Accelerating Actions toward a 2030 Carbon Half

- Fast Forward to “Carbon Half”-

TIME TO ACT

CLIMATE ACTION

Tokyo Metropolitan Government

February 2022

As the climate crisis become even further aggravated, the world is rapidly moving toward the **common goal of net zero CO_2 emissions by 2050**.

To **achieve zero emissions by 2050**, **actions taken in the period leading up to 2030 are extremely important**.

The Tokyo Metropolitan Government (TMG) formed "**Carbon Half**," a plan to halve greenhouse gas emissions by 2030 compared to 2000. To achieve this target, **we are accelerating our efforts** by updating the **Zero Emission Tokyo Strategy** formulated and publicized in 2019.

In May 2021, TMG started to **revise the Tokyo Environmental Master Plan** at the Tokyo Metropolitan Environmental Council. We have been considering ordinances to strengthen and expand programs since then.

TMG finished intensive deliberations on the ideal shape of policies in the climate change field by December 2021 ahead of those in other fields. And, as a roadmap toward "Carbon Half," we have just set forth **new target levels for reducing CO_2 emissions and energy consumption** for the commercial, residential, transport, and other sectors, and brought up a **basic framework of policies** to achieve them.

In light of discussions at the council so far, this booklet **clarifies the roadmap to halving CO_2 emissions** in Tokyo, and shows the **main efforts to be immediately accelerated and strengthened** in each sector.

We have no time to lose.

With the help of intensive and extensive discussions by experts, we will build effective policies toward 2030 promptly, strongly, and in all fields.

Zero Emission Tokyo

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

Thanks to the engagement and inclusion of Tokyo residents and businesses, we will bring together all our strengths to stand against this climate crisis.

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TMG will promote the efforts set forth in this booklet as Strategy 14 in the "Tokyo in the Future" Strategy formulated in March 2021 as a guiding principle for TMG.

This booklet 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.

The efforts for 2022 described in this booklet are based on TMG's draft general account budget for FY 2022 scheduled to be submitted to the first regular meeting of the Tokyo Metropolitan Assembly in 2022. Their contents are subject to change after the deliberation and resolution of the assembly.

TRENDS IN CLIMATE CHANGE

The Climate Crisis Becoming Even Further Aggravated

According to the WMO*1 report in August 2021, the number of disasters caused by climate change has quintupled in the last 50 years.

Record natural disasters, such as heat waves, wildfires, floods, typhoons, and heavy rains, occur almost every year around the world, and the impacts of climate change have extended to the daily lives of people.

The IPCC*2 concludes in its report*3 published in August 2021 that "It is unequivocal that human influence has warmed the atmosphere, ocean and land."

We are approaching the point of no return if we wish to leave this irreplaceable and beautiful world to the future and fulfill our responsibilities for the future.

*1 World Meteorological Organization (UN specialized institution)
*2 Intergovernmental Panel on Climate Change
*3 Working Group I Contribution to the Sixth Assessment Report (the Physical Science Basis)

Major weather disasters in recent times

Source: US NIFC website

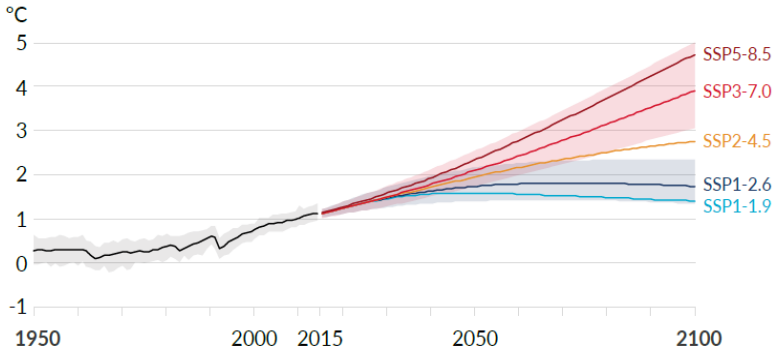
Forest fires
USA (2021)

Source: WMO website

Floods
Germany etc. (July 2021)

Changes in global average temperature relative to 1850 - 1900

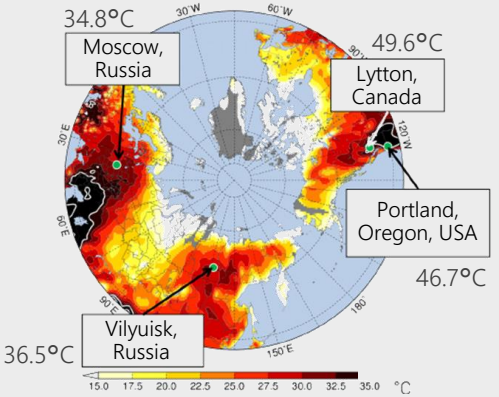
The rise in the global average temperature is very likely to exceed 1.5°C between 2021 and 2040



Source: IPCC AR6/WG1 Report, Summary for Policymakers

Source: Website of the Geospatial Information Authority of Japan

Heavy rains
Saga Prefecture etc. (August 2021)



Source: Website of the Japan Meteorological Agency

High temperatures*4
Various regions of the Northern Hemisphere (June 2021)

*4 Daily maximum temperatures averaged over 10 days from June 20 to 29, 2021

Trend of Decarbonization Expanding around the World

Further development in decarbonization triggered by COP26*

COP26 was held in Glasgow, UK, from October 31 to November 13, 2021. Prior to the holding of COP26, there were movements around the world to accelerate ambitious efforts, such as setting new greenhouse gas reduction targets for 2030.

Japan also declared that it aims to reduce its greenhouse gas emissions by 46% in fiscal year 2030 from its fiscal year 2013 levels, and that it will continue strenuous efforts in its challenge to meet the lofty goal of cutting its emissions by 50%. In October 2021, the NDC (Nationally Determined Contribution) reflecting the new reduction targets was submitted to the United Nations.

At COP26, it was emphasized for the first time that the international community should together work on the 1.5°C goal of the Paris Agreement to pursue net zero emissions.

The trend of decarbonization is significantly accelerating with the completion of the "rule book" necessary for the implementation of the Paris Agreement, which has been a long-standing challenge.

* The 26th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change

National GHG reduction targets for 2030

USA
50-52% compared to 2005

UK
78% compared to 1990 (2035 target)

EU
55% or more compared to 1990

China
Reduce emission intensity of GDP by 65% or more compared to 2005

Germany
65% compared to 1990

Japan
46% compared to FY 2013
(Continue strenuous efforts in its challenge to meet the lofty goal of cutting its emission by 50%)

(As of the end of January 2022)

Photo quoted from the website of the COP26 NFCCC Secretariat

Highlights of the Glasgow Climate Pact

- ✓ Resolution to pursue efforts to limit the global temperature increase to 1.5 °C
- ✓ Accelerating efforts toward the phasedown of unabated coal power
- ✓ Urging developed country Parties to double funding for supporting adaptation in developing country Parties from the 2019 levels by 2025

Role of non-state actors becoming increasingly important

The number of cities participating in Race To Zero, an international campaign to bring together ambitious efforts of non-state actors toward a shift to a decarbonized society, has more than doubled in the past year. Efforts toward decarbonization are expanding in cities around the world.

The number of participating cities is 1,049 as of the end of January 2022

RACE TO ZERO

Awareness of Decarbonization Expanding throughout the Society

Efforts for decarbonization are becoming a prerequisite for socio-economic activities.
People's awareness of decarbonization is also increasing.

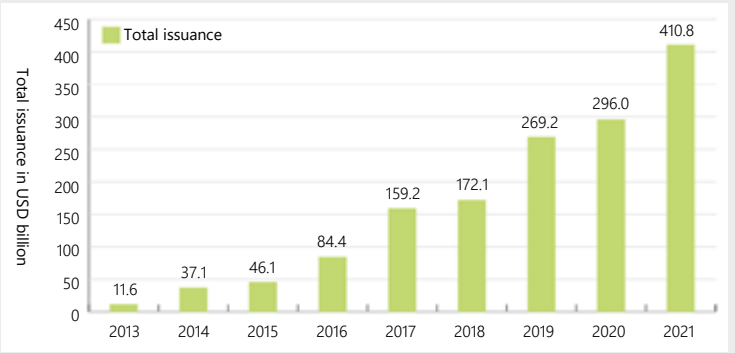
Development of decarbonized management by businesses, expanding sustainable finance

In recent years, businesses' decarbonized management has been increasingly expanding, such as the disclosure of information on the impacts of climate change (TCFD*1) and the setting of goals aimed at decarbonization (SBT*2, RE100*3).

Sustainable finance to realize a sustainable society is expanding rapidly, and green or sustainability bonds are actively used to promote business that contributes to environmental improvement, resulting in an increase in the amount issued.

*1 Task Force on Climate-related Financial Disclosures
*2 Science Based Target. GHG emission reduction targets set by businesses to hold the temperature rise to 1.5°C
*3 Renewable Energy 100%. International initiatives aimed at covering all business operations solely with renewable power

Changes in the issuance of green bonds in the world



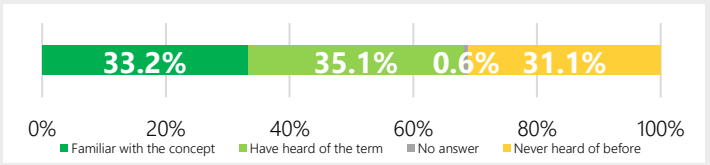
Source: Green Finance Portal website of the Ministry of the Environment

Growing momentum of people for decarbonization

Not only businesses but also people have changed their awareness, and a public opinion survey shows that approximately 70% of people recognize what it means to be a decarbonized society.

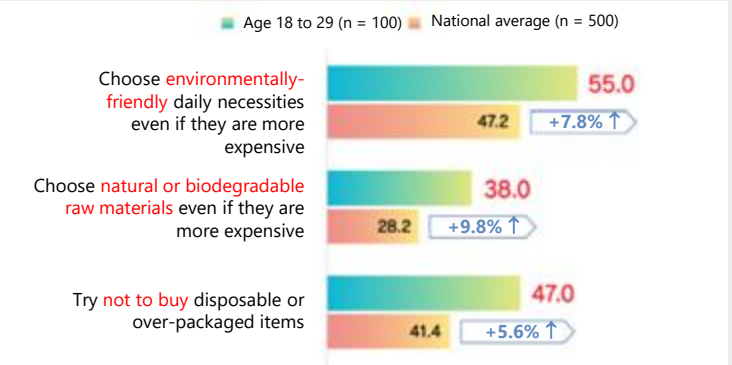
Awareness of the environmental load when purchasing products is much higher among the younger generation than any other generations, with actions toward decarbonization spreading among that generation.

Recognition of a decarbonized society



Source: Public Opinion Survey on Climate Change in FY 2020, Cabinet Office

Are you aware of environmental load when purchasing a product?



Source: Sustainable Lifestyle Receptivity Survey 2021, Dentsu Inc. and Dentsu Institute (4,800 people from 12 countries including 500 from Japan answered the survey conducted in July 2021)

ROADMAP TOWARD A 2030 CARBON HALF

Actions in the Period up to 2030 Extremely Important toward 2050

Formulate strategies and promote actions to realize a 2050 Zero Emission Tokyo

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.

Then, the COVID-19 pandemic emerged and rapidly spread across the globe, damaging socio-economic situations, changing people's lives and behaviors, and causing a change in the mindset for climate change.

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.

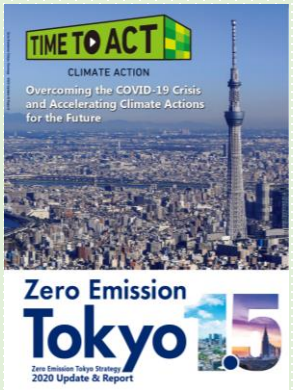
Actions over the next decade define the future Announcement of a 2030 Carbon Half

Recognizing that **actions over the next 10 years are extremely important** for net zero emissions by 2050, in January 2021 TMG announced **"Carbon Half," a plan to halve greenhouse gas emissions in Tokyo by 2030 compared to 2000**.

To achieve this target, we **updated the Zero Emission Tokyo Strategy** in March 2021 to accelerate our actions.

Zero Emission Tokyo Strategy 2020 Update & Report

For the realization of a 2030 Carbon Half, the roadmaps for 14 policies in six sectors set forth in the Zero Emission Tokyo Strategy were updated in March 2021.



For more information:

Strengthening 2030 targets

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

Core elements in the Zero Emission Tokyo Strategy

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)
IV	Resource/industry sector	(5) 3Rs (6) Plastics (7) Food waste (8) Fluorocarbons
V	Climate change adaptation sector	(9) Strengthening adaptation measures
VI	Engagement and inclusion	(10) Cooperate with various actors in movements and reform of social systems (11) Strengthen cooperation with local municipalities (12) TMG's initiatives for its own sustainability (13) Strengthen cooperation with cities and non-states actors around the world (14) Promote sustainable finance

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

Accelerate Discussions toward “Carbon Half” Based on the Opinions of Experts

Considering effective policies to realize “Carbon Half”

TMG consulted with the Tokyo Metropolitan Environmental Council on the **revision of the Tokyo Environmental Master Plan** in May 2021 and has continued discussions since then. We finished intensive deliberations on the ideal shape of policies in the climate change field by December 2021 ahead of those in other fields.

Recognizing that it is necessary to take action toward 2030 promptly and decisively for the realization of a decarbonized society, we also started to consider the **revision of related regulations stipulated in the Ordinance on Environmental Preservation to Secure the Health and Safety of Citizens of the Tokyo Metropolitan Area** without waiting for the revision of the plan.

Consultation on the revision of the Environmental Master Plan (excerpt)

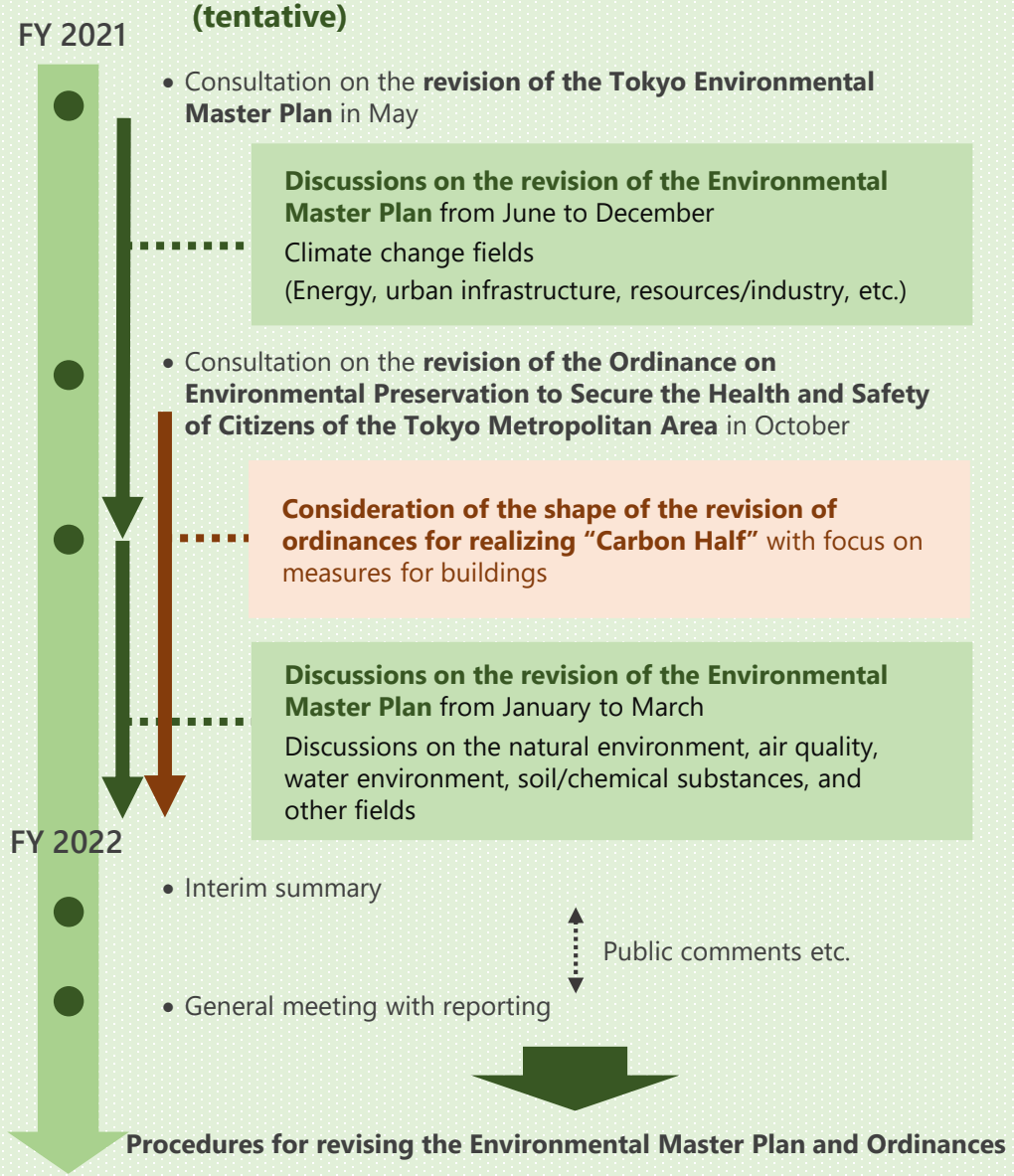
The world is in the midst of an unprecedented crisis due to the COVID-19 pandemic. Under these circumstances, the environmental situation is posing serious issues on a global scale, such as the worsening of the climate crisis, changes in the water environment and air quality, and the loss of biodiversity.

The present determines the fate of Tokyo in the future in the context of realizing a Zero Emission Tokyo through a sustainable recovery and creating a sustainable city full of abundance, which will provide environmental symbiosis and an excellent air quality 50 or 100 years from now.

As one of the major cities in the world, Tokyo will consider the shape of a new Environmental Master Plan that will boldly accelerate our environmental policies to open up the future of the world and Tokyo.

Reference: The Tokyo Metropolitan Environmental Council is an advisory body to the governor of Tokyo established on August 1, 1994 to research and deliberate on basic matters regarding environmental integrity in Tokyo

Schedule of deliberations at the Environmental Council (tentative)



Clarify a Roadmap toward "Carbon Half" to Ensure Its Realization

TMG has brought up to the Environmental Council **new target levels for reducing CO_2 emissions and energy consumption** for the commercial, residential, transport, and other sectors, as well as a **basic framework of policies** to achieve them for more in-depth discussions.

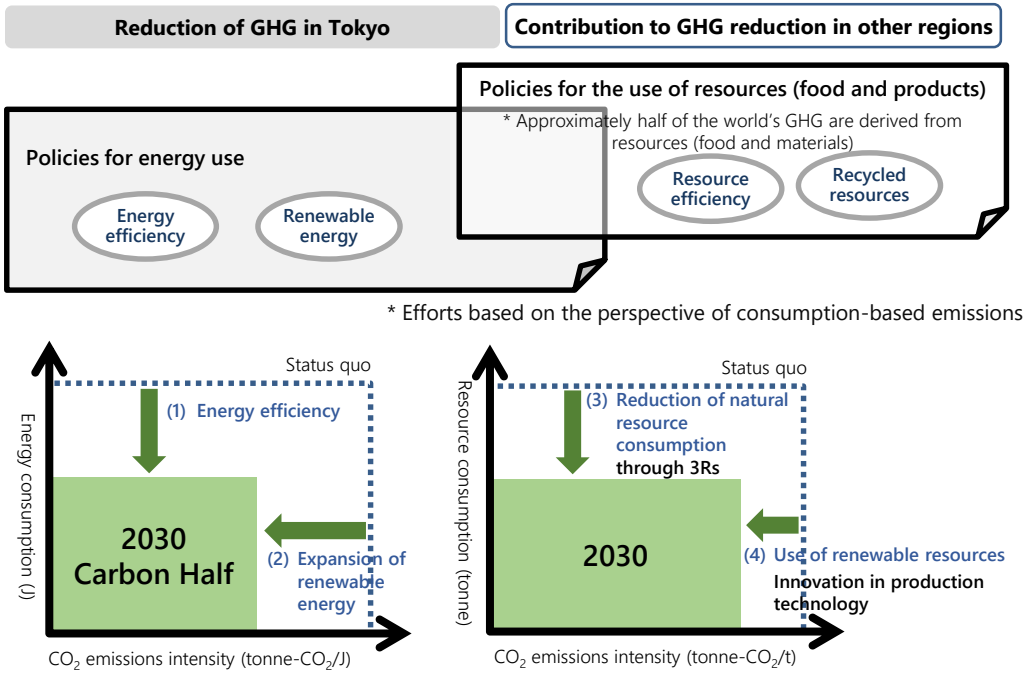
Based on these discussions and the following concept, we will clarify a **roadmap toward "Carbon Half"** to promptly and strongly support a shift to a decarbonized society.

Basic concept of actions toward a 2030 Carbon Half

To realize "Carbon Half," we will strongly develop efforts (1) to (4) shown on the right in the industrial, commercial, residential, transport, and other sectors through improvements in efficiency, switching of energy/material, and behavior change, taking into account the time axis.

Tokyo in 2030 will shape Tokyo in 2050. We will also lay the foundation for further emission reductions from 2030 to 2050.

Climate change is interconnected with other fields, such as biodiversity and air quality. We will develop our efforts keeping this perspective in mind.



Three efforts to clarify a roadmap toward “Carbon Half”:

New Sectoral Targets to Accelerate Actions (Draft)

Clarify sectoral reduction targets to promote reduction measures in each sector

Drastic Strengthening of Policies Including Regulations

Strongly promote decarbonization by establishing and strengthening ordinances/programs as well as expanding support measures

Bold Acceleration of TMG’s Initiatives for Its Own Sustainability

Accelerate TMG’s own efforts to take the lead in society with “Let’s Start from Here” in mind

New Sectoral Targets to Accelerate Actions (Draft)

For the realization of a 2030 Carbon Half, TMG has set **sectoral targets for reducing** energy-related CO_2 emissions and energy consumption to **promote reduction measures in each sector**.

* The sectoral targets are a draft submitted by TMG to the Tokyo Metropolitan Environmental Council, and the nature of the target values is under consideration at the Environmental Council.

New sectoral targets and their concept

■ Energy-related CO_2 emissions

These targets have been set for **each sector to make a 50% reduction from the status quo (2019)**, taking into account sectors that had already made a significant reduction by 2019.

(Unit: Mt-CO_2eq)

	2000 (Baseline)	2019 (Status quo)		2030 (Estimate)			Tokyo Environmental Master Plan (status quo) (from 2000)
	Emissions	Emissions	From 2000	Emissions (Estimate)	Sectoral targets (From 2000)	From 2019	
Industrial/commercial sectors	27.27	27.63	1.3%	13.81	**Approx. 50% reduction**	-50.0%	Approx. 20% reduction
Industrial sector	6.79	3.81	-43.9%	2.22		-41.8%	
Commercial sector	20.48	23.82	16.3%	11.59	**Approx. 45% reduction**	-51.3%	(Approx. 20% reduction)
Residential sector	12.83	16.12	25.6%	7.28	**Approx. 45% reduction**	-54.8%	Approx. 20% reduction
Transport sector	17.65	9.40	-46.7%	6.12	**Approx. 65% reduction**	-34.9%	Approx. 60% reduction
Total of energy-related CO_2	**57.75**	**53.15**	**-8.0%**	**27.21**		**-48.8%**	

Reference:

Total of waste sector	1.20	1.90	58.3%	1.37	From 2017 **40% reduction**[*1]	-27.9%	
Total of other gases, including fluorocarbons	3.25	7.06	117.2%	2.52	From 2014 Approx. **65% reduction**[*2]	-64.3%	
Total of GHG emissions	**62.20**	**62.11**	**-0.1%**	**31.10**		**-49.9%**	

*1 Reduction target for the incineration of plastic waste from households and large office buildings

*2 Reduction target for Hydrofluorocarbons (HFCs)

■ Energy consumption

The targets set in the existing Master Plan have been strengthened by one step for each sector.

The target for the residential sector has been set taking into account that energy consumption has increased due to an increase in the number of households, up approximately 30% from 2000, in spite of a decrease in energy intensity per household, and the number of households in Tokyo is expected to increase until 2035.

(Unit: PJ)

	2000 (Baseline)	2019 (Status quo)		2030 (Estimate)			Tokyo Environmental Master Plan (status quo) (from 2000)
	Consum-ption	Consump-tion	From 2000	Consumption (Estimate)	Sectoral targets (From 2000)	From 2019	
Industrial/ commercial sectors	359	284	-20.9%	233	**Approx. 35% reduction**	-18%	Approx. 30% reduction
Industrial sector	96	46	-52.1%	36		-22%	
Commercial sector	263	237	-9.9%	197	**Approx. 25% reduction**	-17%	(Approx. 20% reduction)
Residential sector	186	190	2.20%	130	**Approx. 30% reduction**	-32%	Approx. 30% reduction
Transport sector	257	125	-51.4%	90	**Approx. 65% reduction**	-28%	Approx. 60% reduction
Total	**802**	**598**	**-25.4%**	**453**		**-24%**	

Drastic Strengthening of Policies Including Regulations

TMG will **drastically strengthen our policies** through programs newly established or strengthened by ordinances, support measures that strongly encourage energy efficiency and renewable energy, and all of our policies and projects, in collaboration with the national government and municipalities.

Commercial/ industrial sector Residential sector	• Establish the foundation for a decarbonized society at an early stage through programs strengthened and expanded by ordinances and support measures acting as a stimulant
Transport sector	• Promote efforts to curb the use of automobiles • Strengthen policies to strongly encourage the spread of ZEVs*, such as the introduction of ZEVs and the development of infrastructure
Expanding the use of hydrogen energy	• Further accelerate the use of hydrogen by expanding hydrogen mobility and infrastructure • Formulate Tokyo Hydrogen Vision to accelerate efforts • Promote efforts to expand the use and facilitate the understanding of hydrogen
Sustainable resource management	• Expand advanced efforts in society to promote the circular use of resources by opening the Tokyo Circular Economy Promotion Center (tentative name) • Promote advanced waste treatment to achieve a higher-level circulation
Other gases (Measures for fluorocarbons)	• Enhance the proper management of commercial equipment and the expanded use of non-fluorocarbon equipment • Promote the proper disposal of home appliances according to law
Climate change adaptation measures	• Strongly promote all-out efforts throughout TMG • Actively collect and provide information in collaboration with the Climate Change Adaptation Center
Engagement and inclusion	• Further encourage the engagement and inclusion of all actors, including Tokyo residents, businesses, municipalities, and overseas cities
TMG's initiatives for its own sustainability	• Boldly accelerate actions throughout TMG with "Let's Start from Here" in mind

* 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

Commercial/ Industrial Sectors

Residential Sector

Zero Emission Tokyo Strategy - Policies 1 & 3

Visions for 2050

- ▶ **All energy used to be decarbonized**
- ▶ **All buildings in Tokyo to be zero emission buildings**

2030

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
- 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.

2030 targets and the status quo

Greenhouse gas emissions compared to 2000	Energy consumption compared to 2000	Percentage of power generated by renewable energy	Installation of solar power generation equipment in Tokyo	Renewable power used at TMG facilities (governor's bureaus/departments)
50% reduction	**50% reduction**	**Approx. 50%**	**1.3 GW**	**100%**
0.2% reduction (preliminary results for FY 2019)	**25.4% reduction** (preliminary results for FY 2019)	**17.3%** (FY 2019)	**0.61 GW** (FY 2019)	**Approx. 7%** (FY 2020)

* Expanding the number of RE100 declaration businesses

- 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
- Energy consumption passed its peak around FY 2000
- The percentage of renewable power used in Tokyo has nearly tripled in the last seven years

Basic concept for actions toward 2030

- Maximizing energy efficiency (Reduce fossil fuel consumption and improve energy efficiency)
- **Shift to decarbonized energy in all fields** (Increase the use of renewable energy)
  - Decarbonization of energy starts from electricity

    (Decarbonization technologies, such as solar and wind power, will be established and available in the market)
- **Promoting a shift to the use of low-carbon materials in parallel**

Necessity of further strengthening efforts

An important target for achieving zero emissions: Measures for buildings

It is imperative to strengthen measures for buildings which account for 70% of CO_2 emissions in Tokyo.
Buildings are used for decades, and those constructed from now on will define the Tokyo of 2050.

Acting as a safety net for the life of Tokyo residents, houses need to not only be good for the environment, but also provide a healthy environment for their inhabitants and refuge in the event of disaster. It is also necessary to ensure high thermal insulation performance from the perspective of response to a disaster and measures for heat or health, and consider the use of buildings in the future, including the way of living in buildings.

Efforts to expand the use of renewable energy entering into a new stage

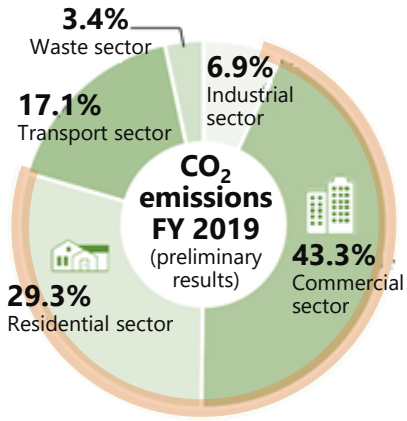
The amount of solar power generation equipment installed in Tokyo has been increasing year by year, but there has been limited installation on the rooftops of private homes, meaning this sector offers great potential.

Installing solar power generation equipment at houses gives inhabitants the advantage of being able to use electricity in the event of a power outage, save on electricity bills, and add to their household income as excess electricity can be sold. Private businesses have been developing business related to the equipment introduction in various forms, such as offsetting setup costs and offering group discounts.

The national government is also promoting the installation of solar power generation equipment by setting the goal of introducing it at 60% of new detached houses by 2030.

Sector breakdown of CO_2 emissions

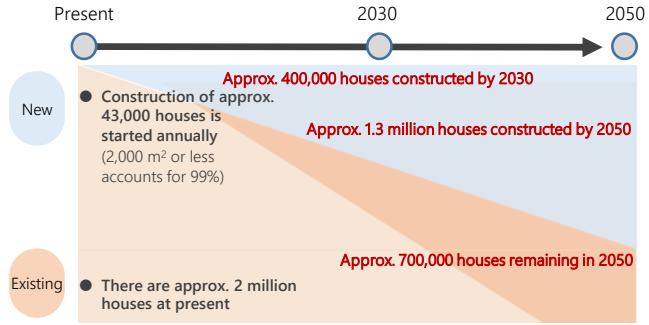
(preliminary results for FY 2019)



Buildings and houses account for approx. 70%

Status of houses in Tokyo (transition toward 2050)

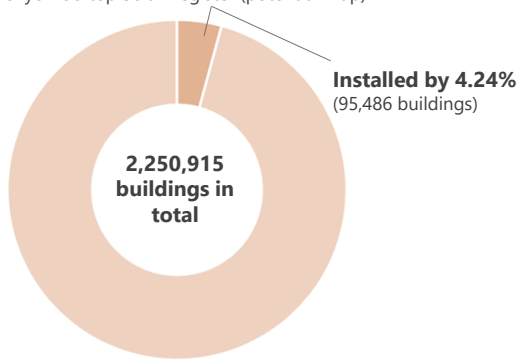
New buildings will account for the majority by 2050



Introduction of solar power generation in Tokyo

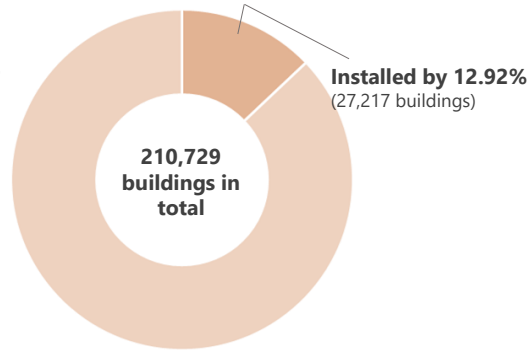
■ Percentage of installation of solar power generation equipment in Tokyo at present

Equipment has been installed on approximately 4% of houses, excluding island housing, deemed "suitable (including conditionally suitable)" for such installation in the Tokyo Rooftop Solar Register (potential map)



■ Percentage of installation at buildings less than 6 years old except those with unknown age

The installation rates at new buildings are relatively high, but have not reached 20% yet.



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

Establish the foundation for a decarbonized society at an early stage through programs strengthened and expanded by ordinances and support measures acting as a stimulant

Commercial/Industrial Sectors

Efforts immediately accelerated and strengthened

Strongly promote the expanded use of renewable energy and more thorough energy efficiency by drastically strengthening and expanding programs through ordinances

Highlights of strengthening programs by ordinances

	New construction buildings	Existing buildings
Large	**Tokyo Green Building Program** (Strengthened/expanded) • **Require the installation of renewable energy equipment** • **Strengthen energy efficiency performance specifications** equivalent to or higher than national standards • **Strengthen and expand** three-level evaluation criteria	**Tokyo Cap-and-Trade Program** (Strengthened/expanded) • Determine **compliance factors looking ahead to 2030 Carbon-Half Buildings** • **Enhance measures** to further promote the **use of renewable energy** • **Strengthen and expand incentive measures** to encourage active efforts
2,000 m² and more / Less than 2,000 m²	**New program** A program that mandates the installation of solar powered systems on designated new houses and other small to medium sized buildings • **Require the installation of renewable energy equipment** • **Determine energy efficiency performance standards** equivalent to or higher than national standards	**Carbon Reduction Reporting Program for Small and Medium-Sized facilities** (Strengthened/expanded) • **Strengthen the mechanism** to develop and expand **energy efficiency and the use of renewable energy** • Encourage active efforts by **publicizing and utilizing more effective program statistical data**
Small/medium		
Effective use of energy	**Program on Effective Use of District Energy** (Strengthened/expanded) • Encourage efforts to advance decarbonization in large-scale development	
Supply of renewable energy	**Energy Environment Program** (Strengthened/expanded) • Strengthen the mechanism to encourage the expansion of power suppliers with a higher percentage of renewable power	

Note: The details of the strengthening and expansion of the programs by ordinances are under consideration by the subcommittee of the Tokyo Metropolitan Environment Council

Strengthening and expanding programs through ordinances

Support measures acting as a stimulant

Establishing a social foundation for decarbonization at an early stage

Realize an attractive city that encourages decarbonized business activities and attracts investment and business partners

Significantly expand support measures to quickly establish and disseminate efforts of businesses for decarbonization

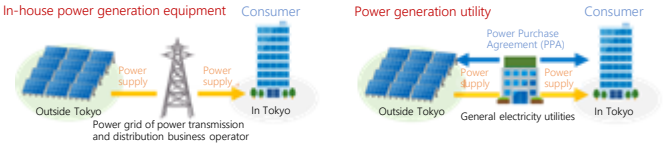
Accelerating the introduction and procurement of renewable energy

◆ **Strong support of the introduction of renewable energy for local production and consumption**

- Significantly expand subsidies to businesses and municipalities that introduce self-consumption renewable energy equipment contributing to improving regional disaster preparedness

◆ **Encouraging businesses to ensure renewable power sources**

- Promote the creation of renewable power sources and procurement of renewable power by expanding support for the introduction of self-consumption renewable power generation equipment installed outside Tokyo by businesses



Promoting energy efficiency taking into account measures against infectious diseases

- Strongly support the introduction of highly efficient ventilation equipment and air conditioning equipment to enable small- and medium-sized businesses to ensure ventilation and energy efficiency

Residential Sector

Efforts immediately accelerated and strengthened

Create the first program in Japan* to require detached houses to install solar power generation equipment, and strengthen and expand existing programs

Highlights of strengthening programs by ordinances

New buildings

Large

Tokyo Green Building Program

Strengthened/expanded

- Require the installation of renewable energy equipment
- Strengthen energy efficiency performance specifications equivalent to or higher than national standards
- Strengthen and expand three-level evaluation criteria

2,000 m² and more

Less than 2,000 m²

New program

A program that mandates the installation of solar powered systems on designated new houses and other small to medium sized buildings

- Require the installation of renewable energy equipment
- Determine energy efficiency performance standards equivalent to or higher than national standards

Small/medium

Supply of renewable energy

Energy Environment Program

Strengthened/expanded

- **Strengthen the mechanism to encourage the expansion of power suppliers with a higher percentage of renewable power**

Note: The details of the strengthening and expansion of the programs by ordinances are under consideration by the subcommittee of the Tokyo Metropolitan Environment Council

* This is the first program in Japan that covers houses with a total floor area of less than 300 m²

Strengthening and expanding programs through ordinances

Support measures acting as a stimulant

Establishing a social foundation for decarbonization at an early stage

Make a shift to a disaster-resilient, healthy and comfortable way of living by accelerating the transition to a lifestyle suitable for a decarbonized society

Strongly support Tokyo residents' efforts to halve CO_2 right now, and foster momentum for a decarbonized society ahead of strengthening the program

Standardizing zero-emission specifications for new houses

◆ Upgrading and promotion of the Tokyo Zero Emission House Standards

- Promote the installation of higher performance houses by introducing multiple levels into the criteria for the Tokyo Zero Emission House, including energy efficiency performance
- Expand subsidies according to the levels and strengthen additional subsidies for the installation of solar power generation equipment

◆ Tax reduction or exemption to promote the introduction of zero emission houses with solar panels

- Exempt new Tokyo Zero Emission Houses that meet certain requirements, such as the installation of solar power generation equipment, from all or part of the taxes owed for the acquisition of real estate

Promoting energy efficiency and the introduction of renewable energy at existing houses by strengthening a wide range of support measures

◆ Strengthening subsidies for thermal insulation renovation and the installation of solar power generation equipment

- Greatly expand subsidies for upgrading to windows and doors with high thermal insulation performance and the installation of storage batteries, and create additional subsidies for solar power generation equipment

◆ Extending the term for Zero Emission Points again to encourage switching to more energy efficient home appliances

◆ Helping households that cannot install solar panels use renewable power at a reasonable price

- Continue a campaign in the Tokyo metropolitan area to reduce prices by recruiting prospective purchasers of renewable power to increase purchasing power

Promoting the spread of energy efficient and renewable energy-oriented houses in collaboration with businesses

- Promote efforts for energy efficiency and renewable energy by setting up a platform in cooperation with housing-related organizations

We Are Considering a New Program That Mandates the Installation of Solar Powered Systems on Designated New Houses and Other Small to Medium Sized Buildings at the Tokyo Metropolitan Environmental Council

Q **Why do you require new houses to install solar power generation equipment?**

A **We aim to help standardize the installation of solar power generation equipment at houses in our shift toward a decarbonized society.**

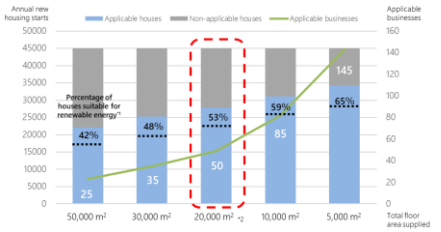
- ✓ Houses deemed "suitable (including conditionally suitable)" for installation by the Tokyo Rooftop Solar Register account for 85%.
- ✓ If you install solar power generation equipment on the roof of your house, you can use clean electricity yourself, save on electricity bills, sell electricity, and use electricity in the event of a power outage.
- ✓ About 40,000 new houses are built every year, providing a great potential.

Q **Do you require all houses to install solar power generation equipment?**

A **The draft currently under consideration doesn't require that from each and every house without exception.**

- ✓ We are considering requiring house builders and real estate developers who supply new houses above a certain level ("top runners") in Tokyo to install solar power generation equipment.
- ✓ We will determine the installation obligations of solar power generation equipment based on the actual state of the installation (minimum capacity) and regional characteristics in Tokyo.
- ✓ It will be a mechanism that allows each covered supplier a variety of installation options.

Number of applicable businesses and their percentage in relation to small and medium-sized houses in Tokyo



The program will cover a total floor area supplied that is 20,000 m²*2 or more

- **Minimum target size to achieve the goal**
- **Most of the covered entities are also covered by the national Housing Top Runner Program, which is a criterion for the energy efficiency performance of houses** (Approximately half will be covered when 10,000 m² is applied)
- **Spillover effects are expected on entities other than those covered**
- **Covered entities will be reviewed based on the percentage of houses with renewable energy after the implementation of the new program**

*1 The percentage of houses with renewable energy has been estimated taking into account the potential for rooftop installation and regional characteristics in Tokyo

*2 20,000 m² is equivalent to approximately 200 detached houses

Calculation of obligations

Installing 4 kW in 100 houses ⇒ 400 kW
Installing 2 kW in 250 houses ⇒ 500 kW
Unsuitable 150 houses ⇒ 0 kW

Total installed capacity
900 kW > Obligations (850 kW)
Obligations achieved

Calculation of obligations: Example of 500 houses supplied in Tokyo

500 houses x 0.85 (possibility of installation)* x 2 kW/house (obligations/house) = 850 kW

* This corresponds to the percentage (85%) of houses deemed "suitable (including conditionally suitable)" for installation by the Tokyo Rooftop Solar Register

Source: Material for the Study Group on the Revision of Ordinances for Realizing "Carbon Half"

We will continue to hold careful discussions, listening to opinions from Tokyo residents and businesses regarding the shape of the programs.

Let's Start Trying to Halve CO_2 Right Now!

Each star in these actions provides approximately 10% CO_2 savings a year! Let's give it a try!

★ CO_2 savings through energy efficiency*1　☆ CO_2 savings through switching to renewable power*2　Assumption: A three-person household with annual CO_2 emissions of 3,000 kg

Action 1 > Installation of solar panels

Disaster preparedness+　Lower prices

CO_2 savings: ★★★★★

- If you install solar power generation equipment, you can **save on electricity bills** and **use electricity in the event of a power outage**. There is a plan with no setup costs!
- If you install a storage battery as well, you can **save even more on electricity bills** and **upgrade your disaster preparedness**!

Use subsidies strengthened and expanded by TMG!

- Solar power generation equipment
  - Up to **360,000 yen** for new houses (120,000 yen/kW)*3&4
  - Up to **450,000 yen** for existing houses (150,000 yen/kW)*4
- Residential storage batteries
  - Up to **600,000 yen** (100,000 yen/kWh)*3&4

The installation of solar power generation equipment will dramatically cut electricity bills!

If a household of two or more people with a monthly electricity bill of about 10,000 yen installs 4 kW of solar power generation equipment,

About 7,700 yen/month can be saved!

(Until 10th year)

The installation cost can be recovered in about 10 years, allowing you to enjoy cost-free electricity after that.

The saving was calculated assuming a household of two or more people (351 kWh/month) living in a ward of Tokyo as reported in the Household Economy Survey by the Ministry of Internal Affairs and Communications in 2020

Reference: Installation of solar power generation equipment costs approx. 920,000 yen (231,000 yen/kW according to a survey by RTS Corporation)
This is an estimate made by TMG under certain conditions, and does not guarantee the same effects or amount of money.

Action 2 > Upgrading thermal insulation of doors and windows

Health+　Lower prices

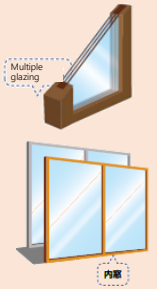
CO_2 savings: ★

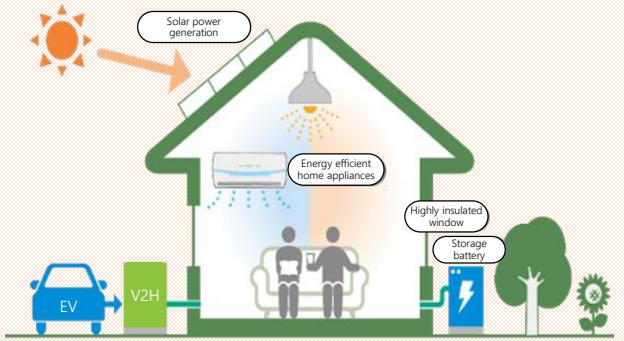
A large proportion of home heating enters and escapes through windows and doors. Upgrading the insulation on your doors and windows will allow you to **save on electricity bills**! You can also **expect health benefits**, such as lowering your risk of heat shock, and you will also have less house dust!

Use subsidies strengthened and expanded by TMG!

- Up to **1 million yen** for highly insulated windows*4
- Up to **160,000 yen** for highly insulated doors*4

(Subsidy rate is 1/3 for both windows and doors)





*1 The savings were estimated based on a survey by the Bureau of Environment, Tokyo Metropolitan Government, and data disclosed on the websites of the Ministry of the Environment and Association for Electric Home Appliances

*2 The savings were estimated from the percentage of electricity in CO_2 emissions from households reported in the Comprehensive Survey on Final Energy Consumption and Greenhouse Gas Emissions in Tokyo, corresponding to those achieved by switching to 100% renewable power

*3 The subsidies are provided when solar power generation equipment is installed through the Tokyo Zero Emission House Introduction Promotion Project starting in FY 2022

*4 The subsidies are provided when certain requirements, such as upgrading to highly insulated windows and doors and contemporaneous installation of storage batteries, are met in the Project for Expanding Thermal Insulation/Solar Power Houses Resilient to Disasters and Contributing to Health starting in FY 2022

Note: Both *3 and *4 are based on TMG's draft general account budget for FY 2022 scheduled to be submitted to the first regular meeting of the Tokyo Metropolitan Assembly in 2022. Their contents are subject to change after deliberation and resolution of the assembly.

Action 3 > Switching to higher-efficiency/more energy efficient home appliances and LEDs

Lower prices

CO_2 savings: ★

Energy efficiency technology for home appliances is advancing year by year. A simple switching will greatly improve energy efficiency and allow you to **save on electricity bills**!

You can get points by switching to a new one!

If you switch to an applicable product that meets certain criteria, you will be awarded Tokyo Zero Emission Points that can be exchanged for gift certificates etc.!

Switching to a refrigerator that achieves energy efficiency specifications or higher levels is awarded points worth **up to 21,000 yen!**

Zero Emission Points

We support municipalities that subsidize the cost of purchasing energy-efficient used items for Tokyo residents.

Action 4 > Switching to renewable power

Lower prices

CO_2 savings: ☆☆☆☆☆☆☆

By switching an electricity contract to a renewable energy plan, **households that cannot place solar panels on the roof can also use clean electricity** to reduce CO_2 emissions caused by the use of electricity!

We are carrying out a campaign in which the more people participate, the better the price they will pay for renewable power!

Transport **Sector**

Visions for 2050

- **Optimized flow of people and products**
- **All cars driven in Tokyo to be ZEVs**
- **Expanded use of renewable energy realizing zero emissions from well to wheel**[*1]

*1 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)

2030

2030 Carbon-Half Style

- Visions for social change -

- Streamlined flow of people and products; shift to actions to curb CO_2 emissions, such as walking, using bicycles and public transportation
- 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[*2] capable of meeting diverse needs
- Larger market for zero emission motorcycles accelerating the phaseout of gasoline-only motorcycles

*2 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

*3 Methods to identify real data for motorcycles are being considered

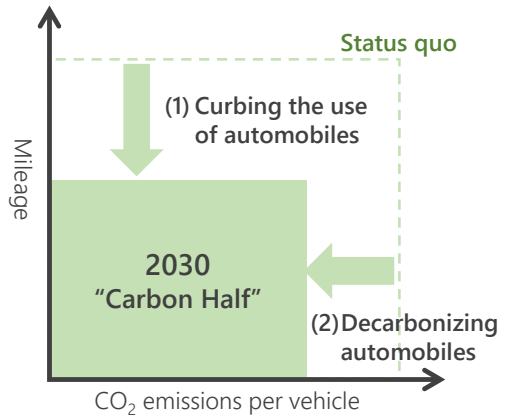
*4 Non-gasoline vehicles: ZEVs and hybrid vehicles (HVs) including buses, cargo vehicles, and motorcycles in addition to passenger cars

2030 targets and the status quo

Phasing out the sale of new gasoline-only passenger cars	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% * 2035 target	50%	300+	Limited to ZEVs in principle	1,000	150
40.2% (FY 2020)	—[*3]	2.3% (FY 2020)	108 in total (FY 2020)	2.7% (FY 2020)	326 (FY 2020)	22 (FY 2020)

- Automobile use and distances traveled have decreased due to various initiatives, but these improvements have been flat for the past few years. It is necessary to promote a shift from cars to other transportation means, including bicycles, which curb CO_2 emissions
- The sales of new non-gasoline[*4] passenger cars have increased in recent years. However, since their prices are higher than those of gasoline vehicles, it is necessary to reduce the initial cost and expand the installation of charging infrastructure for the spread of ZEVs

Basic concept for actions toward 2030



(1) Curbing the use of automobiles

⇒ Shift to actions to curb CO_2 emissions, such as walking, using bicycles and public transportation

⇒ Streamlined flow of people and products

(2) Decarbonizing automobiles

⇒ Standardization of non-gasoline passenger cars, promotion of replacing passenger cars with ZEVs, and replacement of buses and trucks with ZEVs according to their characteristics

⇒ Promotion of ZEV infrastructure development

Efforts immediately accelerated and strengthened

Promote efforts to curb the use of automobiles

◆ Promoting the introduction of low-emission/fuel-efficient vehicles

Program of the Mandatory Introduction of Low-Emission/Fuel-Efficient Vehicles:

- Raise the mandatory ratio of low-emission/fuel-efficient vehicles and establish a mandatory ratio for non-gasoline passenger cars

Items reviewed in the Program of the Mandatory Introduction of Low-Emission/Fuel-Efficient Vehicles

	Before review	After review
Achievement deadline	End of FY 2021	End of FY 2026
Percentage of specified low-emission/fuel-efficient vehicles	15%	30%
Percentage of non-gasoline vehicles to passenger cars* [New]	—	20%

* Not including light motor vehicles

Tokyo Vehicle Emission Reduction Program:

- Review the Tokyo Vehicle Emission Reduction Guidelines and add highly effective initiatives based on the latest trends and technologies to the menu of initiatives for rationalizing vehicle use

◆ Promoting the spread of bicycle sharing

- Promote cooperation with bicycle sharing management companies to broaden the service area and provide support for local governments working to expand cycle ports
- Promote the development of an extensive use environment by allowing multiple businesses to share a cycle port site, which will bring benefits, such as improved convenience, expanded area, and understanding of appropriate management methods

Cycle port shared by multiple businesses

Accelerate efforts to promote ZEVs

◆ Strongly encouraging making cars driven in Tokyo ZEVs

- Increase the number of EVs, PHVs, and EV motorcycles eligible for subsidies
- To encourage automobile manufacturers to develop and sell ZEVs, consider a new subsidy program that will incentivize efforts to introduce ZEVs and non-gasoline vehicles

Increase in the number of passenger cars eligible for subsidies

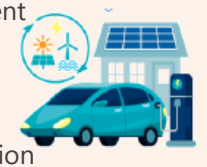
No. of EVs/PHVs/FCVs to be subsidized	
FY 2021	20,000
FY 2022	25,050

Subsidies for FY 2022

	Normal	With renewable energy
EVs	¥450,000	¥600,000
PHVs	¥450,000	¥600,000
FCVs	¥1,100,000	¥1,350,000

◆ Accelerating the development of chargers essential for the spread of ZEVs

- Start subsidies for standard chargers at existing detached houses
- Start subsidies for ultra-fast chargers that shorten charging times with an output of 90 kW or more and charging equipment for small EV trucks
- Expand the scope of subsidies to parking lots not attached to facilities
- Promote the installation along with solar power generation equipment at apartment buildings



◆ Promoting the use of EV motorcycles

- Promote non-gasoline motorcycles from both supply and demand sides by soliciting the general public for further involvement in efforts to promote uptake of EV motorcycles, including sharing them, and through synergistic effects with subsidies for vehicles

Expanding the Use of Hydrogen Energy

Visions for 2050

▶ **CO_2-free hydrogen from renewable energy, or Green Hydrogen, as a pillar for realizing a decarbonized society**

2030 targets and the status quo

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
100%	100%	1 million	30 MW	300+	50%	150
40.2% (FY 2020)	—*1	Approx. 67,000 in total (FY 2020)	Approx. 2.5 MW in total (FY 2020)	108 in total (FY 2020)	2.3% (FY 2020)	22 (FY 2020)

- Most of the hydrogen currently produced is Gray Hydrogen, and Green Hydrogen has yet to become widespread. It is important to ensure more opportunities to use hydrogen generated from renewable energy and gradually make a shift to Green Hydrogen
- The locations of hydrogen stations are not evenly distributed. Hydrogen stations need financial support for development as they are expensive at the development phase as well as during operation

2030

2030 Carbon-Half Style

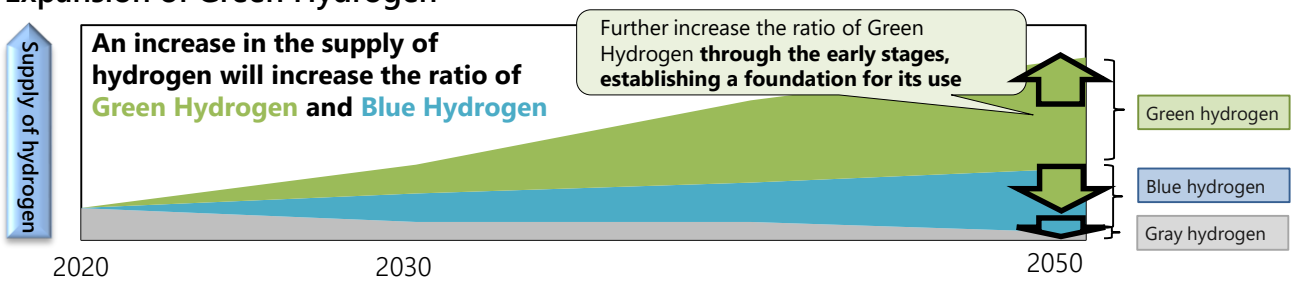
- Visions for social change -

- 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 Green Hydrogen etc. from 2030 onward

Basic concept for actions toward 2030

Ensuring the social implementation of hydrogen energy use in different fields, and expanding the introduction of Green Hydrogen in line with the expansion of renewable power at home and abroad

Expansion of Green Hydrogen*2



*1 Methods to identify real data for motorcycles are being considered

*2 Source: Global Hydrogen Review 2021, IEA

Efforts immediately accelerated and strengthened

Further accelerate the use of hydrogen by expanding hydrogen mobility and infrastructure

◆ Strongly encouraging the introduction of FC buses*1

- Virtually eliminate the majority of a business's payments for a newly introduced FC bus if they install or invite stations to their offices and accept general vehicles
- Provide more subsidies for the introduction of FC buses to a business that formulates a plan for introducing five or more FC buses within five years

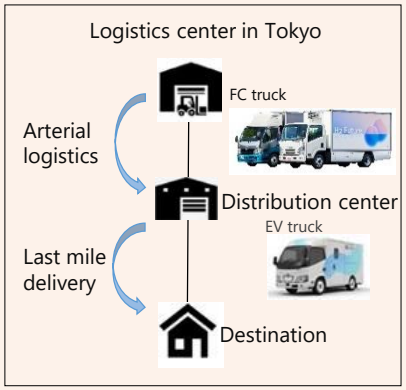
FC bus

◆ Accelerating the installation of hydrogen stations

- To help lower the price of hydrogen at stations that sell hydrogen to FC buses, start subsidies to compensate for the price difference between hydrogen and light oil
- Raise subsidy rates for land rent to mitigate land use costs
- Start subsidies for the installation of small hydrogen stations that can be set up in a limited space, such as that at gas stations
- Raise the upper limit of subsidies for the installation of hydrogen stations for buses

◆ Promoting the social implementation of FC mobility

- Accelerate the implementation in commercial domains by supporting the introduction of FC trucks*2
- Promote the expanded introduction of FC forklifts*3 through an on-site survey of their operation
- Promote the spread of fuel cell garbage trucks by operating them in the Tama Area




Fuel cell garbage truck

Formulate Tokyo Hydrogen Vision to make hydrogen more familiar

- Show the shape of a society driven by hydrogen energy and the direction we should aim for toward a decarbonized society so that Tokyo residents and businesses can envision such a society and create expectations

Accelerate efforts to promote the spread of hydrogen

◆ Creating more demand for hydrogen and raising awareness of hydrogen

- Improve the recognition and encourage the introduction of hydrogen by continuing support of the introduction of fuel cells and promoting equipment using hydrogen from renewable energy
- Develop effective awareness raising focusing on online content and events


© Toshiba Energy Systems

Note: **Color coding of hydrogen types**

- Green Hydrogen is produced by electrolyzing water using electricity derived from renewable energy
- 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
- Gray Hydrogen is made from fossil fuel, such as natural gas and petroleum

*1 Fuel cell buses
*2 Fuel cell trucks
*3 Fuel cell forklifts

Sustainable Resource Management

Zero Emission Tokyo Strategy - Policies 5 to 7

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

Visions for 2050

- ▶ **Establish the sustainable use of resources**
- ▶ **Plastic use with net zero CO_2**
- ▶ **Zero food waste through reduction and food recycling**

2030

2030 Carbon-Half Style

- Visions for social change -

Promotion of 3Rs:

- 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

Measures for plastics:

- Mainstreaming 2R* businesses, including selling by weight, sharing, and reusable containers * Reduce & Reuse
- Implementing closed-loop recycling through diversified and efficient collection/transportation routes and new technologies

Measures for food waste:

- Shift to a sustainable circular society focusing on curbing food waste
- Each entity taking the initiative and working together for further reduction actions

2030 targets and the status quo

Municipal solid waste* recycling rate	Incineration of plastic waste from households and large office buildings compared to FY 2017	Food waste compared to FY 2000
37%	**-40%** (approx. 400,000 tonnes)	**Halved**
23.1% (FY 2019)	**Approx. 700,000 tonnes** (FY 2019)	**-40.1%** (FY 2018)

- Municipal solid waste recycling rates have been flat for the last five years. The level of demand for waste treatment has risen due to changes in social structure and the impact of COVID-19
- There has been momentum in movements such as providing products in reusable containers and selling products by weight There will be further progress in recycling and controlled discharging under the newly promulgated Plastic Resource Circulation Act
- Under the impact of COVID-19, people's behavior and awareness regarding food waste have changed, as shown by the expanded use of takeout and attention to food banks' efforts

Basic concept for actions toward 2030

Creation of a new business through a collaboration between arterial and venous businesses

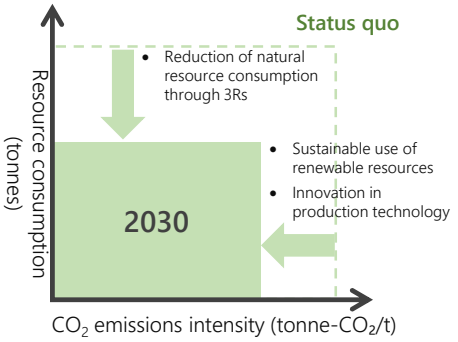
Support the commercialization of new businesses incorporating Reduce and Reuse as well as innovative recycling technologies

"Change the ways to make, sell (buy), and use things!"

Transition to sustainable consumption, production, and a circular economy

(1) Promote 3Rs to reduce natural resource consumption and curb food waste

(2) Reduce CO_2 in the product and food supply chains by keeping the use of renewable resources within a sustainable range



Efforts immediately accelerated and strengthened

Expand advanced efforts in society to promote the circular use of resources

◆ Opening the Tokyo Circular Economy Promotion Center (tentative name)

- As a collaborative center that provides information on sustainable resource management, offer a one-stop consultation service for Tokyo residents and businesses and coordinate effective efforts of different entities

Portal for information provision and exchange
- Survey circular economy initiatives
- Provide information to establish 2Rs

Promoting behavior change
Support behavior change promotion activities by various local entities

Consultation and matching
Give advice on reuse and food waste reduction at local eco events and restaurants

Holding symposiums
Widely share the results of this project at symposiums

◆ Strengthening a recycling system to separate a variety of plastics

- Provide financial and technical support to strengthen the efforts of municipalities to separately collect plastic products, in addition to plastic containers and packaging, whose recycling will be strengthened by law from April 2022

◆ Collaboration with advanced businesses

- Promote inter-business collaboration by supporting the efforts of voluntary business groups that aim to create a new business of sustainable plastic resource management
  - ✓ Promote the building of concrete projects for social implementation
  - ✓ Support technical verification and startup to implement the projects
  - ✓ Hold online seminars and business matching events

Re & Go
(Container sharing service)

Plastic film discharged from apparel businesses

Image of recycling bin for used bottles

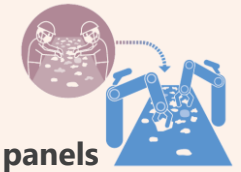
◆ Upcycling through Food × Technology

- Promote advanced circular use of food by taking advantage of Food x Technology to openly solicit upcycling businesses to make products with new added value from food that used to be discarded

Promote advanced treatment to achieve a higher-level circulation

◆ Creating a mechanism for waste treatment and recycling utilizing ICT and AI

- Realize more efficient and sophisticated processes utilizing robots and the latest technologies, and implement projects to diversify 3R routes through visual depictions of information



◆ Promoting the reuse and recycling of solar panels

- To build a reuse/recycling route, promote efforts toward advanced circular use of solar panels in cooperation with businesses related to different processes from removal to treatment

Revision of Sustainable Design Tokyo in September 2021

Basic concept: In order for Tokyo to maintain its vitality as a large city and develop as a society, we aim to build a society that uses resources in a sustainable manner and strengthen waste/recycling systems as part of the social infrastructure, taking into account social costs and environmental load

Program targets*	Status quo	FY 2025	FY 2030
Amount of municipal solid waste	4.41 Mt (FY 2018)	4.40 Mt	4.10 Mt
Final disposal volume of municipal solid waste and industrial waste	960,000 t (FY 2018)	820,000 t	770,000 t
Formulation rate of municipal disaster waste treatment plans	56.5% (FY 2020)	100%	–

* The goals shown on the previous page have been set in addition to these goals

Other Gases (Measures for Fluorocarbons)

Visions for 2050

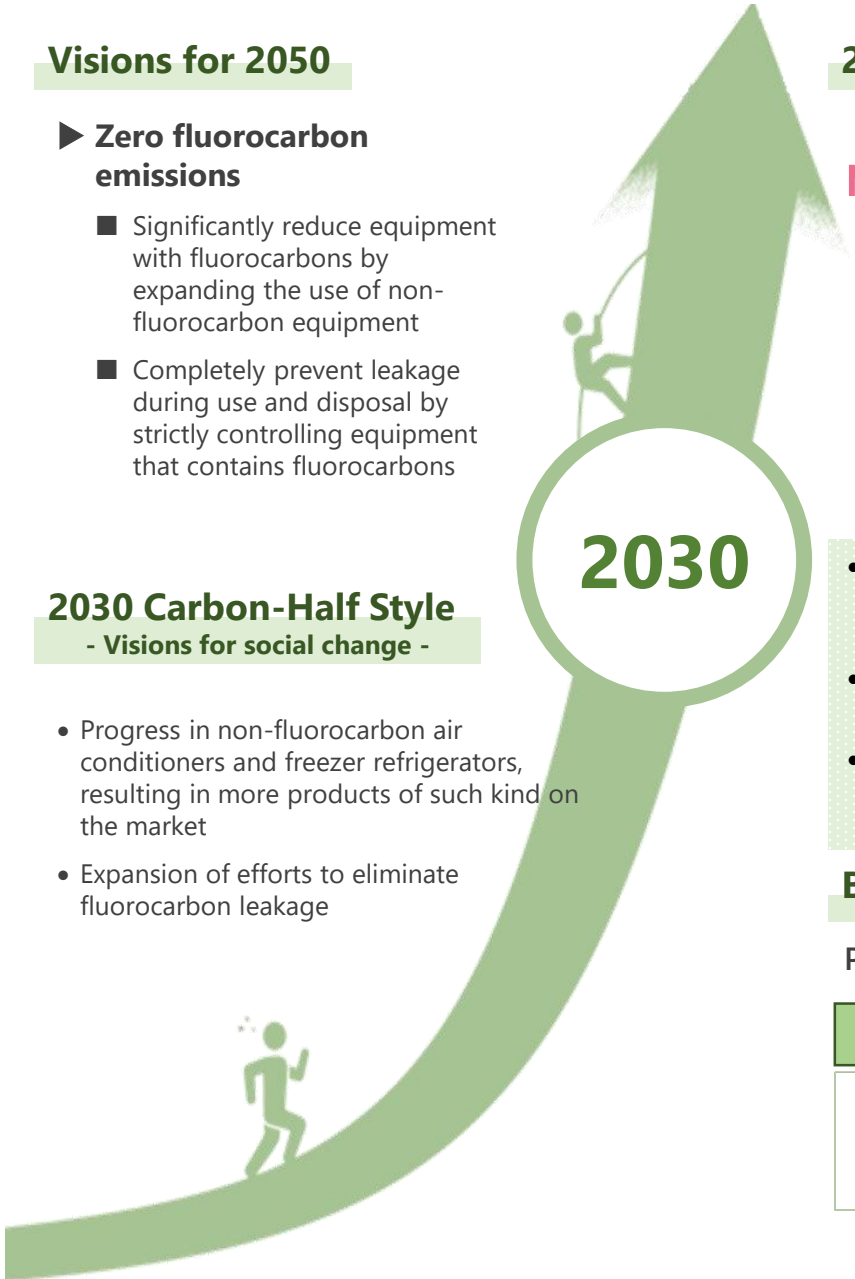
▶ **Zero fluorocarbon emissions**

- 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

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



2030 targets and the status quo

NEW

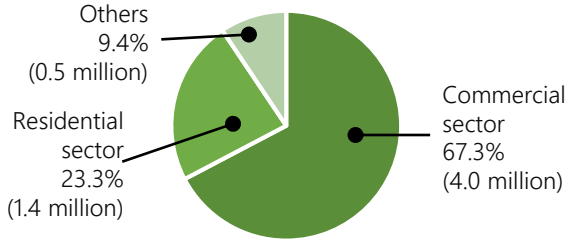
Hydrofluorocarbons (HFCs) emissions -65% (Reduced to approx. 1.4 million tonne-CO_2eq)

(* The target has been raised from -35% in enhanced measures)

HFC emissions in Tokyo **+50% (5.9 million tonne-CO_2eq)**

(preliminary results for FY 2019)

HFC emissions in Tokyo (tonne-CO_2eq)
(Breakdown in FY 2019)



- HFC emissions have increased in recent years with the progress of a shift from ozone-depleting HCFCs (hydrochlorofluorocarbons) to HFCs that do not destroy the ozone layer but still have an impact on global warming
- A challenge is the leakage that occurs when using aged or inadequately inspected or maintained equipment, and leakage caused by the disposal of equipment
- Since the development of non-fluorocarbon equipment is still limited and its cost is high, equipment with fluorocarbons is still the mainstream, hindering the introduction of non-fluorocarbon equipment

Basic concept for actions toward 2030

Promoting emission reduction measures throughout the life cycle

Manufacture/import	Use	Disposal
• Phasing out fluorocarbon production and consumption based on a treaty of the national government	• Ensuring equipment control by administrators • Shift to non-fluorocarbon equipment	• Ensuring the recovery of fluorocarbons • Recycling/destruction by the national government

Efforts immediately accelerated and strengthened

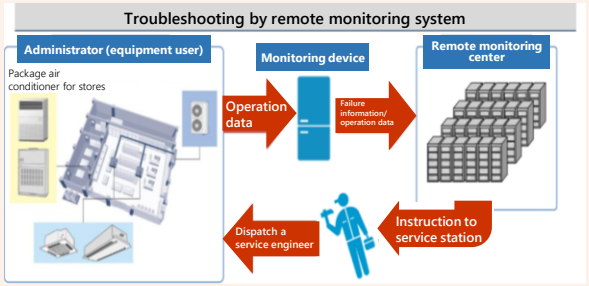
Enhance the proper management of commercial equipment and the expanded use of non-fluorocarbon equipment

◆ Measures for the use of equipment

- Provide businesses lacking awareness of the law with the relevant information through seminars and other opportunities, according to their business categories and levels of understanding of law
- Consider efforts that are expected to be particularly effective for each business type, and disseminate them to businesses in Tokyo, implementing measures and on-site guidance for businesses with large amounts of emissions first
- Promote efforts to reduce emissions by utilizing new technologies, such as an early detection of fluorocarbon leakage with IoT tools

Example of IoT tools

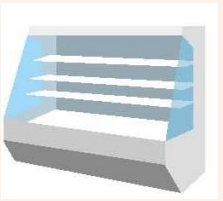
Remote monitoring using a controller, leakage detection using an ultrasonic sensor



Source: Status of Hydrofluorocarbons and Actions Taken for Them, Ministry of Economy, Trade and Industry and Ministry of the Environment, https://www.meti.go.jp/shingikai/sankoshin/seizo_sangyo/kagaku_bussh itsu/flon_godo/pdf/010_01_00.pdf

◆ Spread of non-fluorocarbon products

- Promote support and other initiatives for the expansion of non-fluorocarbon equipment in line with its development trends
- Disseminate management methods for the safe and secure use of toxic or flammable natural refrigerants that are often used in non-fluorocarbon equipment



◆ Measures for the disposal of equipment

- Ensure the recovery of fluorocarbons when equipment is disposed of by raising the awareness of all stakeholders, including administrators, dismantlers, and site workers
- Take more rigorous action against malicious businesses and implement efforts to eradicate illegal release of fluorocarbons

Topics in FY 2021

Guidance and crackdown by TMG fluorocarbon inspectors

TMG provides guidance on leakage of fluorocarbons. Through the efforts of the fluorocarbon inspectors, we aim for zero leakage of fluorocarbons at the time of disposal.

In November 2021, the first arrests for violating the Act on Rational Use and Proper Management of Fluorocarbons were made of an administrator and dismantler in a collaboration between TMG and the Metropolitan Police Department.

Promote the proper disposal of home appliances according to law

- Raise consumers' awareness about completing proper disposal according to the Act for Recycling of Specified Kinds of Home Appliances
- Crack down on illegal recovery operators and scrap dealers

Climate Change Adaptation Measures

Visions for 2050

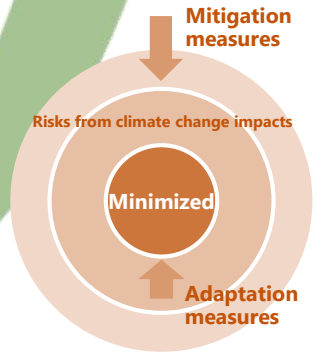
▶ Minimize risks from climate change impacts

■ Realize a city that protects the lives and property of Tokyo residents as well as continues to attract people and businesses

* Initiatives developed in the five fields in light of the impacts of climate change

Natural disasters	The environment in place is able to avoid or mitigate flood inundations and landslides caused by heavy rains or typhoons
Health	Adverse health effects due to temperature rise, including heatstroke and infectious disease as well as health problems due to air pollution, are minimized
Agriculture, forestry, and fisheries	Agriculture, forestry, and fisheries industries resilient to temperature rise and disasters, such as typhoons, are realized
Water resources and the water environment	Risks, such as droughts and deterioration of water quality, are reduced, and a stable supply of high-quality water and a comfortable water environment are realized
Natural environment	Impacts on biodiversity are minimized, and the luxuriant natural environment is safeguarded

2030



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

2030 targets and the status quo

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)

It is necessary to consistently promote the adaptation measures based on the Tokyo Climate Change Adaptation Plan formulated in March 2021 and the Tokyo Climate Change Adaptation Center established in January 2022.

Tokyo Climate Change Adaptation Plan formulated in March 2021

Objectives

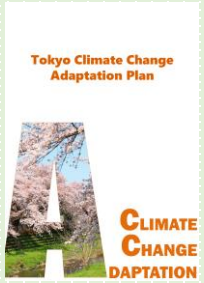
- Avoid or reduce as much as possible the impacts on or damage to the lives of Tokyo residents and the natural environment in a broad range of fields, including natural disasters, human health, and agriculture, forestry, and fisheries
- Realize a robust city that protects the lives and property of Tokyo residents by developing policies in line with the concept of a sustainable recovery, incorporating perspectives, such as the promotion of DX, in addition to the ideas indicated in the Tokyo Climate Change Adaptation Policy

Positioning

- Local Climate Change Adaptation Plan based on Article 12 of the Climate Change Adaptation Act

Implementation system

- Establish the Tokyo Climate Change Adaptation Plan Promotion Council as a promotional system throughout TMG
- Establish the Tokyo Climate Change Adaptation Center



For more information:

Basic concept for actions toward 2030

Strongly promoting adaptation measures based on the Tokyo Climate Change Adaptation Plan

Efforts immediately accelerated and strengthened

Strong promotion of efforts and active provision of information

◆ Promoting all-out efforts throughout TMG

Promote adaptation measures in all fields by strengthening cooperation with bureaus involved through the Tokyo Climate Change Adaptation Plan Promotion Council

◆ Collection and provision of information

Actively provide information to encourage efforts of Tokyo residents and businesses by collecting, organizing, and analyzing information on the status and impacts of climate change in cooperation with the Climate Change Adaptation Center

◆ Providing support and advice to municipalities

Provide support for municipalities that formulate climate change adaptation plans, and give advice via the Climate Change Adaptation Center as necessary

Tokyo Climate Change Adaptation Center
established in January 2022

- Established based on Article 13 of the Climate Change Adaptation Act and the Tokyo Climate Change Adaptation Plan
- Established in the Tokyo Metropolitan Research Institute for Environmental Protection of the Tokyo Environmental Public Service Corporation

Main roles

- Collect, organize, and analyze information on climate change impacts and adaptation to climate change, and share the information with organizations involved
- Provide information and advice to local governments in Tokyo and raise awareness of Tokyo residents

Tokyo Metropolitan Research Institute for Environmental Protection

Main efforts in each field

Natural disasters

- In response to natural threats, such as floods, inland floods, storm surges, and landslides due to intensified heavy rains and typhoons, promote the utilization of state-of-the-art technologies and the development of urban facilities in both structural and non-structural aspects
  - Development of revetment and regulating reservoirs along rivers
  - Promoting the removal of utility poles
  - Flood control in subways
  - Improved provision of information on water disaster preparedness

Health

- Implement preventive and ex-post measures to minimize adverse health effects due to temperature rise, such as patients with heat stroke or infectious diseases and health hazards caused by air pollution
  - Creation of cool spots
  - Construction of heat blocking pavement etc.
  - Development and utilization of smart poles
  - Measures for mosquito-borne infectious diseases
  - Measures for PM2.5 and photochemical oxidants

Agriculture, forestry, and fisheries industry

- 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
  - Promotion of Tokyo-Style Smart Agriculture
  - Development of forests resistant to forest disasters
  - Development of marine product supply infrastructure

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
  - Conservation and management of water conservation forests
  - Development of facilities to capture initial stormwater mixed with sanitary sewage
  - Improvement of quality of treated water

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
  - Revision of a local biodiversity strategy
  - Expansion of conservation areas to protect valuable biodiversity
  - Reforestation in the Tama area
  - Creation and conservation of greenery
  - Proper management of wildlife

Engagement and Inclusion

Work together to confront the impending climate crisis through engagement and inclusion

A Zero Emission Tokyo cannot be achieved by TMG's administrative capability alone.

It is necessary to acknowledge the climate crisis we are facing, take effective measures, call for collaboration with Tokyo residents, businesses, and organizations while eliciting their cooperation, and work together to confront the climate crisis.

To solve the global issue of climate crisis, cities have to take leadership and join forces to take action in an era when more than half of the world's population lives in cities.

2030

Basic concept for actions toward 2030

Cooperate with various actors in movements and reform of social systems

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

Strengthen cooperation with local municipalities

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

TMG's initiatives for its own sustainability

* See pages 32 and 33 for main efforts and other information

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

Strengthen cooperation with cities and non-states actors around the world

Cooperation with various actors for decarbonization enhanced with the world accelerating climate actions

Promote sustainable finance

Realizing a leading sustainable finance city

- We have carried out a variety of initiatives, such as cooperation with businesses and municipalities, and provision of information overseas but still need to enhance and strengthen our efforts to create further engagement and inclusion

Major efforts in FY 2021

Making efforts toward closed-loop recycling that provides virgin-quality recycled resin through the Bottle-to-Bottle Tokyo Project in collaboration with the beverage industry

Quadruple recycling bin

Supporting the efforts of municipalities toward decarbonization by adding an assistance menu to realize a Zero Emission Tokyo to a project for revitalizing local environmental power

New menus for FY 2021

- ✓ Project for Promoting the Planning of the Realization of a Zero Emission Tokyo
- ✓ Project for Promoting the Reuse of Energy Efficient Home Appliances

Developing the climate action movement from Tokyo in the spirit of the "TIME TO ACT" slogan in collaboration with C40 and ICLEI

CLIMATE ACTION FORUM

(October 2021)

- Holding high-level sessions and workshops on hydrogen and buildings with the theme of accelerating actions toward a 2030 Carbon Half
- Communicating concrete actions to the rest of the world immediately before COP26

Announcing the "Global Financial City: Tokyo" Vision 2.0 centered on the Tokyo Green Finance Initiative (TGFI), a strategic initiative to develop green finance in Tokyo (November 2021)

Efforts immediately accelerated and strengthened

Bring together the power of Tokyo through engagement and inclusion

◆ Encouraging the engagement and inclusion of all entities

- Enhance the engagement with ambitious businesses and organizations to further accelerate a movement for decarbonization actions

◆ Promoting environmentally friendly behavior at home with the participation of children

- Implement the "Director General, Bureau of Environment, in My Home" project, in which children play a leading role to enjoy efforts for energy efficiency, waste reduction, and food waste reduction at home

◆ Strong promotion of decarbonization by municipalities and TMG working together

- Develop support tailored to municipalities' needs
- Promote collaboration between local governments in Tokyo, including horizontal development of effective efforts
- Significantly expand subsidies to municipalities that introduce self-consumption renewable energy equipment contributing to improving regional disaster preparedness (repeat from page 16)

◆ Strengthening cooperation with cities and non-state actors around the world

- Strengthen exchanges with international networks to contribute to the decarbonization of the world
- Provide more information overseas to improve TMG's presence in climate actions
- Strengthen and expand TMG's initiatives by collecting advanced examples from overseas cities to learn from each other

◆ Strong promotion of TGFI

- Create a virtuous cycle of the environment and economy from Tokyo to promote greening of the urban system and financial system at the same time

Zero-carbon cities spreading in Tokyo

✓As of the end of January 2022, 24 municipalities in Tokyo declared their intention to become Zero Carbon Cities with the aim of net zero CO_2 emissions by 2050. Source: Ministry of the Environment website

✓In FY 2021, the special wards started joint efforts to realize Zero Carbon Cities - Special Wards

Bold Acceleration of TMG's Initiatives for Its Own Sustainability

With "**Let's Start from Here**" in mind, TMG will **boldly accelerate its own initiatives to foster the understanding and cooperation of Tokyo residents and businesses**. TMG will **take the lead in reform as a large-scale business** that consumes a lot of energy and resources.

Promotion of efforts based on the Zero Emission TMG Action Plan (FY 2020 to 2024)

- ✓ **Significantly raise the targets of solar power generation installation (FY 2024)** to accelerate their installation at TMG facilities
- ✓ Promote decarbonization actions by bureaus of TMG by setting forth a range of targets and efforts toward FY 2024 as a waypoint to 2030

Main targets:

NEW Total amount of solar power generation installed at TMG facilities (governor's bureaus/departments)
12 MW
→ 20 MW

Greenhouse gas emissions at TMG (governor's bureaus/ departments) compared to FY 2000
Reduced by 40%

Energy consumption at TMG (governor's bureaus/departments) compared to FY 2000
Reduced by 30%

Renewable power used at TMG facilities (governor's bureaus/ departments)
Approx. 50%

TMG-owned non-gasoline passenger cars
100%
* Except special-purpose vehicles

Installation of public chargers at TMG facilities
300+

Incineration of plastic waste from the TMG city hall compared to FY 2017
Reduced by 20%

Bold strengthening of all efforts throughout TMG to further accelerate actions

Summary of strengthened and expanded efforts

- ✓ To make maximum use of the potential of public facilities, **accelerate the installation of solar power generation equipment at existing facilities in addition to those newly constructed or renovated**
- ✓ Leading the way for private buildings, take the initiative in **realizing zero emission buildings by maximizing the introduction of energy efficiency technology and renewable energy equipment**
- ✓ To strongly promote the spread of ZEVs, **introduce chargers to TMG facilities with 10 or more parking spaces in principle**

Efforts immediately accelerated and strengthened

Expanding the installation of solar power generation equipment

Installation to all applicable TMG facilities by 2030

- Formulate panel installation guidelines for existing facilities to install them at applicable TMG facilities first, including 50 facilities under governor's bureaus/departments, police department buildings, fire department facilities, and metropolitan schools
- Update the target for installing solar panels at TMG facilities under governor's bureaus/departments
  Total amount of installation from 12 MW to 20 MW by FY 2024

Use a new method to install large-capacity solar panels at Tokyo public housing ahead of others and optimize the method for extensive installation in the future

Realization of zero emission TMG facilities

- At the time of new construction or renovation, maximize the introduction of energy efficiency technology and renewable energy equipment indicated in the Tokyo Energy Savings & Renewable Energy Specifications
- Formulate new Energy Efficiency Renewal Standards that define energy efficient operations and their effects to increase energy efficiency at existing facilities

Tokyo Metropolitan Archives

Promoting ZEV introduction

© Nissan Motor Co., Ltd. © Honda Motor Co., Ltd.

Replacement of TMG-owned vehicles
Replacement of all TMG-owned vehicles* with non-gasoline counterparts * Except special-purpose vehicles
Passenger cars by FY 2024/motorcycles by FY 2029

- Replace passenger cars with ZEVs in principle when updating (Metropolitan Police Department, Bureau of Environment, etc. in FY 2022)
- Switch to EV motorcycles (Metropolitan Police Department, Tokyo Fire Department, etc. in FY 2022)
- Introduce additional FC buses to the Toei Bus Lines (80 in total by FY 2024)

Infrastructure development

- Formulate a policy for installing public chargers at TMG facilities to accelerate the introduction (More than 300 in total by FY 2024)
- Increase the number of hydrogen stations by utilizing TMG-owned land (Demonstration of charging with a mobile hydrogen station and an awareness raising project to be conducted in FY 2022)

Promoting the procurement of renewable power

Switching all electricity used at TMG facilities (governor's bureaus/departments) to renewable power by 2030

- Expand the scope of the TMG Power Plan that utilizes renewable power generated in Tokyo

Circular use of resources

Measures for plastic waste
Reducing incineration of plastic waste from the TMG city hall (20% reduction by FY 2014 compared to FY 2017)

- Start the Bottle to Bottle Project at TMG facilities
- Promote sophisticated plastic recycling in the wholesale market

Measures for food waste

- Control food waste in restaurants and shops
- Utilize soon-to-expire emergency food at food banks

Lifeline facilities

Water facilities

- Introduce solar power generation equipment and small hydropower generation equipment at purification plants and water supply stations
- Replace water transmission/distribution pump equipment with an energy-efficient counterpart

Sewerage facilities

- Introduce an energy self-sustaining sludge incinerator
- Introduce energy-efficient equipment in the water treatment and sludge treatment processes

TOPIC Consumption-Based Greenhouse Gas Emissions in Tokyo

What are consumption-based greenhouse gas (GHG) emissions?

Consumption-based GHG emissions indicate how much GHG is emitted based on consumption in Tokyo, regardless of whether production is carried out in Tokyo or not.

Consumption, production, and disposal in Tokyo heavily depend on other regions. It is essential to contribute to reducing the emissions toward the realization of a decarbonized society.

Estimate of consumption-based GHG emissions

According to an estimate of consumption-based GHG emissions in Tokyo,

Consumption-based GHG emissions related to final demand in Tokyo in 2015 were approximately 210 million tonne-CO_2

* Production-based GHG emissions were approximately 80 million tonne-CO_2

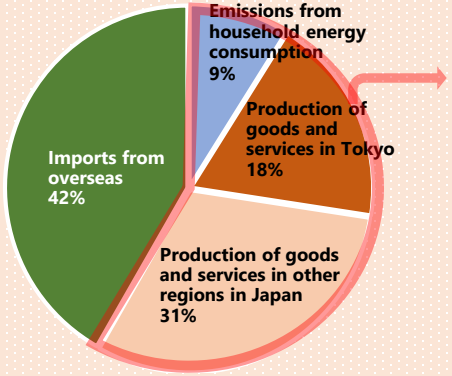
The breakdown of consumption-based GHG emissions indicates that the emissions from the secondary industry outside Tokyo, the material industry in particular, are large, while the emissions from the tertiary industry account for a large proportion in the production in Tokyo.
For the final demand by sector,

Per capita emissions related to household consumption expenditures in Tokyo are 7.6 tonne-CO_2/person

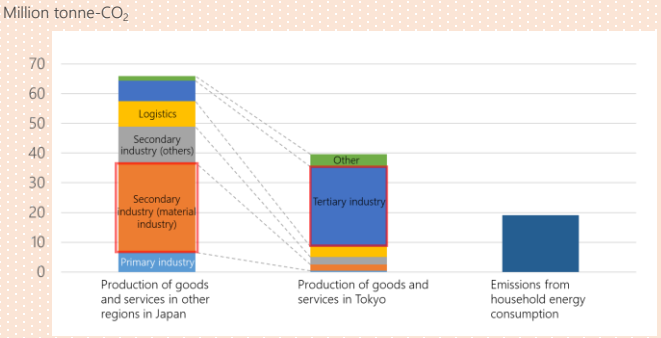
This suggests that Tokyo has low emissions related to transportation.

To realize a Zero Emission Tokyo that will contribute to achieving net zero CO_2 emissions worldwide, it is necessary to develop efforts with these characteristics in mind.

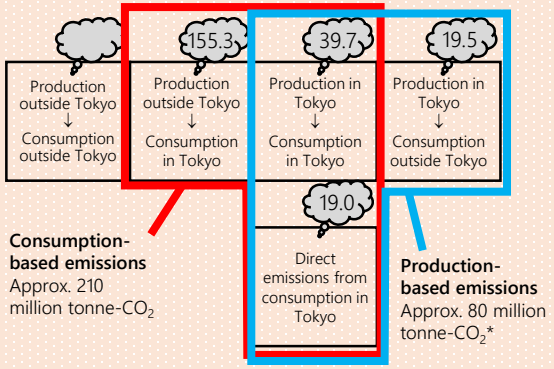
Breakdown of consumption-based GHG emissions in Tokyo



Analysis excluding imports from overseas

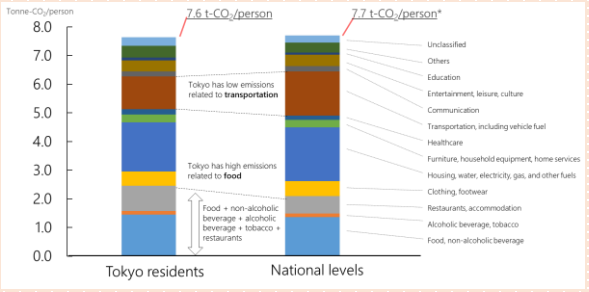


Relationship between consumption-based GHG emissions and production-based GHG emissions



* It does not match the result of the greenhouse gas emission survey in Tokyo, approximately 70 million tonne-CO_2, due to the differences in the intensity used and other reasons

Per capita consumption-based GHG emissions



* The value is estimated as 7.6 tonne-CO_2/person in the Annual Report on the Environment 2020, Ministry of the Environment

TOPIC The Link between Biodiversity and Climate Change

What is biodiversity?

Biodiversity is something irreplaceable created over long periods through a variety of lifeforms, including human beings, creating immeasurable benefits essential for our lives. (See "Four ecosystem services" on the right)

However, biodiversity has been deteriorating due to a variety of factors, including four crises:

Four crises

First crisis
Decline and extinction of species, reduction of habitats due to development and overhunting/overfishing

Second crisis
Crisis due to reduced care afforded to the natural environment

Third crisis
Disruption of the ecosystem due to the introduction of alien species

Fourth crisis
Crisis (climate change) due to changes in the global environment

Four ecosystem services

Provisioning Services
Supply the resources needed for our daily lives, such as food, wood, water, and medicine

Regulating Services
Bring about an environment where we can live a healthy and safe life by adjusting the climate, reducing heavy rain damage, and purifying water

Cultural Services
Provide artistic and cultural inspiration, educational effects, and peace of mind and body through contact with nature

Supporting Services
Support the above three services by serving as the basis for the survival of humans and all other life, which provides oxygen generation by photosynthesis, soil formation, and nutrient cycling

Comprehensive solution to biodiversity and climate change issues

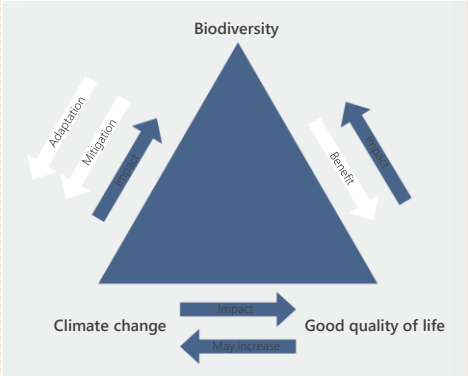
Regarding the relationship between them, the IPBES*-IPCC Co-Sponsored Workshop Report says:

- Limiting global warming to ensure a habitable climate and protecting biodiversity are mutually supporting goals, and their achievement is essential for sustainably and equitably providing benefits to people.
- Several land- and ocean-based actions to protect, sustainably manage and restore ecosystems have co-benefits for climate mitigation, climate adaptation and biodiversity objectives.

The realization of a sustainable city requires more integrated efforts to solve biodiversity and climate change issues.

* IPBES stands for Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

Relationships between climate change, biodiversity, and good quality of life



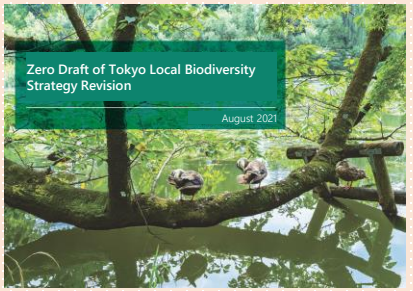
Blue arrows represent interactions that are predominantly threats, white arrows predominantly opportunities

Source: IPBES-IPCC Co-Sponsored Workshop Report on Biodiversity and Climate Change

Zero Draft of Tokyo Local Biodiversity Strategy Revision

TMG is considering a revision of its Local Biodiversity Strategy based on the Basic Act on Biodiversity.

In August 2021, we combined the status quo and challenges of biodiversity in Tokyo and future visions to be aimed for into a zero draft and solicited opinions from Tokyo residents and businesses.



Imagined Community in 2050

REALIZING A ZERO EMISSION TOKYO

The year 2030, the target year for “Carbon Half,” is right around the corner.

Society in 2030 will shape the future of society in 2050.

Tokyo residents, businesses, and organizations all have to share the sense of crisis and promote social reform toward decarbonization.

TIME TO ACT—Let's move forward together to realize a sustainable recovery and make our future sustainable and prosperous.

Realize a Decarbonized Society to Open up a Bright Future

Strongly promote efforts in each field by shifting into high gear

Decarbonization in all fields, such as business, civic life, and urban development, is indispensable to realize “Carbon Half.”

We will promote our efforts in an agile manner, bringing in ideas from all fields and perspectives, such as social and urban activities, as well as encouraging the utilization of digital technology, technological innovation for decarbonization, and social implementation of existing and advanced technologies.

Linkage with other fields is an important factor in advancing efforts.
We will promote effective efforts in consideration of synergies and trade-offs, including biodiversity and air quality.

Through discussions at the Environmental Council, we will continue to examine the revision of the Environmental Master Plan and Tokyo Metropolitan Environmental Security Ordinance and listen to the opinions of Tokyo residents, businesses, and experts to accelerate our efforts.

Create a sustainable city by involving all entities

A decarbonized society cannot be realized by administrative capability alone.
We will bring together all the power of Tokyo by promoting efforts to deepen the understanding of Tokyo residents, businesses, and organizations, including children and young people who will lead the future, and deepening cooperation and engagement with a range of actors who have the same aspirations for the realization of a decarbonized society.

Climate change measures contribute to solving social issues, such as security of health, livelihood, resources, and food, and are important factors to achieve the Sustainable Development Goals (SDGs).
From the perspective of co-benefits, we will strengthen collaboration in various policy fields to promote our efforts.
Recovery from the COVID-19 crisis should not mean just returning to our previous state—
what TMG is promoting is a sustainable recovery.

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

Consideration by the national government is also accelerating, indicated by the revision of the Basic Energy Plan and discussions on the shape of energy efficiency measures for houses and buildings in the future and that of the building code program toward a decarbonized society.

We will continue to urge the national government to play a leading role in the realization of a decarbonized society, including the strengthening of measures for renewable energy and energy efficiency in buildings
as well as further technology development.

Zero Emission Tokyo 1.5

TOKYO METROPOLITAN GOVERNMENT