Zero Emission Tokyo

A decarbonization strategy to realize a Tokyo that serves as a pioneer for the future and continues to light the way

Zero Emission Tokyo Strategy

Outline of Zero Emission Tokyo Strategy

Trends in Climate Change
Climate Crisis and Paradigm Shift of Climate Change Measures

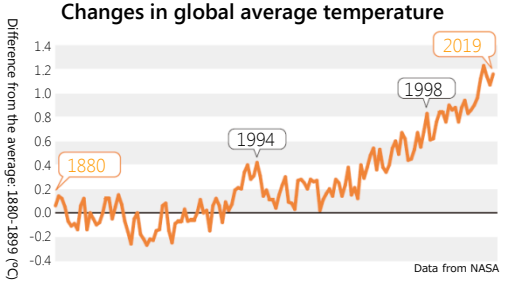
- Along with an increase in CO_2 emissions, the impacts of climate change, such as extreme weather, have increased on a global scale. The world, Japan, and **Tokyo are facing a climate crisis**.
- As the world shifts from low carbon to decarbonization, Tokyo also has to boldly and quickly move toward decarbonization by drastically changing society as a whole to fulfill its responsibility as a large city and achieve sustainable growth.
  *We are in **a historical turning point** in the climate change measures: **Paradigm shift**.

A rise in global average temperatures and crisis of climate change affecting daily lives

The global average temperature has already risen by approximately 1ºC

Global warming has accelerated in recent years

Changes in global average temperature



Impacts of major weather disasters in the world and Japan

Texas, USA (Aug. 2017) — Hurricane Harvey
$125 billion economic losses (¥13,687.5 billion)


©NASA

Western Japan (July 2018) — Heavy rains
237 deaths due to economic difficulties
¥1,158 billion damage


©OKAYAMA FIRE DEPT.

California, USA (Aug. 2018) — Forest fires
Over **185,000** ha burnt (Approx. 3 times Tokyo's 23 wards)


©U.S. Forest Service

Throughout Japan (Oct. 2019) — Typhoon No. 19
Over **90,000** houses damaged


©Geospatial Information Authority of Japan

Around the Himalayas — Melting glaciers
Affecting over **20%** of the world's population


©K. CHIKITA Department of Earth and Planetary Sciences, Faculty of Science, Hokkaido University

Throughout Japan (2018) — Heatstroke
More than **95,000** patients seeking emergency care

If we do not take any measures against global warming...

In 2100, the world will see:

Annual GDP	**Loss of approx. 12%**[1]

Reference: Global GDP in 2018 was approximately 9,279 trillion yen.[2]

1 Source: Integrated Report "Investing in Climate, Investing in Growth," OECD (Organisation for Economic Co-operation and Development)
2 Source: Calculated using the closing price $1 = ¥109.5 at the end of November 2019, based on figures from the IMF-World Economic Outlook Databases (April 2019)

Non-state actors moving ahead of national governments, stimulated by the Paris Agreement

Paris Agreement

Agreement on a global common, long-term goal of holding the increase in the global average temperature to well below 2ºC above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5ºC

Moving cities and economy

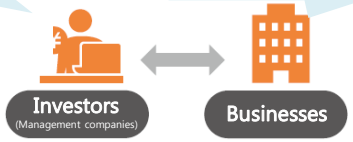
Aiming for net zero CO_2 emissions by 2050

- ✓ 398 cities
- ✓ 789 businesses
- ✓ 16 investors
  * Announced at COP25 on Dec. 11, 2019

Movement by businesses

Evaluate businesses' goals and efforts, including climate change measures, before investing.

Take climate change measures, reduce risks and acquire opportunities and investments in business development.



Purchase environmentally conscious products and services.

IPCC Special Report on Global Warming of 1.5°C

Pursuing the 1.5ºC target of net zero CO_2 emissions by 2050

- ✓ The global average temperature has already risen approximately 1ºC compared to pre-industrial levels. If greenhouse gases are emitted at the current pace, it will rise to 1.5ºC as early as around 2030.
- ✓ Climate change risks are lower with a 1.5ºC rise than a 2ºC rise.
- ✓ To keep the temperature rise at 1.5ºC, CO_2 emissions need to be reduced to net zero by 2050.
- ✓ Limiting to 1.5ºC has a synergistic effect of achieving the Sustainable Development Goals (SDGs), such as eradicating poverty and eliminating inequalities between people as well as countries.

1.5ºC rise		2ºC rise
14%	World population suffering severe heat wave at least once every 5 years	37%
Once every 100 years	Arctic summer without sea ice	Once every 10 years
26-77 cm	Sea level rise by 2100	10 cm higher than the case of 1.5ºC
1.5 million tonnes	Loss of fisheries	3 million tonnes
70-90%	Disappearance of coral reefs	99% or more

As the world faces a climate crisis, Tokyo will **pursue efforts to limit the temperature increase to 1.5ºC. By achieving a Zero Emission Tokyo by 2050**, Tokyo will assume responsibility as a global megacity having a major impact on the use of energy and resources and contribute to the realization of net zero CO_2 emissions in the world.

Formulation of **Zero Emission Tokyo Strategy**
Visions, Specific Efforts, and Roadmap for Realizing a Zero Emission Tokyo

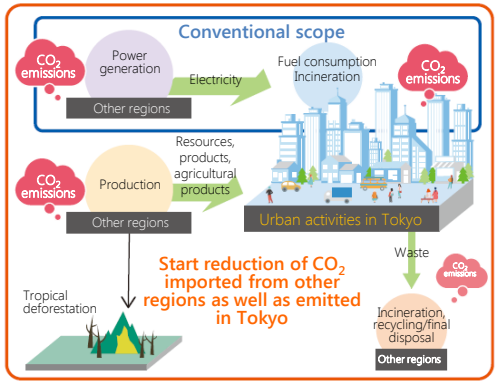
Declaration of Tokyo's Climate Crisis Mobilization

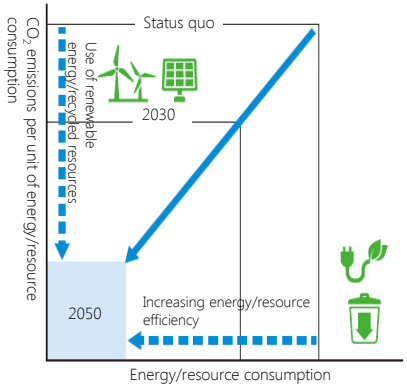
TMG recognizes that we are currently facing a climate crisis, and will implement concrete policies and effective measures. We call for the understanding and cooperation of all of Tokyo's citizens, and declare that we will continue to stand against this climate crisis.

Key point – Three perspectives of the strategy

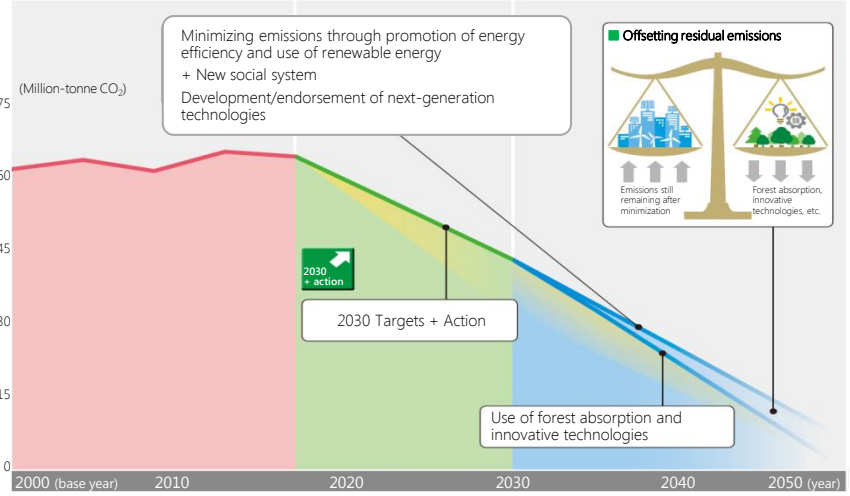
- ✓ **Comprehensively develop mitigation measures** to halt climate change and **adaptation measures** to prepare for the impacts of climate change that have already begun to occur.
- ✓ **Fully incorporate the sustainable resource management into climate change policy** to contribute to CO_2 reductions imported from other regions.
- ✓ **Strengthen efforts in all fields**, such as sustainable management of materials including plastics and measures for the automotive environment, in addition to measures to expand energy efficiency and renewable energy.

Scope of CO_2 emissions reductions envisaged by Tokyo and image of minimizing emissions





Roadmap for CO_2 emissions by 2050



Efforts toward low carbon → **Efforts toward decarbonization**

2017 performance	2030 targets	2050 goals
4.2% increase in CO_2 emissions	**30% reduction + action**	**Net zero CO_2 emissions**
● Pursue efforts to limit the temperature increase to 1.5°C, taking into account the increasing severity of climate change and the urgency of countermeasures. ● Recognize the climate crisis and formulate a strategy to take action.	● Advance and accelerate initiatives, such as energy efficiency and renewable energy, to take action that exceeds 2030 targets. ● Set new goals and develop prioritized initiatives for urgent issues such as the promotion of ZEVs and measures for plastics. ● Contribute to the reduction of CO_2 caused by resource use outside Tokyo.	● Encourage the development and endorsement of a new social system and next-generation technologies. ● Offset emissions still remaining after minimization through forest absorption and by developing innovative technologies.
Formulate the Zero Emission Tokyo Strategy	Advance and accelerate action during the crucial 10 years until 2030	Aim for net zero emissions in Tokyo and contribution to decarbonization in the world

Policy Organization for the Zero Emission Tokyo Strategy

- Taking into account the characteristics of Tokyo, organize prioritized fields into **6 sectors and 14 policies.**
- Provide visions or **goals** to aim for by 2050 and **targets** to be achieved by 2030 for each policy, **2030 Targets + Action** (specific efforts advanced and accelerated to exceed the 2030 targets), systems and innovations necessary for a dramatic leap from 2030 onwards.

Six sectors to promote specific efforts

* Formulate **individual plans and strategies** for fields requiring prioritized measures.

Realization of a Zero Emission Tokyo

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 (ZEV)	Formulation of ZEV Promotion Strategy
IV	Resource/industry sector	(5) 3Rs (6) Plastics (7) Food waste (8) Fluorocarbons	Formulation of Plastic Strategy
V	Climate change adaptation sector	(9) Strengthening adaptation measures	Formulation of Climate Change Adaptation Policy
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	

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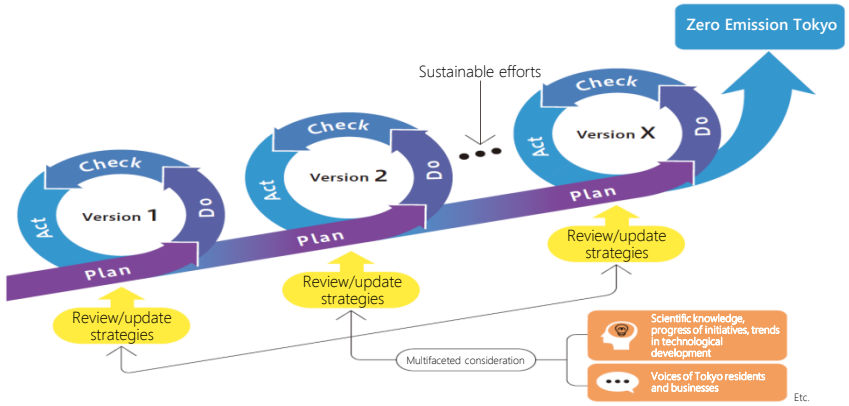
Roadmap for each policy

Upgrading strategies

Improve goals and initiatives taking into account scientific knowledge and trends in technological development.



Goals, Milestones, and Main Actions for Each Policy – Strategies I to III

	- Goal -	- Milestone -	- Actions -
	Visions for 2050	**Key targets toward 2030**	**2030 Targets + Action**
Make renewable energy a major energy source 	■ **All** energy used to be **decarbonized**	■ Power generated by renewable energy used at **all** TMG facilities ■ Installation of **1.3-GW** solar power generation equipment ■ Percentage of power generated by renewable energy increased to **30%** ■ Energy consumption **reduced by 38%** compared to 2000	■ Promote the TMG Power Plan that uses post-FIT electricity generated in Tokyo at TMG facilities ■ Promote self-consumption of solar power by subsidizing introduction of solar panels and storage batteries ■ Establish power purchase agreement (PPA) that lead to introduction of new renewable equipment using the scale of procurement by businesses or administrations ■ Build a business model to promote household-basis group buying of renewable power
Expand the use of hydrogen energy 	■ **CO_2-free hydrogen generated from renewable energy** as a pillar in realizing a decarbonized society	■ **1 million** residential fuel cells ■ Commercial and industrial fuel cells of **30 MW** ■ **300 or more** zero emission buses ■ Market share of ZEVs increased to **50%** of new passenger car sales ■ **150** hydrogen stations	■ Support adoption and endorsement of residential, commercial, and industrial fuel cells ■ Support introduction of equipment using hydrogen generated from renewable energy and use CO_2-free hydrogen generated from RE in Fukushima Prefecture ■ Foster movement through public-private partnerships, such as the Tokyo Hydrogen Promotion Team
Expansion of zero emission buildings 	■ **All buildings** in Tokyo to be **zero emission buildings**	■ Greenhouse gas emissions **reduced by 30%** compared to 2000 ■ Energy consumption **reduced by 38%** compared to 2000 ■ Percentage of power generated by renewable energy increased to **30%**	■ Increase the number of zero emission facilities through the Tokyo Cap & Trade Program, Tokyo Green Building Program, etc. ■ Support introduction of the Tokyo Zero Emission House specification which ensures energy efficient performance to make it widely adopted ■ Encourage switching to high-energy efficient home appliances ■ Promote energy management utilizing AI and IoT
Formulation of ZEV Promotion Strategy **Promote the spread of ZEV** 	■ **All** cars driven in Tokyo to be **ZEVs**	■ Market share of ZEVs increased to **50%** of new passenger car sales ■ **300 or more** zero emission buses ■ New small route buses for sale limited to **ZEVs** in principle ■ ZEV infrastructure development (**1,000** EV fast chargers, **150** hydrogen stations)	■ Support purchase of ZEVs by individuals and businesses and introduction of large ZEVs including buses ■ Support development of ZEV infrastructure to put it in place, introduce a mechanism to encourage charger installations ■ Use promotion teams based on public-private partnerships to foster momentum and encourage development

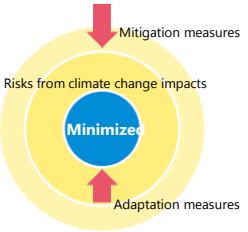
Goals, Milestones, and Main Actions for Each Policy – Strategies IV and beyond

	- Goal - Visions for 2050	- Milestone - Key targets toward 2030	- Actions - 2030 Targets + Action (2030 + action)
3Rs 	■ **Sustainable use of resources**	■ Municipal solid waste recycling rate increased to **37%**	■ Reduce resource consumption by promoting design for environment ■ Promote circular use of recycled resources by establishing recycling routes ■ Ensure entirely green procurement
Formulation of Plastic Strategy **Plastics** 	■ Realization of **plastic use with net zero CO_2**	■ Cumulative **25% reduction** in single-use plastics (national target) ■ Incineration of plastic waste from households and large office buildings **reduced by 40%** compared to FY 2017	■ Create innovations, such as closed-loop recycling, in cooperation with businesses ■ Promote bottle-to-bottle recycling of plastic bottles ■ Promote source separation and recycling by strengthening cooperation with municipalities and through 3R advisors ■ TOKYO Zero Marine Litter Action
Food waste 	■ **Zero food waste** through reduction and food recycling	■ Food waste **reduced by 50%** compared to FY 2000	■ Reduce food waste through cooperation throughout the food supply chain ■ Change consumption behavior using apps to obtain markdown information ■ Promote pioneering efforts using ICT etc.
Fluorocarbons 	■ **Zero fluorocarbon emissions**	■ Hydrofluorocarbons (HFCs) emissions **reduced by 35%** compared to FY 2014	■ Support introduction of non-fluorocarbon equipment ■ Strengthen supervision by visiting all businesses that emit a large amount of fluorocarbons and must therefore report to the national government ■ Make sure of thorough collection of fluorocarbons at the time of disposal through guidance at all demolition sites where commercial equipment has been installed.
Formulation of Climate Change Adaptation Policy **Strengthening adaptation measures** 	■ **Minimized risks** from climate change impacts	■ **Efforts made in all fields** affected by climate change **taking into account** climate change **impacts in the future**	■ Strengthen disaster countermeasures both in structural and non-structural aspects, such as maintenance of regulating reservoirs and publication of disaster risks ■ Further strengthen preventive and ex-post measures, such as urban greening to mitigate heat ■ Establish Local Climate Change Adaptation Center

Outline of Tokyo Climate Change Adaptation Policy

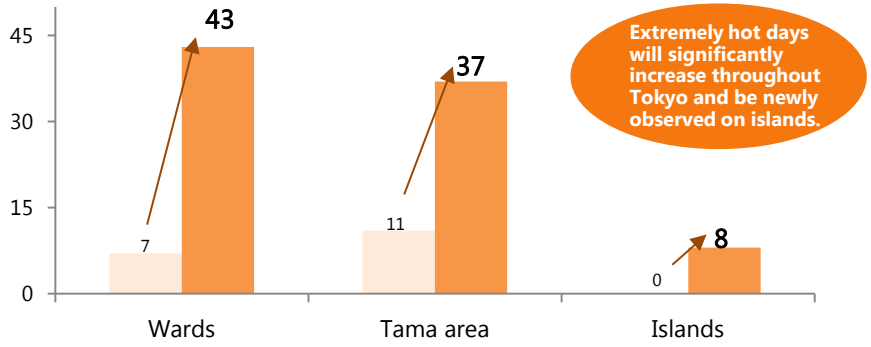
Purpose and positioning of the policy

- Severe impacts of climate change, such as extreme heat and heavy rains in recent years, have already affected our daily lives.
  - ➢Necessity of working on **adaptation measures** to avoid or reduce damage caused by the climate change impacts as well as mitigation measures to reduce CO_2 emissions
- Present **approaches for avoiding or reducing damage in a wide range of fields**, including natural disasters, health, and agriculture, forestry, and fisheries, taking into account the climate change impacts in Tokyo.
  - ➢A policy that summarizes current approaches for **formulating Local Climate Change Adaptation Plans** based on the Climate Change Adaptation Act



Forecast of future changes in climate and weather

Forecast of changes in the annual average number of extremely hot days in the worst scenario of climate change at the end of the 21st century



Basic approaches to adaptation

(1) Work on adaptation to climate change through all of TMG's initiatives.

(2) Promote climate change adaptation based on scientific knowledge.

(3) Support local efforts in cooperation with municipalities.

(4) Promote dissemination of information including risks to facilitate understanding of Tokyo residents.

(5) Promote international cooperation in C40 and other organizations to accelerate intercity collaboration.

Typical examples of initiatives in each field

Natural disasters

- ✓ Maintain regulating reservoirs to achieve capability of 65 or 75 ml/hour.
- ✓ Promote maintenance of storage facilities for sewer systems.
- ✓ Promote the removal of roadside utility poles to be better prepared for natural disasters, such as increasingly larger typhoons.
- ✓ Ensure broader spread of "Tokyo My Timeline."
- ✓ Expand flooding measures in large underground malls and subways.
- ✓ Raise public awareness of disaster preparedness through "easy Japanese."


Removal of roadside utility poles

Health

- ✓ Promote urban greening to mitigate heat.
- ✓ Leverage knowledge of heat countermeasures at the Tokyo 2020 Games as a legacy.

Water resources and water environment

- ✓ Properly manage water conservation forests for waterworks.
- ✓ Introduce water treatment technologies capable of correctly responding to changes in raw water quality.

Agriculture, forestry, and fisheries

- ✓ Develop robust agricultural facilities that can withstand increasingly larger typhoons and better cope with extreme heat.

Natural environment

- ✓ Formulate a biodiversity strategy taking into account climate change impacts.

Implementation system

- Formulate an adaptation plan based on the law by the end of FY 2020 and make sure adaptation measures are promoted by collaborative efforts throughout TMG.
- Establish Local Climate Change Adaptation Center based on the law.
  - * The center is planned to be established within the Tokyo Metropolitan Research Institute for Environmental Protection.

Outline of Plastic Strategy

For sustainable use of plastics

- We must stop climate change and biodiversity loss caused by massive resource consumption.
- Reduce CO_2 emissions upstream of resource consumption in Tokyo, contributing to net zero CO_2 worldwide.

Aim for sustainable use of plastics with net zero CO_2 and no marine plastics by 2050.

Roadmap for sustainable use of plastics

Goal – Tokyo's visions for 2050

- Plastic use with net zero CO_2
- No marine plastics

- Achieve significant reduction and eliminate unnecessary single-use plastics.
- Transform plastics into sustainable, valuable materials.
- Implement and expand the use of innovative technologies, such as closed-loop recycling.
- Eliminate plastics flowing into the ocean.

* Closed-loop recycling provides virgin-quality recycled resin.

Milestone – 2030 targets

- Incineration of plastic waste from households and large office buildings **reduced by 40%** compared to 2017

2030

- Foster empathy to promote behavior change.
- Create innovations in cooperation with businesses.
- Enhance source separation and recycling in cooperation with municipalities.
- Build domestic resource circulation routes, curb the generation of marine litter.

2020

Reduce disposable plastics and realize advanced recycling of plastic waste at the Tokyo 2020 Games

Main initiatives to achieve the 2030 targets

Reduce, Reuse, Closed-loop Recycling

- **Thorough review of disposables, shift to a reuse-based society**
  - Do not depend on disposable plastics. **Promote new business models** etc.
- **Enhancing circular use**
  - Promote **expansion of separate collection of plastic containers and packaging** by municipalities.
    - Cooperate with municipalities to solve cost and facility issues.
  - **3R advisors** promote source separation and recycling at commercial buildings.
  - Promote **bottle-to-bottle** recycling of plastic bottles.
    - Cooperate with beverage manufacturers to implement model projects.
- **Emergency measures to promote circular use of waste plastic in Japan**
  - To cope with the tight conditions of the plastic waste recycling market and prevent illegal dumping, promote **the building of new resource circulation routes** in cooperation with industry organizations.
  - **TOKYO Zero Marine Litter Action, shift from incineration and heat recovery,** etc.

Example: Products provided in returnable containers

©TerraCycle

Developing initiatives

Partnerships and innovations

- **Spurred on by the Tokyo 2020 Games:**
  - Reduce disposable plastics and promote advanced and high-quality recycling.
- **Partnerships, international cooperation**
  - Cooperate through "Team Mottainai," cooperate with businesses and universities in Tokyo.
  - Hold SPO-GOMI Contest in Asia etc.
- **Making rules, promoting introduction of innovative technologies and business models**

SPO-GOMI Contest in Tomsk, Russia

Outline of ZEV Promotion Strategy

* **ZEV:** 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

Aiming for net zero CO_2 emissions from vehicles

- Making vehicles zero emission is a common duty of large cities around the world. Set various targets related to the promotion of ZEVs, a determining factor of the approach, to actively promote social acceptance.
- Encourage changes toward the realization of a ZEV society by cooperating with various participants, including businesses, Tokyo residents, and the national government

Roadmap for realizing net zero CO_2 emissions from vehicles and primary initiatives for achieving 2030 targets

* Well-to-Wheel: A concept that indicates the environmental load (CO_2 emissions) generated through the entire process, from the stage of obtaining automobile fuel (well) to the stage of actual driving (wheel)

Goal – Tokyo's visions for 2050

- All cars driven in Tokyo to be ZEVs
- Expanded use of renewable energy realizing zero emissions in a Well-to-Wheel* manner

Milestone – Promotion of ZEVs – 2030 targets

- Market share of ZEVs increased to **50%** of new passenger car sales in Tokyo
- Introducing **300 or more** zero emission buses
- New small route buses* for sale limited to **ZEVs in principle**

* Route buses with a capacity of approx. 30 passengers

Milestone – Infrastructural targets – 2030 targets

- **1,000** EV fast chargers
- **150** hydrogen stations

Promotion of ZEVs

Infrastructure development

2030

2030

- **Encouraging replacement of existing vehicles, including passenger cars, buses, and motorcycles, with ZEVs**
  - Make up the price difference from the same class vehicles to mitigate the impression of higher costs or heavier burden. Inspire automotive manufacturers to promote ZEV development and diversify vehicle types.
  - Consider a mechanism to encourage users, manufacturers, and dealers to introduce ZEVs.
  - Aggressively incorporate ZEVs into vehicles owned by TMG.
- **Contribution to energy management**
  - Support introduction of V2H or EV power stations for use in emergency feeding or energy management with renewable energy introduced.

- **Fostering momentum for social acceptance**
  - Promote expansion through public-private partnerships.
  - Create opportunities to experience ZEVs.

- **Ensuring infrastructure to support the promotion of ZEVs**
  - Provide support for maintenance costs etc. to enhance EV chargers and hydrogen stations as social infrastructure prior to the introduction of ZEVs.
  - Encourage the installation of EV chargers by taking advantage of large building construction and urban development.
  - Request the national government to ease restrictions on hydrogen stations.
  - Aggressively use TMG's facilities.

2020

Initiative development for promoting ZEVs toward 2030

2020