity of promoting the spread of zero emission vehicles

- CO_2 emissions from the transport sector in Tokyo account for 20% of the total with vehicles accounting for 80% of that. To achieve zero emissions in the transport sector, we have to not only change our behaviors to those that do not emit CO_2, for example walking and using bicycles, but also decarbonize the vehicles we use.
- In addition to reducing CO_2, TMG will realize the full-scale spread of ZEVs that bring new social value, such as the role as an energy infrastructure taking advantage of their power storage and supply functions as well as the creation of new mobility services utilizing autonomous driving technology.

Breakdown of CO_2 emissions in Tokyo by means of transportation in the transport sector
(preliminary results for FY 2018)



Status quo of promoting the spread of zero emission vehicles

Status quo

- **Market share of non-gasoline vehicles in new passenger car sales** — **39.5%** (FY 2019)
- **Introduction of zero emission buses** — **62** (total in FY 2019)
- **New small route buses* for sale limited to ZEVs in principle** — **1.4%** (FY 2019)
  * Route buses with a capacity of approx. 30 passengers
- **ZEV infrastructure development**
  - Public fast chargers — **Approx. 300** (total in FY 2019)
  - Hydrogen stations — **17** (total in FY 2019)

- The sales ratio of new non-gasoline passenger cars has increased in recent years, reaching 39.5% in FY 2019
- The number of zero emission buses introduced by FY 2019 was limited to 62 due to higher prices and fewer vehicle types
- Public chargers and hydrogen stations are yet to become widespread as many of them are expensive to develop and operate
- TMG is developing various promotion measures, including subsidies for ZEV purchase and support for infrastructure development

Trends in ZEVs

The trend toward zero emission vehicles is accelerating around the world as well as in Japan

We see a worldwide acceleration in strengthening and advancing efforts to make vehicles zero emissions. In Japan, the Prime Minister clarified the policy that by 2035 the only new vehicles sold will be electric in his policy speech made in January 2021.

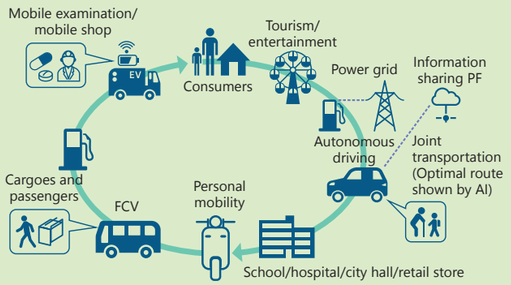
Advances in vehicle technology, entrants into ZEV manufacturing from other industries

Mobility services using new vehicle technology are expected to contribute to solving social issues. For example, the Ministry of Land, Infrastructure, Transport and Tourism first specified vehicle types for autonomous driving under specific conditions in November 2020 and mass-produced vehicles were released by manufacturers in March 2021.

The entry into ZEV manufacturing from other industries continues at home and abroad.

To promote the spread of ZEVs, we need to keep an eye on such technological advances.

Image of next-generation mobility and related services



Source: Material for "The Second Meeting on Structural Changes in Mobility and the Direction of Automotive Policy from 2030 Onward," Ministry of Economy, Trade and Industry
(https://www.meti.go.jp/shingikai/mono_info_service/mobility_kozo_henka/ pdf/002_02_00.pdf)

2020

TIME TO ACT CLIMATE ACTION Accelerating Actions

Visions for 2050

2030

- **All cars driven in Tokyo to be ZEVs**
- **Expanded use of renewable energy realizing zero emissions from well to wheel***

* A concept that indicates the environmental load generated through the entire process, from the stage of obtaining fuel (well) to the stage of actual driving (wheel)

Key targets toward 2030

NEW Phasing out the sale of new gasoline-only passenger cars	NEW Phasing out the sale of new gasoline-only motorcycles	Market share of ZEVs in new passenger car sales	Introduction of zero emission buses	New small route buses for sale	ZEV infrastructure development: Fast chargers	ZEV infrastructure development: Hydrogen stations
100%	100%*	50%	300+	Limited to ZEVs in principle	1,000	150

* 2035 target

Efforts immediately accelerated and strengthened

Strong promotion of making cars driven in Tokyo ZEVs

- Provide more support for purchase by individuals and businesses by increasing subsidies or utilizing tax system in collaboration with the national government
- Support the purchase of used ZEVs that can be utilized in the event of a disaster in the islands
- Continue research and study for making large buses and cargo vehicles ZEVs and support for the introduction of community buses
- Support R&D conducted by start-ups in collaboration with large businesses to promote technologies that lead to ZEV development
- Support the creation of an environment that allows depleted batteries to be replaced with a fully charged battery to improve the convenience of EV motorcycles

Creating an opportunity to experience ZEVs

- Create a promotional movement by holding global races etc.
- Increase familiarity for Tokyo residents by introducing ZEVs to rental car and car sharing services

Developing social infrastructure indispensable for ZEV promotion

- Subsidize the development and operation of hydrogen stations and increase the number of fast chargers to be subsidized
- Support environment-friendly multi-energy stations* that utilize existing gas stations
- Evaluate the installation of chargers when a building is constructed and promote the spread of fast chargers through the Revised Tokyo Fire Prevention Ordinance

* Existing gas stations having hydrogen stations, fast chargers, or renewable energy equipment installed in their sites

Prioritizing the introduction to TMG-owned vehicle fleet and TMG facilities

- Ensure the replacement of TMG-owned vehicles (except special-purpose vehicles) with ZEVs in principle when updating—replace all passenger cars with non-gasoline counterparts by the end of FY 2024 and all motorcycles with non-gasoline counterparts by the end of FY 2029
- Conduct research and study for utilizing FC buses as Toei Bus and introducing EV buses to the Toei Bus Lines
- Introduce chargers to city hall, parks, and other places

2030 Carbon-Half Style – Visions for social change

- **Establishment of environmentally friendly multi-energy stations as social infrastructure**
- **Widespread ZEVs, from small to large sizes, due to diversified vehicle types; progress in mobility reform to deliver a society using autonomous driving and MaaS* capable of meeting diverse needs**
- **Larger market for zero emission motorcycles accelerating the phaseout of gasoline-only motorcycles**

Approaches for 2030 Carbon-Half Style

Considering FY 2021 as the starting year for eliminating gasoline vehicles, making comprehensive efforts to promote ZEVs

- Further promote environment-friendly multi-energy stations that utilize existing gas stations
- Consider a mechanism to promote the installation of charging infrastructure tailored to various types of parking lots
- Introduce more ZEVs to mobility in the Tokyo metropolitan area and expand its infrastructure development in collaboration with related local governments and businesses
- Build a new mechanism to encourage the elimination of gasoline vehicles
  - Encourage businesses to introduce ZEVs through the Tokyo Vehicle Emission Reduction Program that requires environment-friendly behavior
  - Promote the introduction by building a mechanism that will give manufacturers an incentive to develop and sell ZEVs

* Mobility as a Service. Shows the optimal route for users from a point of departure to destination, and collectively provides multiple means of transportation and other services.

Column 03

Trends in Zero Emission Vehicles

TMG announced that it aims to eliminate the sale of new gasoline passenger cars by 2030 and new gasoline motorcycles by 2035 in Tokyo. Vehicle-related policies of overseas cities etc. have been changing rapidly in recent years.

Country	City etc.	Publication	Target year	Goal/regulation	Remarks
USA	California	Sept. 2020	2035	• Limiting the sale of new passenger cars to ZEVs alone	• Will formulate rules to limit medium- and heavy-duty trucks driving in the state to ZEVs alone by 2045
France	Paris	Oct. 2017	2024	• Prohibition of diesel vehicles	• Restrict entry into the city in the 2018 Action Plan
			2030	• Prohibition of gasoline cars	
Canada	Quebec	Nov. 2020	2035	• Prohibition of the sale of new gasoline cars	• Allocate more than half of the budget for a green economy plan to the transport sector, including the addition of charging equipment
China	Hainan	Mar. 2019	2030	• Prohibition of the sale of gasoline cars	• Develop policies in three stages (by 2020, 2025, 2030)
Japan	–	Jan. 2021	2035	• Limiting the sale of new vehicles to EVs alone	• Indicate the goal will be achieved around the mid-2030s in the Green Growth Strategy in December 2020 as expressed in the Prime Minister's policy speech in January 2021
Japan	Tokyo	Dec. 2020	2030	• Eliminating the sale of new gasoline passenger cars	• Consider FY 2021 as the starting year for eliminating gasoline vehicles to make comprehensive efforts
			2035	• Eliminating the sale of new gasoline motorcycles	

(Created based on information as of January 2021)

More prosperous life spurred on by the spread of ZEVs

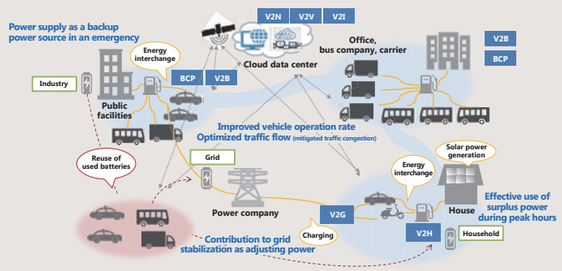
The spread of ZEVs will not only eliminate CO_2 emissions during driving, but also reduce environmental loads, including vehicle noise and exhaust gas.

Promoting the spread of ZEVs will facilitate the broader use of MaaS (Mobility as a Service).

In Japan, efforts are underway to promote MaaS, such as support for demonstration experiments as well as that for financial and know-how aspects provided by the Ministry of Land, Infrastructure, Transport and Tourism.

ZEVs, linked and integrated with services, energy, and infrastructure, are expected to help solve social issues by optimizing transportation, mitigating traffic congestion, ensuring power sources in emergencies, and stabilizing the power grid at the time of the massive introduction and supply of renewable energy.

Image of collaboration between ZEVs and energy system



Source: Material for the 36th Basic Policy Subcommittee, the Comprehensive Resources and Energy Study Group, Agency for Natural Resources and Energy (https://www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/036/036_005.pdf)

The spread of ZEVs will contribute to solving social issues and bring affluence to people's lives.

Column 04

Does Hydrogen Have a Color?

Green Hydrogen, Blue Hydrogen, Gray Hydrogen

One of the features of hydrogen energy is that it does not emit any CO_2 while in use and can be produced from a variety of sources.

Hydrogen itself is colorless and transparent, but it may be expressed in different colors, green, blue, or gray, for example, due to the differences in the manufacturing process. Green Hydrogen, in particular, is deemed most promising for decarbonization as it does not emit CO_2 during the manufacturing process.

Green Hydrogen is produced by electrolyzing water using electricity derived from renewable energy

Turquoise Hydrogen is produced by the thermal decomposition of methane. Byproduct is carbon that is produced as a solid, not as CO_2

Blue Hydrogen is made from fossil fuel but does not release CO_2 into the air as CO_2 generated during the manufacturing process is captured and stored (CCS*)

Gray Hydrogen is made from fossil fuel, such as natural gas or petroleum

* Abbreviation of Carbon dioxide Capture and Storage, the process that collects CO_2 and stores or presses-fits it deep in the ground

Where is Green Hydrogen made and used?

Green Hydrogen is produced through demonstration projects in Germany, Australia, and other countries. In March 2020, in Fukushima Prefecture of Japan, an experimental study was started at one of the world's largest hydrogen production units using electricity from solar power generation.

However, the production and utilization of Green Hydrogen is limited both at home and abroad, needing further efforts to expand its use.

Fukushima Hydrogen Energy Research Field (New Energy and Industrial Technology Development Organization)

TMG has already started using Green Hydrogen. For example, we support the introduction of Green Hydrogen utilization equipment. During the Tokyo 2020 Games, hydrogen produced with renewable energy in Fukushima Prefecture will be used to generate electricity at the athletes' village, which in turn will be used at some of athletes' facilities.

PR driving by FCV filled with Green Hydrogen

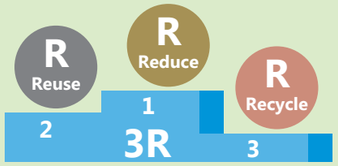
Aiming for a society in which Green Hydrogen is fully utilized, TMG will further accelerate efforts for social implementation of hydrogen energy technology, including the expansion of demand for hydrogen.

When you find hydrogen, imagine what color it has.

Policy 5 3Rs

Necessity of promoting 3Rs

- The recycling system in Japan is quite well developed, but there is room for further efforts in the Reduce and Reuse aspects. Also, the system has big challenges yet to be resolved, such as overcoming its partial dependence on overseas countries.
- The consumption of natural resources has increased along with the population growth around the world, resulting in global concerns about resource use, and competition for resources. Furthermore, environmental destruction and biodiversity loss are accelerating, placing a heavy burden on the earth.
- To significantly improve resource efficiency in consumption and production while giving consideration to sustainability concerns, and limit resource consumption to within the range of the regenerative power of the earth, Tokyo will bring about significant changes in social structure.



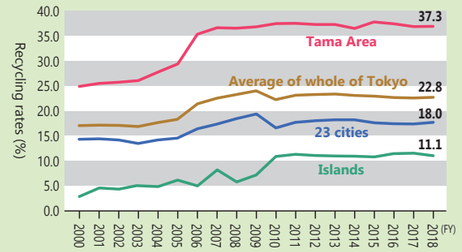
Status quo of 3Rs

Status quo ▶ **Municipal solid waste* recycling rate** **22.8% (FY 2018)**

* Municipal solid waste is divided into household waste and general waste generated from business activities

- Municipal solid waste recycling rates have been flat for the last five years. However, recycling rates vary by region. In the Tama Area, where recycling is being promoted by controlling the amount of disposal by charging for household waste and through strict separation of waste, the municipal solid waste recycling rate has reached 37%
- TMG promotes and supports efforts for recycling containers and packaging, home appliances, and small electronic devices based on the Law for the Promotion of Effective Utilization of Resources and various recycling laws. In addition, we have started creating a new recycling mechanism for solar panels and disposable diapers

Changes in municipal solid waste recycling rates



Trends in 3Rs

The point in question: How to best organize arterial and venous businesses

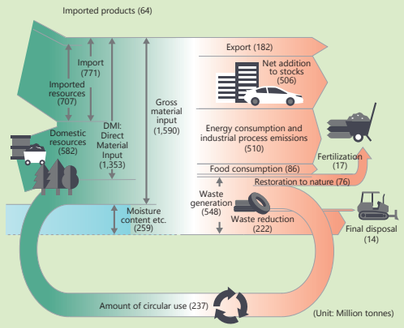
COVID-19 has affected various industries causing the suspension of operations at production bases or the stagnation of logistics in Japan and abroad, with approximately 80% of the entire industry seeming to be adversely impacted. A review of production and sales plans and changes in supply chains is underway in arterial industries*, which, in turn, requires vein industries* to do the same.

Waste treatment/recycling systems need optimization and enhancement

Waste treatment has to be maintained as part of social infrastructure even in an emergency, such as an outbreak of COVID-19. In response to changes in the social structure due to a super-aging population along with a decrease in population, there is an increasing demand for contactless and optimized operation at waste treatment sites and in business procedures.

While further promotion of recycling is required, the status quo is that sufficient waste suitable for high-quality recycling is not collected or optimal recycling is not always performed according to the type of waste. Therefore, we need to take measures to improve the level of recycling by taking advantage of the potential of waste treatment and recycling businesses.

Material flow in Japan (FY 2017)



Source: Annual Report on the Environment, the Sound Material-Cycle Society and Biodiversity in Japan 2020, Ministry of the Environment

* Arterial industry collects and processes natural resources and manufactures, distributes, and sells products
Vein industry collects used products and waste, recycles them, and disposes of them properly

2020

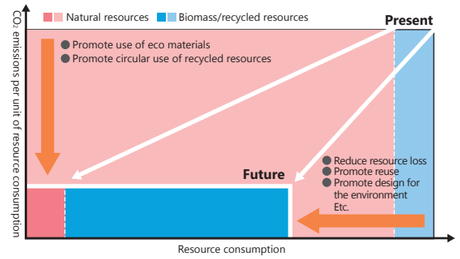
TIME TO ACT CLIMATE ACTION

Accelerating Actions

Visions for 2050

2030

Establish the sustainable use of resources



Key targets toward 2030

Municipal solid waste recycling rate **37%**

Efforts immediately accelerated and strengthened

Creating a mechanism for the effective use of resources utilizing AI/ICT technologies

- Introduce AI, ICT, and robotics technologies into waste treatment and recycling systems, which have long relied on human labor, to sophisticate and optimize work and improve the quality of processed materials

Circular use of recycled resources

- Based on the results of social demonstration research, build a mechanism for the circular use of waste, such as solar panels, for which recycling routes have not been established
- Circular use of recycled resources by, for example, using products manufactured by converting incineration ash into cement raw materials as civil engineering and construction materials

Promoting contactless and optimized office work through digitization

- Contactless and optimized office work related to the consignment of waste treatment by expanding the use of electronic manifests
- Contribute to not only cost reduction but also improved business continuity by introducing RPA into office work

2030 Carbon-Half Style – Visions for social change

▶ A resilient waste treatment system established based on the system with no manual operation and various 3R routes

▶ Realizing higher-quality recycling by making full use of advanced technologies

Approaches for 2030 Carbon-Half Style

Strengthening a waste treatment system utilizing the know-how and potential of waste treatment businesses

- Aiming to build a resilient recycling system that responds to changes in social structure, search for and build a treatment process with no manual operation by making use of the knowledge of waste treatment businesses
- For optimal treatment and improved resilience in emergencies, promote the diversification of 3R routes by developing a mechanism to create a network of businesses involved in waste

Improving the level of recycling by incorporating advanced technologies into waste treatment and recycling processes

- In order to realize the sustainable use of resources through high-quality recycling, promote efforts to build treatment processes that utilize advanced technologies in collaboration with businesses involved in every aspect from separation to recycling

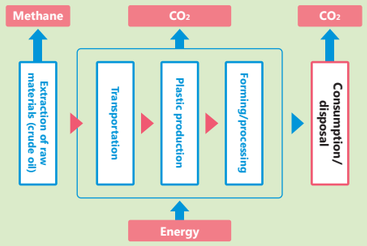
Revision of Sustainable Design Tokyo

- Taking into account international trends in resource use, revise Sustainable Design Tokyo and enhance a mechanism for waste treatment in order to deal with issues facing sustainable resource management and waste treatment in Tokyo

Policy 6 Plastics

Necessity of measures for plastics

- CO_2 is emitted at each stage, from the extraction of crude oil used for producing plastic through production, distribution, consumption, and disposal. The majority of plastic waste is subjected to heat recovery and incineration. Most of the plastic waste discharged from households and large office buildings in Tokyo is incinerated, resulting in 1.45 million tonnes of CO_2.
- Large amounts of plastic flow to the sea via rivers, causing deep concern about impacts to the marine ecosystem. With respect to countries that have imported plastic waste from developed countries, there have been reports on risks of environmental pollution, resulting in an urgent need to expand resource circulation routes in Japan.
- As global plastic consumption is expected to increase sharply in the future, Tokyo will make the use of plastics sustainable and share its visions with the rest of the world.



Status quo of measures for plastics

Status quo ▶ **Incineration of plastic waste from households and large office buildings** **Approx. 700,000 tonnes (FY 2018)**

- Incineration of plastic waste from households and large office buildings remained unchanged at approximately 700,000 tonnes in FY 2018
- TMG formulated the Plastic Strategy in December 2019 to present the main targets for 2030 and the direction of new policies. We have developed policies and initiatives based on the strategy ever since
- Promote separate collection of plastic containers and packaging by providing financial support to local municipalities
- To reduce plastic waste generated from business activities, start trial efforts to dispatch 3R advisors to office and other buildings in collaboration with local municipalities
- Develop demonstration projects for building new domestic resource circulation routes, such as conversion into industrial raw fuels, as emergency measures in response to the tightening of import restrictions on plastic waste in Asian countries

Trends in plastics

Increased use of single-use plastics due to longer periods spent at home

While the amount of waste discharged by businesses is decreasing, the amount of food take-out containers, individual packaging, and mail-order packaging materials is increasing at home.

A movement of reuse revolution accelerated at businesses

Advanced businesses, which provide products in reusable containers at cafes or sell food and daily necessities by weight, have become more active all over the world. In addition, technological innovations continue in closed-loop recycling that provides virgin-quality recycled resin, and there is a growing movement to replace plastics with sustainable biomass materials.

New policies for plastics

In January 2021, the revised Basel Convention came into effect, requiring countries exporting dirty plastics to obtain the consent of trading partners. For marine plastics, new international agreements, frameworks, and other mechanisms are under consideration.

In Japan, discussions about legislation are underway in the Diet to promote the formulation of guidelines for reducing single-use plastics by manufacturers and distributors, the collection of plastic containers and packaging and products in collaborative efforts between municipalities, voluntary collection by distributors, and controlled discharging and consistent recycling of business plastic waste.


Paper barrier material that blocks moisture or odors © Nippon Paper Industries Co., Ltd.


Providing products in reusable containers © Loop Japan


Detergent sold by weight © Lawson, Inc.


Reusable cups/ containers © Nissha Co., Ltd.


Wooden straws © Aqurahome Corp.


Switching to paper cups and recycling © Itochu Pulp & Paper Corporation


Recyclable tableware that can be composted © Marubeni Pulp & Paper Co., Ltd.

2020

TIME TO ACT CLIMATE ACTION

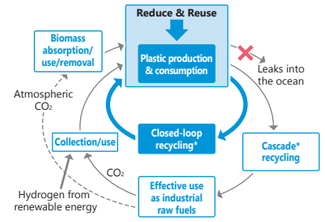
Accelerating Actions

Visions for 2050

2030

▶ Plastic use with net zero CO_2

- **Plastic production and recycling completely covered with renewable energy**
- **Switching to biomass causing no land use change, limited within the growth rate of plants. Consider social and environmental issues, such as competition with food production**



* Closed-loop recycling provides virgin-quality recycled resin.
* Cascade recycling provides resin of lower quality for other uses.

Key targets toward 2030

Incineration of plastic waste from households and large office buildings compared to FY 2017 **-40% (approx. 400,000 t)**

Efforts immediately accelerated and strengthened

■ Fostering empathy to promote behavior change

- Raise public awareness of good practices, such as reuse and repair that do not depend on single-use plastics, create content that encourages reduction actions in the new normal, and provide information in collaboration with the media

Video for raising public awareness of the need to reduce food waste and single-use plastics

■ Creating innovations in cooperation with businesses

- Bottle-to-bottle recycling of plastic bottles in a consortium with the beverage industry
- Create a place for innovative collaboration among businesses
- By optimizing the operation of the Waste Management Law, promote collection through integrated arterial/venous logistics and by manufacturers and distributors

■ Promoting separation and recycling in cooperation with municipalities

- Utilize the Plastic Containers and Packaging Recycling Support Project to continue the support of municipalities that work to implement separate collection with a view to collective collection and improve the results of separate collection
- Promote the recycling of business plastic waste through individually-targeted advice from 3R advisors to office and other buildings

■ Measures for marine plastics

- TOKYO Zero Marine Litter Action focusing on raising awareness of Tokyo residents and a field survey of marine litter

■ International cooperation

- To reduce single-use plastics and build a circular economy, provide more information in collaboration with overseas cities and international organizations by taking advantage of online content

2030 Carbon-Half Style – Visions for social change

▶ Mainstreaming 2R* businesses, including selling by weight, sharing, and reusable containers

▶ Implementing closed-loop recycling through diversified and efficient collection/ transportation routes and new technologies

* 2R stands for Reduce & Reuse

Approaches for 2030 Carbon-Half Style

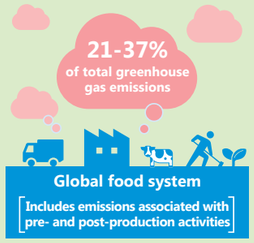
■ Implementation of innovative technologies and business models

- Encourage the progress of the Reuse Revolution and promote efforts in collaboration with leading businesses etc. towards generalization and mainstreaming of new business styles and consumer behaviors, such as selling by weight, sharing, and using reusable containers for selling and purchasing
- In light of the progress in mono-material containers and packaging, the use of recycled plastics, and the development of closed-loop recycling technology for plastic waste, promote initiatives in cooperation with businesses in various fields to create a social system that optimizes product design, separate discharge, collection, and closed-loop recycling (using recycled plastic). Focus on promoting infrastructure development and rule-making for efficient separate collection, sorting, and transportation

Policy 7 Food waste

Necessity of measures for food waste

- Annual food waste in Japan in FY 2017 is estimated to be approximately 6.12 million tonnes, which is the equivalent to every person in Japan throwing away a bowl of rice every day.
- Before reaching us, food goes through production, processing, distribution, and other processes in each of which greenhouse gases are emitted. They account for 21-37% of global emissions. CO_2 is also generated when disposing of food thrown away due to the expiration of its use-by date or other reasons. The impacts of food waste on climate change cannot be overlooked.
- TMG will foster momentum to work on reducing food waste and strongly promote voluntary actions and collaborative efforts by businesses and consumers. Toward 2050, we will build a virtuous cycle of food resources, giving consideration to food safety and food culture.



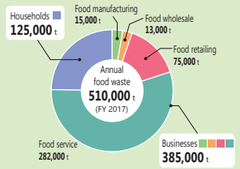
Source: IPCC. Climate Change and Land 2019

Status quo of measures for food waste

Status quo ▶ **Food waste compared to FY 2000*** **-32.9% (FY 2017)**

* Food waste of approx. 760,000 tonnes

- It is estimated that the total amount of food waste in Tokyo in FY 2017 was about 510,000 tonnes, of which about 385,000 tonnes were generated by businesses and 125,000 tonnes by households
- Based on the demand forecast using ICT and other technologies, TMG has implemented model projects in collaboration with businesses working to reduce food waste throughout the supply chain. We have also raised awareness of consumers through online content
- In November 2020, the Proposal for Food Waste Reduction was compiled at the Food Waste Reduction Partnership Conference, which is composed of food-related organizations and consumer groups. According to the proposal, the Tokyo Food Loss and Waste Reduction Plan based on current regulations was formulated in March 2021



Trends in food waste

The impact of the COVID-19 crisis on the food supply chain

The expansion of COVID-19 has significantly changed the balance between supply and demand, as shown by a sharp increase in demand for household food and a decrease in demand for food for commercial use. In order to respond to such a change, we need to strengthen the supply chain functions.

Responding to changes in people's consciousness and behavior

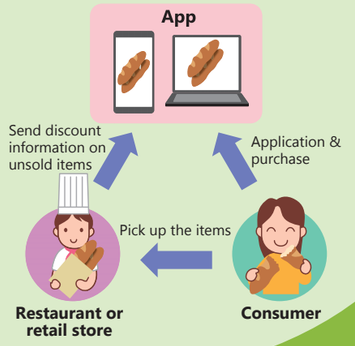
There are more opportunities to cook and eat at home due to social restrictions and other reasons, resulting in more occasions of take-out and delivery. As the number of people in need of assistance increases, more attention has been focused on efforts for helping one another, such as food bank activities. We have to accurately recognize these changes in people's consciousness and behavior, promote their understanding of measures against food waste, and encourage them to take concrete action.

Development of businesses targeting food waste reduction

New private businesses have been launched recently to help reduce food waste by utilizing sharing apps to provide information on demand for food or unused food. It is important to accelerate such efforts in collaboration with related industries.

■ **Increased demand for takeout and delivery**

■ **Image of a sharing app**



2020

TIME TO ACT CLIMATE ACTION Accelerating Actions

Visions for 2050

2030

▶ **Zero food waste through reduction and food recycling**

■ **Maximize efforts to control the occurrence of food waste and eliminate remaining food waste by converting it into feed and fertilizer**

Key targets toward 2030

Food waste compared to FY 2000 **50% reduction**

Efforts immediately accelerated and strengthened

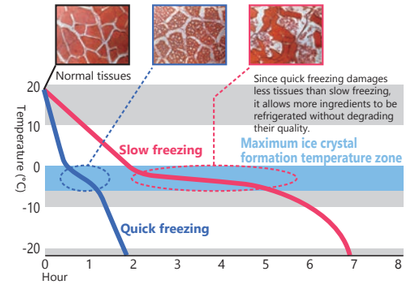
■ **Efforts to control food waste using advanced technology**
- Support business that contributes to extending the life of food by utilizing new freezing and packaging technologies
- Efforts to share demand forecast information throughout the supply chain using ICT and other technologies

■ **Developing best practices for reducing food waste**
- Widely provide food-related businesses with excellent know-how of food waste reduction that is easy to work on

■ **Raising public awareness to change consumption styles through cooperation with businesses and municipalities**
- Develop an awareness-raising campaign in collaboration with municipalities, such as introducing recipes at restaurants that minimize generation of leftovers
- Continue raising public awareness of efforts at home under the new normal through online content

■ **Further efforts for effective use of unused food**
- Encourage the effective use of emergency food stockpiled at municipalities and TMG by matching it with food banks

■ **Impacts of different freezing technologies on food**



Source: Materials of Japan Frozen Food Association

■ **Consumers making informed choices**
- Bring about changes in consumer behaviors to help them identify real needs and quantities, such as utilizing discount information on unsold food through apps, buying small-quantity packs at retail stores, and using small serving menus at restaurants

■ **Efforts in cooperation with the food supply chain**
- Provide consumers with clear information on the progress of efforts, such as the review of the one-third rule that has become a business practice for food-related businesses

2030 Carbon-Half Style – Visions for social change

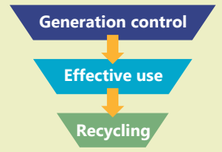
▶ **Shift to a sustainable circular society based on curbing food waste**

▶ **Each entity taking the initiative and working together for further reduction actions**

Approaches for 2030 Carbon-Half Style

■ **Promoting systematic policies based on the Tokyo Food Loss and Waste Reduction Plan**

- According to the basic concept of food waste reduction in the Tokyo Food Loss and Waste Reduction Plan, the administration, consumers, businesses, and related organizations will work together to promote food waste reduction measures
- Prioritizing efforts to control generation of food waste, TMG will develop a wide range of policies, including efforts to effectively use food that is no longer needed for various reasons and to recycle food waste that happens unavoidably
- We will promote social establishment and dissemination of efforts to reduce food waste in response to social change, such as the effects of the COVID-19 crisis



Priority of efforts for food waste reduction

Column 05

Better relationship with products in a sustainable way
The Keywords: From Cradle to Cradle

Since the industrial revolution, humankind has produced many goods and prospered under the mechanism of extracting resources from the earth, making products, and throwing away unwanted items.

Such an economic model has consumed resources faster than the regenerative capacity of the earth and discharged an enormous amount of waste that the earth cannot handle.

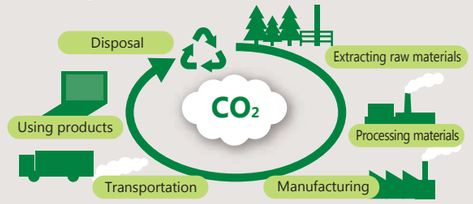
The conditions of the overuse of the earth are decreasing its productive power, resulting in the loss of biodiversity, degeneration of the land, deforestation, and depletion of resources. Furthermore, resource consumption beyond the earth's limits as well as mass production, mass consumption, and mass disposal generate a large amount of CO_2, which causes climate change and affects life on Earth.

How many Earths do we need to sustain human life?

Source: Global Footprint Network, Research Institute for Humanity and Nature

We are consuming natural resources 1.7 times faster than the earth regenerates itself, which means we are using 1.7 Earths. An estimate indicates that if all human beings lived like people in Tokyo, they would need 3.1 Earths. We are borrowing the resources future generations should use and consuming all those resources now.

Life of products and CO_2



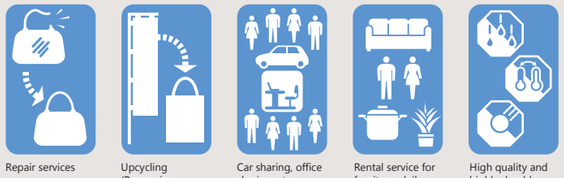
A large amount of CO_2 is generated at each stage of the development of products through to their disposal. To realize zero emissions, we need not only to decarbonize energy, including the use of renewable energy and more efficiency in energy use, but also to switch to a circular economy.

Goodbye to a society of "mass production, mass consumption, and mass disposal!" Toward a society that continues using "existing products"

In response to the critical situation of the earth, such as the loss of biodiversity and climate change, we have to change the conventional way of "mass production, mass consumption, and mass disposal" and use resources efficiently and carefully.

Aiming to shift from the existing economic model, businesses in Japan and overseas are already creating innovative, circular products and services that contribute to the sustainable use of raw materials and goods.

Examples of circular products and services which are sustainable uses of resources



Repair services | Upcycling (Processing material into another product) | Car sharing, office sharing, etc. | Rental service for furniture, daily necessities | High quality and highly durable products

Right to repair

The EU recognizes consumers' right to repair and is improving access to the repairability of products or information on product repairs. In France, for example, repairability score which shows ease of repair must be indicated on home appliances and PCs.

Repairability score (example)
Ease of repair is indicated on a scale of 1 to 10 and color coded

Source: French Ministry of Ecology Transition

These efforts will also strengthen local resilience in the event of a spread of an infectious disease or a natural disaster. The COVID-19 pandemic has disrupted the supply chain on a global scale. Building a mechanism that allows resources and products to be circulated and sustainably used in local communities will not only revitalize the local economy and promote employment, but also help create a sustainable and resilient society.

Sustainable use of resources - From cradle (Earth) to cradle
Let's be more mindful in how we use products.

Column 06

Biodiversity Crisis

What is biodiversity?

Biodiversity is a term which describes an abundance of living things and ecosystems.

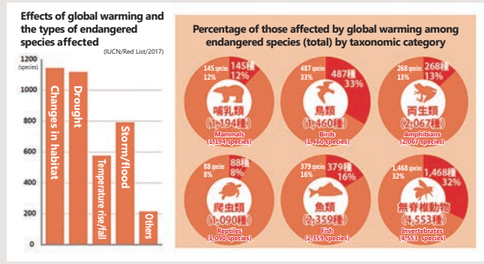
There are a variety of creatures in different types of nature on Earth, which live interconnectedly and in support of each other. Our lives are built on the blessings of biodiversity.

As for Tokyo, a large amount of food, energy, and supplies necessary for an affluent urban life and business activities also rely on the blessings of biodiversity from inside and outside of the country.

Of the estimated 30 million species of creatures that exist on Earth, approximately 40,000 species go extinct each year. A major factor for this rapid biodiversity loss is a lifestyle based on mass production and consumption as well as global warming.

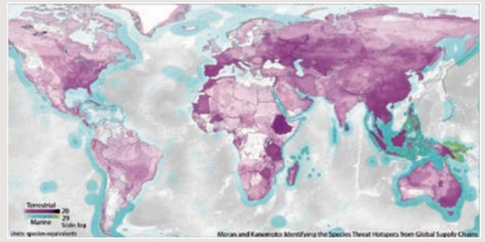
Since biodiversity loss is an issue as critical as climate change, efforts to conserve biodiversity are underway under an international framework*.

* Conference of the Parties (COP) to the Convention on Biological Diversity. Aichi Biodiversity Targets adopted at COP10 in 2010 are global common targets at present. The aim of the targets is to realize a world of living in harmony with nature by 2050. Post-Aichi Biodiversity Targets from 2021 will be discussed and adopted at the next COP15.



Source: Website of WWF Japan

Areas in which biodiversity is threatened by Japan's consumption



Source: Annual Report on the Environment, the Sound Material-Cycle Society and Biodiversity in Japan 2020, Ministry of the Environment

The relationship between people and nature is in question

Accelerating climate change measures is important to preserve biodiversity and continue to reap its bounty. However, we have to avoid biodiversity loss due to hasty measures.

In recent years, the idea of green infrastructure that utilizes the functions of the natural environment has attracted attention. It is one of the most important considerations for the future: achieving both biodiversity conservation and climate change measures.

A United Nation report* pointed out that COVID-19 is potentially a zoonotic disease derived from wildlife, such infectious diseases will increase in the future, and one of the reasons is the destruction of nature by humans.

We are now required to review the relationship between socio-economics and nature, reconsider the lives of each of us, and practice a sustainable lifestyle—the COVID-19 crisis may be a warning in this context.

* Preventing the Next Pandemic, a joint report in July 2020 of the United Nations Environment Programme (UNEP) and International Livestock Research Institute (ILRI)

Examples of flood mitigation functions of the natural environment

Drainage of rainwater at city park (Kamiyoga Park, Setagaya City)

Water retention in satoyama (open light-filled woodland near populated areas) (Zushi Onoji Historical and Environmental Conservation Area, Machida City)

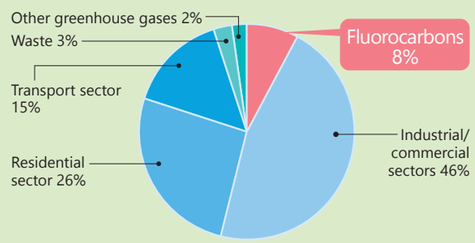
Living in harmony with nature : A slogan to create the future

Policy 8 Fluorocarbons

Necessity of measures for fluorocarbons

- Fluorocarbons have an enormous greenhouse effect that is several tens to more than 10,000 times that of CO_2 and cannot be recovered once released into the atmosphere, having a significant impact on climate change.
- Fluorocarbons account for 8% of greenhouse gas emissions in Tokyo. We need to take urgent measures against the emission of fluorocarbons.
- Fluorocarbons are widely used in appliances such as air-conditioners at offices and commercial facilities and freezer/refrigerator showcases at supermarkets. It is necessary to reduce the leakage of fluorocarbons due to the malfunction or disposal of such equipment.

Breakdown of greenhouse gas emissions in Tokyo
(preliminary results for FY 2018)



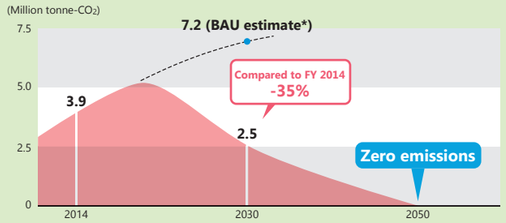
Status quo of measures for fluorocarbons

Status quo ▶ **Hydrofluorocarbons (HFCs) emissions compared to FY 2014** **+38% (5.4 million tonne-CO_2eq*) (preliminary results for FY 2018)**

* CO_2eq is an abbreviation of CO_2equivalent, a value calculated using the global warming potential (GWP)

- The use of HCFCs (hydrochlorofluorocarbons), which are regulated as ozone-depleting substances, has shifted to HFCs (hydrofluorocarbons) which do not destroy the ozone layer. In recent years, HFC use has increased, resulting in more emissions.
- Fluorocarbons leak due to aging of equipment, inadequate inspection and maintenance or disposal of equipment. TMG promotes the prevention of fluorocarbon emissions by identifying the actual situation of leakage while in use, gives guidance to businesses at the time of disposal, and promotes the spread of non-fluorocarbon equipment.

Estimated HFC emissions in Tokyo



* BAU estimate is based on the case where existing measures are continued

Trends in fluorocarbons

Fluorocarbon regulations accelerated globally

The regulations for the production and sales of fluorocarbons have been applied in stages based on the Montreal Protocol which is an international framework. In addition, to control their emissions throughout the life cycle, an international initiative was established in December 2019 under the leadership of Japan.

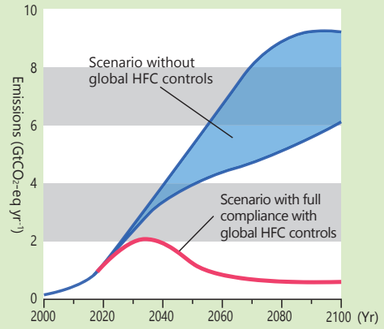
Strengthened domestic regulations

In January 2020, Japan enacted a total ban on the production or import of ozone-depleting HCFCs. With the revised Act on Rational Use and Proper Management of Fluorocarbons in April 2020, obligations and penalties have been reinforced to ensure the recovery of fluorocarbons at the time of the disposal of commercial freezers and air conditioners.

Changes in domestic demand

COVID-19 has made it increasingly important to establish an appropriate cold chain to ensure quality control of pharmaceutical products and food safety. In addition, there is an increase in demand for office air conditioning with enhanced ventilation functions and equipment for cooling digital devices associated with digital transformation, including remote work.

Forecast of HFCs emissions in the world



Source: Scientific Assessment of Ozone Depletion, World Meteorological Organization (WMO)/United Nations Environment Programme (UNEP): 2018 (Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018.) (https://csl.noaa.gov/assessments/ozone/2018/downloads/2018OzoneAssessment.pdf)

2020

TIME TO ACT CLIMATE ACTION Accelerating Actions

Visions for 2050

Zero fluorocarbon emissionsg

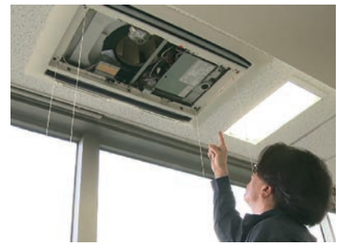
- **Significantly reduce equipment with fluorocarbons by expanding the use of non-fluorocarbon equipment**
- **Completely prevent leakage during use and disposal by strictly controlling equipment that contains fluorocarbons**

Key targets toward 2030

HFC emissions compared to FY 2014 **-35% (Reduced to approx. 2.5 million tonne-CO_2eq)**

Efforts immediately accelerated and strengthened

- **Accelerating the shift to non-fluorocarbon equipment**
  - Promote the introduction of non-fluorocarbon freezer/refrigerator showcases through subsidization
  - Promote the spread by providing support in line with trends in equipment development
- **Supporting control of equipment to prevent leakage during use**
  - Carry out a pilot project with businesses that have a large amount of leakage, and strengthen measures based on verification of the effects
  - Ensure understanding of the regulation and proper management of equipment through on-site guidance and video
- **Strengthening measures for leakage at the time of disposal**
  - Ensure understanding of the proper treatment of fluorocarbons when disposing of equipment through on-site guidance at building demolition sites
  - Strictly deal with malicious businesses that repeatedly release fluorocarbons illegally
  - Promote efforts to eliminate leakage when removing home air conditioners
- **Change in awareness of all the relevant people to prevent fluorocarbon emissions**
  - Hold online quality workshops regularly instead of on-site ones during the COVID-19 pandemic, which will not limited to the availability of participants



Video about revision of the fluorocarbon act

Video of equipment inspection procedures

2030 Carbon-Half Style – Visions for social change

- **Progress in non-fluorocarbon air conditioners and freezer refrigerators, resulting in more products of such kind on the market**
- **Expansion of efforts to eliminate fluorocarbon leakage**

Approaches for 2030 Carbon-Half Style

Fostering momentum and promoting systematic initiatives

- Support the introduction of non-fluorocarbon equipment according to development trends and awareness to encourage the selection of non-fluorocarbon equipment to create a society where everyone chooses non-fluorocarbon equipment
- Ensure measures against leakage when using or disposing of equipment by utilizing the knowledge obtained through on-site guidance to businesses or pilot projects
- Accelerate cutting emissions and the reduction in the amount of use by utilizing innovative technologies, such as IoT tools, to prevent fluorocarbon leakage at each stage from using to disposing of equipment

2030

Policy 9 Strengthen adaptation measures

Necessity of strengthening adaptation measures

- As a report from IPCC (Intergovernmental Panel on Climate Change) indicates that mitigation alone can no longer prevent the impacts of climate change. We need to promote not only mitigation measures to reduce anthropogenic CO_2 emissions but also adaptation measures to reduce the impacts that still remain after implementing the maximum mitigation measures.
- Strategically working on adaptation measures at the city level leads to sustainable economic and social development as well as protecting people's lives.

Illustration by A-PLAT

Status quo of strengthening adaptation measures

Status quo ▶ **Formulation of the Tokyo Climate Change Adaptation Plan**

- The Tokyo Climate Change Adaptation Policy was formulated in December 2019 to confront the impact of climate change in Tokyo and avoid or reduce damage in a wide range of fields, including natural disasters, health, and agriculture, forestry, and fisheries. In addition to the concept indicated in the policy, the Tokyo Climate Change Adaptation Plan was formulated in March 2021 based on the concept of sustainable recovery, incorporating a variety of perspectives, such as the promotion of digital transformation

Five basic strategies for adaptation

- Implement climate change adaptation into all of TMG's initiatives
- Promote climate change adaptation based on scientific knowledge
- Support local efforts in cooperation with municipalities
- Promote dissemination of information, including risks, to facilitate understanding of Tokyo residents
- Promote international cooperation in C40 and other organizations to accelerate intercity collaboration

Trends in adaptation measures

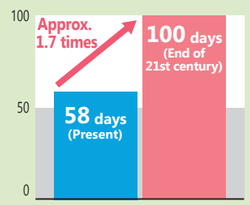
Increasing need for adaptation measures

As the impact of climate change has become more serious, the need for adaptation measures is greater than ever. To protect the lives and property of Tokyo residents from increasingly intensified disasters, it is essential for TMG to actively utilize innovative technology and promote more advanced adaptation measures. It is also very important for municipalities, Tokyo residents, and businesses to deepen their understanding of climate change adaptation and promote their efforts.

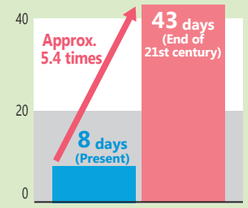
Concerns about combined damage to vulnerable groups

With the spread of COVID-19, there are concerns about the threat of climate change and the combined damage caused by infectious diseases to vulnerable groups. In promoting adaptation measures, it is necessary to enhance the adaptation to not only deal with the threat of climate change, but also various crises related to the lives of Tokyo residents.

Annual number of sweltering days (above 30°C)

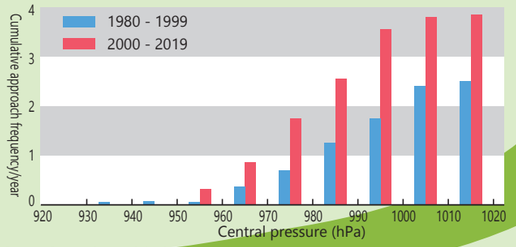


Annual number of extremely hot days (above 35°C)



Source: Tokyo Climate Change Adaptation Plan

Cumulative frequency distribution of central pressure of typhoons approaching Tokyo



Source: Press release of the Meteorological Research Institute, "More typhoons on the Pacific Ocean front in the last 40 years" (Japanese)

2020

TIME TO ACT CLIMATE ACTION Accelerating Actions

Visions for 2050

▶ **Minimize risks from climate change impacts**

- **Protect the lives and property of Tokyo residents and realize a city that continues to attract people and businesses**

2030

Key targets toward 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)

Efforts immediately accelerated and strengthened

Adaptation measures in fields affected by climate change

Natural disasters:
- Promote the utilization of innovative technology and the development of urban facilities in both structural and non-structural aspects against natural threats, such as floods, inland floods, storm surges, and landslides caused by increasingly intensified heavy rains or typhoons

Health:
- Implement preventive and ex-post measures to minimize adverse health effects due to temperature rise, including cases of heatstroke and infectious disease as well as health problems due to air pollution


Installation of fine misting (OASE Shibaura, Minato City)

Water resources and the water environment:
- Reduce the risks posed by severe droughts and deterioration of raw water quality as much as possible
- Create a comfortable water environment by improving the combined sewer system

Using drones for on-site investigations in ordinary times and in times of disaster


A distant view of a collapsed area (Photo taken by a drone)

A close-up view of a collapsed area (Photo taken by a drone)

Agriculture, forestry, and fisheries:
- Realize a robust agriculture, forestry, and fisheries industry by providing technical guidance for and promoting the spread of switching to items and varieties compatible with temperature rise

Natural environment:
- Minimize impacts on biodiversity, such as changes in the distribution of organisms
- Enhance efforts to utilize and restore the functions of the natural environment

Promoting efforts toward adaptation by municipalities, Tokyo residents and businesses by establishing the Local Climate Change Adaptation Center
- In FY 2021, establish the Local Climate Change Adaptation Center in the Tokyo Metropolitan Research Institute for Environmental Protection, which has been engaged in research on countermeasures for the urban heat island effect
- Provide municipalities with information and advice on climate change and raise awareness of Tokyo residents


Tokyo Metropolitan Research Institute for Environmental Protection

2030 Carbon-Half Style – Visions for social change

▶ **With the aim of realizing a city that protects the lives and property of Tokyo residents as well as continues to attract people and businesses, efforts will be made taking into account climate change impacts in the future**

Approaches for 2030 Carbon-Half Style

Promoting adaptation measures based on the Tokyo Climate Change Adaptation Plan

- Promote measures to avoid or alleviate damage caused by climate change impacts in all fields (including natural disasters and health, etc.), by incorporating sustainable recovery and digital transformation
- Actively provide information on climate change impacts and adaptation in cooperation with the Climate Change Adaptation Center

Column 07

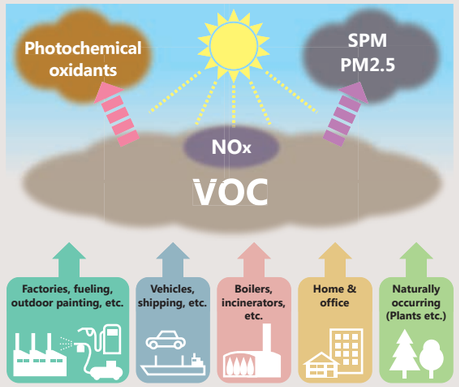
Improving Air Quality Leads to Climate Change Measures

Relationship between the air quality and climate change impacts

Many of the efforts to reduce air pollutants also have the effect of reducing CO_2 emissions, leading to climate change measures.

Among air pollutants, the reduction of ozone, the main component of photochemical oxidants, and soot (black carbon) in PM2.5 is said to be effective for both avoiding climate change and improving the air environment, attracting the attention of international organizations. In addition, it has been reported that a temperature rise due to global warming promotes production reaction, increasing the concentration of air pollutants, such as ozone.

In this way, improvements in air quality and the avoidance of climate change are closely related.



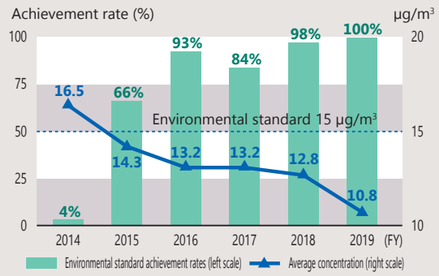
Generation of photochemical oxidants, PM2.5, etc.

Changes in the air quality of Tokyo

The air quality in Tokyo has improved as a result of the implementation of vehicle emission reduction measures, including diesel vehicle emission control, and measures for factories. That allowed the environmental standards for PM2.5 to be met at all monitoring stations for the first time in FY 2019.

Moreover, there have been many reports of improvement in the air quality throughout the world due to stagnant socio-economic activities associated with COVID-19. In Japan as well, it has been suggested that changes in socio-economic activities due to the measures for the state of emergency have contributed to a decrease in PM2.5 concentration.

Changes in achievement rates of PM2.5 environmental standards in Tokyo and average concentration of all monitoring stations



Toward further improvement of the air quality

To improve its status as an environmentally conscious city, TMG has set a new target for PM2.5 to the world's most stringent WHO guideline value in order to achieve the highest global standards of air quality:

10 μg/m³ or less (average of all monitoring stations) by FY 2030

TMG will promote efforts for a clean urban environment together with Tokyo residents and businesses by further accelerating and establishing initiatives, such as measures for vehicle emission reduction, factories, and the Clear Sky Supporter Program as well as deepening their content.

In addition, TMG will provide air quality data as open data to encourage the development of measures for air pollution utilizing the latest technologies, such as 5G and AI.

Clear Sky Supporter logo

TMG is recruiting businesses that work to reduce air pollutants as Clear Sky Supporters and make their efforts public.

Image of open data

Open data on TMG catalog site

TMG will accelerate efforts to improve the air quality and contribute to climate change measures.

Column 08

Bicycle Sharing Expanding in Tokyo!

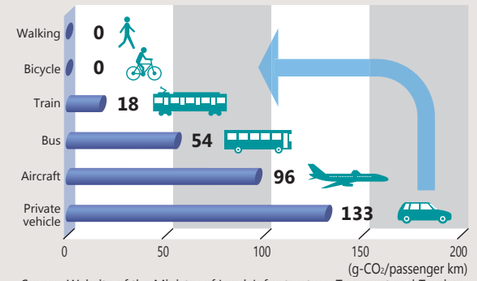
CO_2 reduction and bicycle sharing

Bicycles are not only good for your health but also do not emit any CO_2, thus helping to achieve zero emissions in the transport sector.

The use of a bicycle is recommended to avoid the Three Cs (three conditions which are Closed spaces, Crowds and Close contact) during the COVID-19 pandemic.

Bicycle sharing has rapidly become widespread in recent years as a type of bicycle use. The system allows users to freely rent and return bicycles at multiple cycle stations, and is expected to be used more widely as a means of local transportation.

Comparison of CO_2 emissions (FY 2018)



Source: Website of the Ministry of Land, Infrastructure, Transport and Tourism (https://www.mlit.go.jp/sogoseisaku/environment/sosei_environment_tk_000007.html)

Situation at home and abroad

Bicycle sharing has been introduced in approximately 2,300 cities, mainly in North America and Europe. In London, Paris, and other cities, it has been well developed and positioned as an alternative or complement to public transportation.

In Japan, the number of cities introducing bicycle sharing is increasing year by year, amounting to 225 cities as of the end of March 2019.

Introduction of bicycle sharing at home and abroad

Cities	Bicycles	Stations
Tokyo's 11 cities—wide area interoperation*	9,000	850
London	13,900	840
Paris	23,600	1,200
New York	9,800	750

Tokyo's 11 cities were those as of January 2021.
Other cities are based on The Bike Share Planning Guide 2018 Edition, ITDP

* Wide area interoperation in Chiyoda, Chuo, Minato, Shinjuku, Bunkyo, Koto, Shinagawa, Meguro, Ota, Shibuya, Nakano

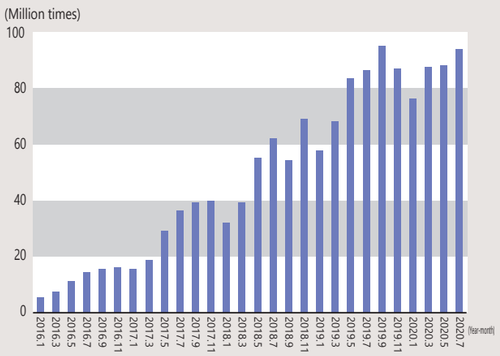
Efforts of Tokyo

In Tokyo, bicycle sharing has been introduced in multiple municipalities. The system features wide area interoperation that enables bicycle use across municipalities, with the amount of use being on the rise.

TMG will make bicycle sharing more convenient and ensure its expanded use by promoting cooperation with multiple businesses to broaden the service area and supporting municipalities working to expand cycle stations.

Changes in the amount of use in 11-city wide area interoperation

DOCOMO BIKE SHARE



Environmentally friendly bicycle sharing is becoming more widespread.

Policy 10 Cooperate with various actors in movements and reform of social systems

Necessity of cooperation with various actors

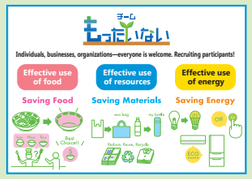
A Zero Emission Tokyo cannot be realized by TMG on its own. CO_2 emissions are closely tied to daily lives and routine activities. TMG will make significant progress in social changes toward decarbonization by working with the Tokyo metropolitan area, the national government, and the rest of the world, integrating actions, technologies, and knowledge of a range of actors, including Tokyo residents, businesses, and organizations, and changing business mechanisms and patterns of behavior.

Progress of the policy

- **Collaboration with advanced businesses etc.**
  Foster momentum by working with businesses etc. in each policy, share technology and knowledge, and implement verification projects
  - Bottle-to-Bottle Tokyo Project in collaboration with the beverage industry
  - Tokyo Hydrogen Initiative in collaboration with hydrogen suppliers and automobile manufacturers
  - Food Waste Reduction Partnership in collaboration with food supply chains

Kickoff of Bottle-to-Bottle Tokyo Project in August 2020

- **Outreach to individual Tokyo residents—Team Mottainai***
  Provide information on the activities of members who are working on energy efficiency or food waste reduction, and promote efforts for households that respond to lifestyle changes, such as increased demand from people spending a long time at home, due to COVID-19



* A framework to communicate the consciousness of "Mottainai" (sense of "too precious to waste") to consumers, collaborate with Tokyo residents, businesses, and organizations working on activities to create an opportunity for behavioral changes, expand the scope of efforts toward decarbonization by Tokyo residents, and support actions for that purpose

Behavioral changes of individuals as they go about their daily life are a prerequisite for building a decarbonized society

To build a decarbonized society, it is important to transform the daily activities of individuals into decarbonized and sustainable actions, in addition to the efforts of the administration and businesses.

According to an IEA (International Energy Agency) report, behavioral changes in daily life are considered important in the race to achieve a decarbonized society by 2050.

TMG is impelled to approach those who could not be sufficiently influenced by TMG alone in cooperation with various actors with the same vision by considering changes in life consciousness or lifestyle to be indispensable elements for the sustainable reduction of CO_2.

- **Behavioral changes featured in the IEA 2050 Net Zero Emissions Scenario**

Behavior	Description
Heating temperature setting	Lower the setting by 3 degrees
Cooling temperature setting	Raise the setting by 3 degrees
Drying laundry	Hang the laundry instead using a dryer in summer
Optimizing driving speed	Reduce by 7 km/h
Eco-driving	Avoid sudden starts or stops and idling
Ride-sharing	Share a ride for car use in urban areas
Cycling, walking	Do not use a car for a distance within 10 minutes by bicycle, instead use a bicycle or walk
Air conditioning in the car	Optimize the setting by raising or lowering 3 degrees as appropriate
Working from home	Ensure at least three days a week for working from home in 20% of the world
Flights	Substitute low-carbon transportation for flights of less than an hour. Hold web conferencing instead of business flights. Reduce long-distance freight transportation

▶ It is estimated that approximately 60% of reductions as a result of behavioral changes can be achieved by awareness-raising or mandatory measures taken by the government.

Source: Material for the 146th Global Environment Subcommittee, Ministry of the Environment

TIME TO ACT CLIMATE ACTION Accelerating actions toward 2030

Establishing individual practice and connections with various actors of decarbonization actions to put social change on track

We will work with diverse actors, appeal to each consumer for empathy and support from various channels, and aim to establish a sustainable behavior pattern indispensable for accelerating decarbonization actions and further expand the circle of efforts.

- **Collaboration with businesses and organizations taking the lead in decarbonization**
  - Collaborate with businesses and organizations that are actively engaged in decarbonization to accelerate efforts that promote sustainable consumption behavior in the majority of aspects of business and daily life
- **Cooperation with TMG's policy partners**
  - Strengthen cooperation with the Tokyo Environmental Public Service Corporation, which has abundant know-how and on-site capabilities cultivated at Cool Net Tokyo* and the Research Institute for Environmental Protection, and promote efforts that encourage concrete behavioral changes by taking advantage of the corporation's resources
- **Further fostering a movement for decarbonization actions**
  - Promote efforts that contribute to fostering momentum, such as public awareness raising activities and the development of specific projects in cooperation with local governments in the Tokyo metropolitan area and large cities across the country

* Cool Net Tokyo is a nickname of the Tokyo Metropolitan Center for Climate Change Actions

Policy 11 Strengthen cooperation with local municipalities

Necessity of strengthening cooperation with local municipalities

To foster the understanding of Tokyo residents, businesses, and organizations and take action together with them, cooperation with the municipalities most familiar to the residents is indispensable. In order to develop climate change measures with TMG and local municipalities as one body, we will further strengthen cooperation with municipalities that are familiar with local circumstances and have the regional networks and resources of local governments.

Progress of the policy

- **Support for efforts toward decarbonization by municipalities**
  Support the efforts of municipalities by adding an assistance menu that contributes to the realization of a Zero Emission Tokyo to a support system for revitalizing local environmental power
- **Promotion of sharing of knowledge and cooperation in initiatives**
  Promote the support for and cooperation in effective efforts, such as joint examination of initiatives in the resource management field and the sharing of technologies and expertise of climate change measures
- **Number of projects utilized in the project for revitalizing local environmental power (FY 2020)**

Special wards	Cities	Towns/villages	Total
87 (23)	50 (23)	3 (3)	140 (49)

Unit: Project (number of applicable local governments in parentheses)

Further strengthening partnerships with local municipalities

Since TMG declared the realization of a Zero Emission Tokyo, the movement of local governments toward decarbonization has begun to take on momentum. For example, the seven wards and cities in Tokyo declared their own Zero Carbon Cities policies in which they aim for net zero CO_2 emissions by 2050, and the special wards started joint efforts to realize Zero Carbon Cities - Special Wards.

The realization of a Zero Emission Tokyo requires us to expand our efforts throughout Tokyo and encourage actions of all actors. To this end, the role of municipalities capable of developing initiatives according to local circumstances is extremely important.

TMG needs to further strengthen cooperation with municipalities, expand the circle of collaboration between local governments in Tokyo, and accelerate actions in the whole of Tokyo.

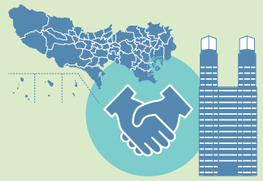
Local governments declaring aims to be Zero Carbon Cities
(From the website of the Ministry of the Environment as of March 23, 2021)
Setagaya Ward, Toshima Ward, Adachi Ward, Katsushika Ward, Musashino City, Chofu City, Tama City

TIME TO ACT CLIMATE ACTION Accelerating actions toward 2030

Municipalities and TMG working together to strongly promote decarbonization with voluntary efforts by all actors, including residents, businesses, and organizations, firmly established

In addition to strongly supporting efforts in line with the circumstances of municipalities, TMG will take leadership in expanding the circle of efforts for decarbonization to local governments in Tokyo.

- **Support for efforts toward decarbonization according to local characteristics**
  - Support efforts toward decarbonization by collecting information and exchanging opinions in detail through separate approaches to each municipality, and reviewing subsidy systems based on local needs and issues
- **Promoting horizontal development of effective efforts implemented by municipalities**
  - Foster momentum for decarbonization by creating and utilizing tools that introduce best practices of local governments, TMG's initiatives for its own sustainability, and collaboration and support menus
  - Actively provide follow-up for knowledge and issues found during the process of decarbonization through opportunities, such as liaison meetings that help share information between local governments



Policy 12 TMG's initiatives for its own sustainability

Necessity of TMG's initiatives for its own sustainability

While it is in a position to promote various initiatives, Tokyo is also a large-scale business that consumes a lot of energy and resources. With "Let's Start from Here" in mind, TMG will take the initiative in implementing efforts contributing to the realization of a Zero Emission Tokyo, in order to foster the understanding and cooperation of Tokyo residents, businesses, and organizations.

Progress of the policy

- **Greenhouse gas emissions at TMG (governor's bureaus/departments) compared to FY 2000** — **Reduced by 20.9%** (FY 2019)
- **Energy consumption at TMG (governor's bureaus/departments) compared to FY 2000** — **Reduced by 20.8%** (FY 2019)
- **Renewable power used at TMG facilities (governor's bureaus/departments)** — **Approx. 3%** (FY 2019)

- Have reduced both greenhouse gas emissions and energy consumption by more than 20% compared to base-year levels as a result of an all-out effort to increase energy efficiency, promote the introduction of solar power generation, and expand the use of renewable power based on TMG's Smart Energy Action Plan
- Have strengthened the promotional system in TMG to realize a Zero Emission Tokyo by reorganizing its previous promotion council for the energy field into the Zero Emission TMG Promotion Council that deals with additional fields, including ZEVs, plastics, food waste, and measures for fluorocarbons

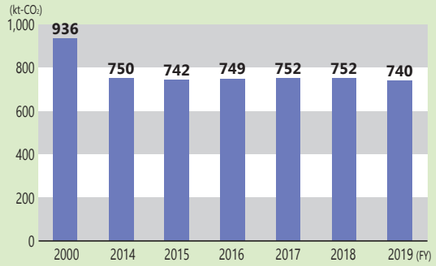
"Carbon Half" is an absolute requirement for TMG

It goes without saying that TMG has to take the initiative in accelerating decarbonization action and leading the efforts of Tokyo residents and businesses to realize "Carbon Half" (halve GHG emissions) in the whole of Tokyo.

TMG accounts for more than 1% of the total greenhouse gas emissions in Tokyo, which would mean that the success or failure of its efforts is a touchstone for the realization of a Zero Emission Tokyo.

TMG is an integral part of TIME TO ACT and as such must acknowledge that now is the time to accelerate actions. With the consciousness of "Let's Start from Here," TMG, in its entirety, needs to take a swift and bold action for decarbonization.

Changes in greenhouse gas emissions at TMG (governor's bureaus/departments)



TIME TO ACT CLIMATE ACTION

Accelerating actions toward 2030

Achieving "Carbon Half" at TMG and powerfully leading the whole of society by taking concrete initiatives and changing mechanisms and systems to realize Carbon-Half Style

Based on the new Zero Emission TMG Action Plan (FY 2020 - 2024), TMG will set forth a range of goals and efforts toward FY 2024, a waypoint to 2030, and promote decarbonization action as a unit, taking the initiative toward 2030.

Taking the initiative for points on the Zero Emission TMG Action Plan

Main goals and concrete efforts set forth in the plan

Greenhouse gas emissions at TMG (governor's bureaus/departments) compared to FY 2000	Energy consumption at TMG (governor's bureaus/departments) compared to FY 2000	Renewable power used at TMG facilities (governor's bureaus/departments)	TMG-owned non-gasoline passenger cars	Installation of public chargers at TMG facilities	Incineration of plastic waste from the TMG city hall compared to FY 2017
Reduced by 40%	Reduced by 30%	Approx. 50%	100% (Except special-purpose vehicles)	300+	Reduced by 20%

- Procure 100% renewable electricity through the TMG Power Plan
- Take the initiative in introducing additional energy efficiency or renewable energy equipment
- Ensure that operational measures are in place by automating energy management and centralizing energy information at TMG facilities
- Ensure that TMG-owned vehicles are replaced with ZEVs in principle, accelerate the introduction of public chargers, and develop hydrogen stations utilizing TMG-owned land
- Promote bottle-to-bottle recycling of plastic bottles at TMG facilities
- Control food waste in restaurants and shops at TMG facilities
- Introduce and upgrade non-fluorocarbon equipment in a planned manner, collect fluorocarbons accordingly at the time of maintenance or disposal of equipment

Policy 13 Strengthen cooperation with cities and non-state actors around the world

Necessity of strengthening cooperation with cities and non-state actors around the world

As climate change measures require response on a global basis, we need to enhance and strengthen cooperation with cities and non-state actors around the world. Tokyo will exercise international leadership as one of the world's largest cities and further enhance its initiatives and contribute to decarbonization around the world by deepening inter-city cooperation to share knowledge and technologies.

Progress of the policy

Further strengthening of global networks

- Actively participate in international intercity network activities, such as C40 and ICLEI*, collect information on climate change measures in cities around the world, and provide information on initiatives of TMG

* C40: C40 Cities Climate Leadership Group, ICLEI: Local Governments for Sustainability

Environmental support for Asian cities

- In addition to sharing knowledge that contributes to the realization of a Zero Emissions Tokyo, hold technical exchanges on air quality and workshops on resource circulation. Continue providing information on initiatives and exchanging technologies via the Web
- Support the formulation of building decarbonization initiatives in Kuala Lumpur together with the Institute for Global Environmental Strategies (City-to-city Collaboration Programme of the Ministry of the Environment)

Researchers of the Beijing Municipal Research Institute of Environmental Protection visiting the Tokyo Metropolitan Research Institute for Environmental Protection (Nov. 2019)

Acceptance of overseas visitors in FY 2019
173 groups (3,372 participants) (Asia, Europe, etc.)

Dispatch of officials overseas in FY 2019
23 groups (52 officials) (Yangon, Beijing, New York, etc.)

Moving the world from Tokyo

As the climate crisis becomes more serious, we must enhance our willingness to act for this crisis throughout the world and take steps toward decarbonization.

We are facing another major crisis in the COVID-19 pandemic. A movement aiming for economic recovery from the impacts of this pandemic in conjunction with coping with the climate crisis is gathering pace throughout the world. To develop the climate action movement from Tokyo in the spirit of the "TIME TO ACT" slogan, TMG held a kick-off meeting in February 2021. TMG will accelerate effective efforts by making the most of Tokyo's strong influence and ties with cities around the world to call for climate actions from the world.

Kick-off meeting on "Sustainable Recovery: TIME TO ACT" (Feb. 2021)

TIME TO ACT CLIMATE ACTION

Accelerating actions toward 2030

Under the leadership of TMG, international cooperation for decarbonization enhanced with the world accelerating climate actions

TMG will lead the world in decarbonization by collaborating with international intercity networks, such as C40 and ICLEI, as well as a range of actors, including international think tanks, to collect data and knowledge helpful for policy design at TMG and provide information on specific actions.

Development of the climate action movement, TIME TO ACT

- International cooperation based on TMG's experience and know-how
- Expand TMG's measures for buildings and examples of utilizing hydrogen in other cities in collaboration with C40
- Promote policy support for and technology exchange with Asian cities in the fields of sustainable resource circulation and air quality
- Share new business models as best practices with other cities, TMG's initiatives for its own sustainability, and efforts utilizing green finance
- Effective provision of information and sharing of knowledge through all diplomatic channels
- Optimize timing for most effective provision of information and methods of outreach in collaboration with experts who have knowledge of international publications
- Demonstrate the presence of Tokyo at conferences and other occasions which attract high international interest
- Strengthen the collaboration with international think tanks and organizations

C40 CITIES

ICLEI Local Governments for Sustainability

Policy 14 Promote sustainable finance

Necessity of promoting sustainable finance

Finance plays an important role in climate change measures, with environmental finance and investment being a major trend worldwide. To improve its presence as an international financial city and contribute to solving social issues through finance, TMG will revitalize the trend of utilizing investment funds for environmental measures, creating opportunities for Tokyo residents and businesses to invest in environmental measures.

Progress of the policy

Promotion of ESG investment

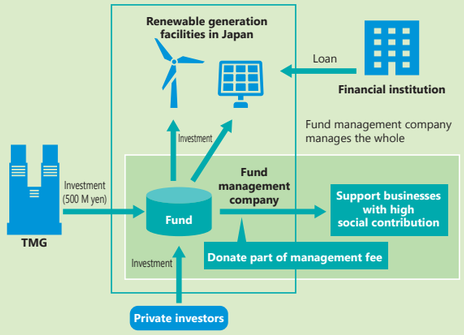
TMG invested JPY 500 million in the Tokyo ESG Fund, which has already made its first investment in a renewable power generation business*. We have promoted the spread of ESG investment by holding Tokyo Sustainable Finance Week etc.

* Wind power generation business in Iwate Prefecture with approximately 46,000 kW output, scheduled to start operation in December 2023

Revitalization of the green bond market

Every year TMG issues Tokyo Green Bonds, the first green bond issued by a local government in Japan. This has contributed to the revitalization of the market by increasing the demand from investors year by year—the bid-to-cover ratio of institutional investors increased from 4.1 times in FY 2017 to 8.0 times in FY 2020

Scheme of Tokyo ESG Fund



* Specific investment destinations are selected by fund management company

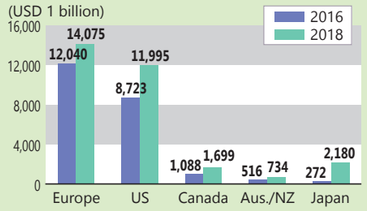
Sustainable finance indispensable for decarbonization

ESG investment is steadily expanding as indicated by an increase in the balance of ESG assets held in the world. In Japan, a trend is emerging to positively evaluate businesses that make capital investment for decarbonization.

Further fund injection in both the public and private sectors is essential to change social systems toward the realization of a Zero Emission Tokyo.

To this end, TMG needs to promote initiatives to ensure the flow of funds leading to ESG investment and attract investment from home and abroad by acting as a driving force.

Balance of ESG assets held by region



Source: "Finance," January 2020 issue, Ministry of Finance (Japanese) (http://www.mof.go.jp/public_relations/finance/202001/202001j.pdf)

TIME TO ACT CLIMATE ACTION — Accelerating actions toward 2030

Realizing a leading sustainable finance city

We will achieve the rebirth of Tokyo by moving Japanese personal financial assets and enticing investment from the rest of the world by communicating the attractiveness of Japanese businesses with high ESG values.

Tokyo green finance market (tentative name)

- To make Tokyo a city where ESG knowledge, technology, and funds are concentrated on a global scale, consider the establishment of a Tokyo green finance market to collect ESG funds from home and abroad

Subsidy to Support Base of Operations of Overseas Financial Corporations

- Provide focused and intensive support for new investment etc. required when an overseas financial business working on green finance starts a business in Tokyo

Tokyo Green Bonds

- Support further revitalization of the green bond market and realization of SDGs from the financial sector, such as increasing the issuance in FY 2021

Sustainable energy fund (tentative name)

- Promote the development of clean energy bases, such as hydrogen stations, and renewable energy power plants through the scheme of a public-private partnership fund that is backed up by investment from TMG

04

CHAPTER 04

REALIZING A ZERO EMISSION TOKYO

Ensure the progression to a sustainable city through decarbonization

With improved awareness, technological innovation, and organization

Let's Create the Future Together

© Tokyo Convention & Visitors Bureau

Bring about changes toward "Carbon Half" through a variety of approaches

The year 2030, the target year for "Carbon Half," is not just some distant future, but will be here in no time.

The pathway to "Carbon Half" leads to the realization of a Zero Emission Tokyo by 2050. And in order to make it happen, bold redesign and reconstruction of our socio-economic system, rather than just some tweaking of the past, is indispensable.

From the perspective of co-benefits, which aim to contribute to both the progression of climate change measures and resolution of various social issues, we have to refine Tokyo into a city full of attractions, including human-centered urban development that enables good and comfortable living as well as harmony with nature, and affluence, vitality, and the competitiveness that is specific to megacities.

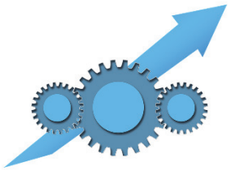
In order to achieve this change, we will collect ideas from all fields and aspects in social life and urban activities to create a new mechanism that will change society based on not only all-out efforts throughout TMG but also cooperation with a range of actors who have the same aspirations for decarbonization, such as Tokyo residents, businesses, organizations, and cities at home and abroad.

Ramp up and accelerate efforts for social change from every angle

The previous chapter shows the visions and approaches in different policy areas for social change leading up to 2030. We need to ramp up efforts to increase the effectiveness of these actions and accelerate the momentum for bold changes.

The next page presents envisaged key considerations from the perspective of backcasting to promote the acceleration and progression of social change. To incorporate them into concrete initiatives and implement them in society, we will need to overcome different challenges, such as garnering the understanding of stakeholders, the resolution of legal issues, and working within financial constraints.

Next fiscal year, TMG will ensure a step toward a decarbonized and sustainable city by discussing what future measures should be taken in light of the perspective of key considerations at the Tokyo Metropolitan Environmental Council as well as involving all actors in the efforts of TMG.



Key considerations to promote the acceleration and progress of social change

Transition to a decarbonized society through a circular economy: Tokyo will change the ways to make, sell, and use things

- Mainstream circular economy-oriented businesses; support consumers' circular choice
- Contribute to the reduction of consumption-based CO_2 by prolonging the life of products and using low-carbon materials

Collaboration with all initiatives/projects of TMG

- Cooperate in a range of policy areas, such as buildings/houses, welfare, health, transportation, urban development, disaster preparedness, and industrial initiatives
- Promote the leadership of the entire administration sector (public facilities etc.) including TMG

Bold use of digital technology and financing

- Utilize big data, depict/evaluate environmental values

Further cooperation with other regions at home and abroad

- Interchange renewable energy with other regions, create demand for hydrogen in collaboration with other prefectures in the Tokyo metropolitan area

Human resource development and capacity building to support decarbonization actions

- Activate the exchange of human resources with expertise in climate change measures at businesses or local governments

Further fostering momentum to encourage a shift in the behavior of each individual Tokyo resident

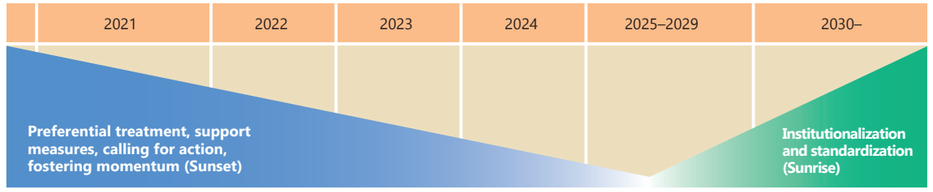
Efforts for sustainability, including coexistence with nature and improvements in the air environment

Our key considerations include making the best use of various policy approaches and inventiveness in order to move ahead with these efforts and achieve social change. Some examples of them are:

Promoting policies through various approaches

- Improve accessibility for Tokyo residents and businesses to decarbonization actions
  - – Create an additional mechanism that enables Tokyo residents and businesses to easily take concrete decarbonization actions together with the administration
- Utilization of incentive-based subsidies
  - – Utilize subsidy programs that call for active efforts of each entity, including subsidies to promote the development and spread of products that contribute to decarbonization, and subsidies in proportion to the level of efforts
- Promoting policies through sunset/sunrise legislation
  - – Utilize a method of providing generous preferential treatment and specific support measures for a limited time to rapidly establish and implement efforts or initiatives in society, and a means of leading society by presenting in advance what should be institutionalized or standardized in the future
- Others, including the utilization of the public procurement and tax system, encouragement through institutional or regulatory incentives and disincentives

Image of policy promotion



Promote both technological innovations for decarbonization and social implementation of existing and advanced technologies

Acceleration in the movement of technological innovations for decarbonization

Even though the world strengthens and accelerates its efforts toward decarbonization, the realization of zero emissions by 2050 is an extremely daunting challenge and indubitably involves the utilization of technology and innovations.

Considering innovation as the key to achieving decarbonization, the national government will create a JPY 2 trillion fund to support research and development for decarbonization by the private sector. A vast majority of countries are also planning large amounts of fiscal investment to promote technological development in addition to the environmental motivation for decarbonization: the need to recover an economy that has been depressed by the COVID-19 crisis.

Investing in decarbonization technology is seen as an opportunity for growth, as the ability to proactively establish promising decarbonization technology is expected to be a focus of international competition in the near future. Against this backdrop, the industrial world including start-ups is actively moving toward the innovation and social implementation of decarbonization technology based on digital technology etc.

Making the most of existing technology is top priority
Support through policies is indispensable to that end

To realize "Carbon Half" by 2030 and a Zero Emission Tokyo by 2050, we have to, instead of simply waiting for future innovations, make the most of existing and advanced technologies with a potential for great CO_2 savings for lower costs, higher performance, and more sophisticated and widespread implementation. To this end, support through policies is essential, including subsidies and institutional support. We also need to strategically consider and implement efforts for regulatory reform and standardization, creating further demand for technology and lowering prices.

By being committed to ambitious goals and clearly showing the direction of initiatives, TMG aims to realize a virtuous cycle of technologies and initiatives in which we enhance predictability in the private sector to encourage technological development, revitalize the market, and promote investment.

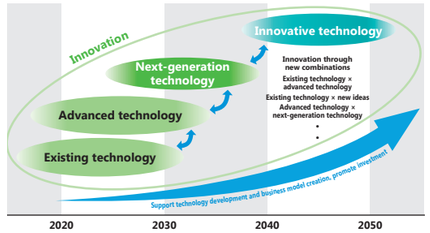
Combine different initiatives to Strongly promote social implementation of existing and advanced technologies

To ensure that existing and advanced technologies with great CO_2 savings, such as storage batteries, fuel cells, and green hydrogen, will become widespread as highly versatile technologies, TMG will support introduction in the initial stages of market launch and additional support in infrastructure development and institutional aspects.

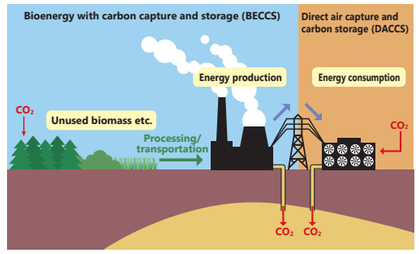
Tokyo will take the initiative in promoting verification projects and encouraging the utilization and spread of technology in Tokyo in collaboration with the private sector at home and abroad that takes on the challenge of business models that utilize advanced technology. In the Bay Area in particular, we will support the swift social implementation of cutting-edge technologies, such as green technology, and realize a sustainable urban model by attracting green technology businesses and developing a variety of projects.

Furthermore, we will strive to create more innovations by building and supporting a mechanism that encourages collaboration between businesses.

Technology development toward 2050



Examples of negative emission technologies to remove CO_2 from the atmosphere



* To introduce these technologies on a large scale, we must consider biodiversity, land use change, and the water cycle.

Priority areas to be supported by the national government for 10 years

Areas indispensable for a decarbonized society and serving as the basis of industrial competitiveness	Greening of electricity and electrification, including next-generation storage battery technology
	Realization of a hydrogen powered society, including technology for mass supply/utilization of hydrogen to decarbonize heat/electricity areas
	CO_2 fixation/reuse, including carbon recycling that reuses CO_2 as raw materials or fuels

Tokyo Bay eSG Project Illustrated visions for 2021 to 2030

National government's 2050 Carbon Neutral Declaration is welcomed Essentials: Clarifying the path to 2030 to take action

The role of the national government is crucial for realizing a decarbonized society

In the fall of 2020, the national government announced the long-awaited 2050 Carbon Neutral Declaration. It is a great pleasure for Japan to be regaining a voice in the international community regarding climate change measures. TMG welcomes the statement of intention of the national government.

In the face of climate change, we are forced to take concrete action that will lead to net zero emissions by 2050. In accordance with the recognition that efforts during the decade up to 2030 are extremely important given by the IPCC Special Report on Global Warming of 1.5°C, we call for the national government to appropriately clarify new 2030 greenhouse gas targets and clear paths to them at an early stage, and take action for reduction as soon as possible.

Specifically, we strongly urge them to work on carbon pricing as well as incisively promote further improvement of energy efficiency and expansion of the use of renewable energy from manufacturing to buildings and civic life by making full use of the existing and advanced technologies currently available.

Since the national government has a major responsibility and role in energy supply, we will press for maximized acceleration of efforts to make renewable energy a major energy source and a dramatic increase in the proportion of renewable energy in electricity by 2030.

It is also important to link the circular economy policy to climate change measures to promote it in an integrated manner. We hope that the national government will discuss effective policy approaches for the sustainable use of resources and promote decarbonization efforts that will contribute to the achievement of SDGs.

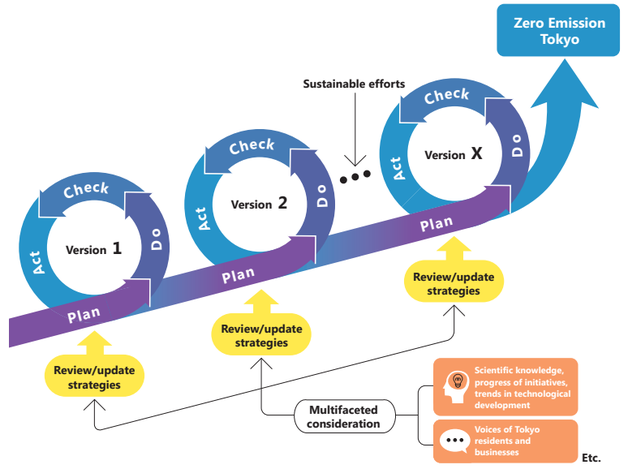
The role of the national government is crucial for realizing a decarbonized society. We will continue to request that the national government work on the formulation of initiatives to support the independent and proactive efforts of Tokyo and other regions, strive for further technological development toward 2050, and play a leading role in realizing the decarbonized society promoted by the international community.

Flexible response to changes in time or circumstances - Agility*

Focus on PDCA cycle to continue developing highly effective initiatives

This strategy is intended as a whitepaper with the aim of realizing a Zero Emission Tokyo. We are continuing to monitor and verify the progress of the Zero Emission Tokyo Strategy formulated in December 2019. Against this background, we have shown our vision and efforts toward "Carbon Half" by 2030.

As the movement toward decarbonization progresses rapidly in the world, we will continue to precisely identify changes in social structure and trends in scientific knowledge and technological development, listen to the opinions of Tokyo residents, businesses, and experts, keep on working on the PDCA cycle, and consider and implement the upgrade of the goals and initiatives as necessary.



* Agility is used here to mean a flexible and swift response to changes in time or circumstances.

Column 09

Make a solar power generator a must-have home appliance in 2030!

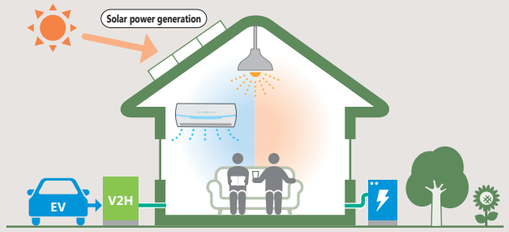
Tokyo is a densely built city with many buildings but it is also a residential city home to approximately 14 million people. In Tokyo, solar panels have not yet been installed on approximately 95% of roofs* that are suitable for solar power generation (This applies to houses including apartment buildings).

* Houses are deemed "suitable (including conditionally suitable)" for installation by the Tokyo Rooftop Solar Register and other programs

Home appliances that shape a decarbonized society: Solar power generators

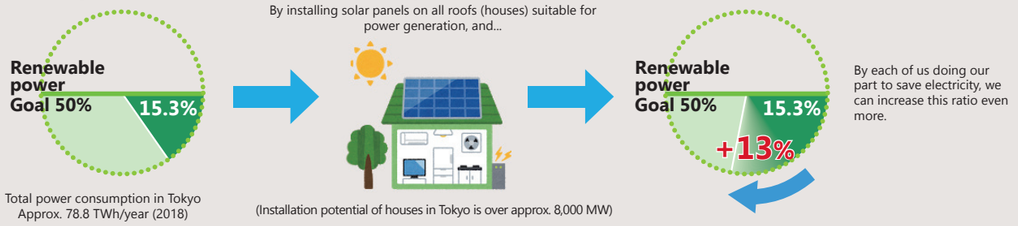
If you install solar power generation equipment on the roof of your house, you can use clean electricity yourself, save on electricity bills, sell electricity, and use electricity in the event of a power outage. If you add a storage battery, your house will have the added advantage of high energy self-sufficiency and excellent disaster preparedness.

Installing solar power generation equipment on all eligible roofs of houses in Tokyo can cover approximately 13% of the total power consumption in Tokyo (approximately 41% in the residential sector). The realization of a Zero Emission Tokyo is required to utilize such potential and make a shift to a society in which solar panels are installed as standard at each home like home appliances.



In California, in the United States, a system that requires the installation of solar panels in new houses started in 2020.

Percentage of renewable power used in Tokyo



By each of us doing our part to save electricity, we can increase this ratio even more.

Use as power supply during power outages or disasters (daily practice recommended)

In normal times, a solar power generation system operates in a linked operation mode that connects to a power company. By switching the operation mode to the self-sustained operation mode, you can use electricity even in the event of a power outage or emergency.

There are seven steps for actual use as shown below. Practice on a regular basis in case of emergency.

Source: Japan Photovoltaic Energy Association (JPEA)

(side of unit)

How to use self-sustained operation mode

(1) Check the location of the outlet for self-sustained operation.
(2) Read the instruction manual to check how to switch to the self-sustained operation mode.
(3) Turn off the main circuit breaker.
(4) Turn off the solar power generation breaker.
(5) Switch to the self-sustained operation mode.
(6) Connect the home appliance you wish to the outlet for self-sustained operation and use the appliance.
(7) Make sure to restore the unit after power restoration: Cancel the self-sustained operation mode ⇒ Turn on the solar power generation breaker ⇒ Turn on the main circuit breaker.

Source: Material of Japan Photovoltaic Energy Association (JPEA)

In 2030, solar power generation may well be standard in every home.

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Policy Planning Section,
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Bureau of Environment,
Tokyo Metropolitan Government
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