As a massive energy consumer, TMG has taken pioneering measures for climate change mitigation and energy saving. The Tokyo Cap-and-Trade Program, fine-tuned to the characteristics of a megacity densely packed with a variety of buildings including offices, has produced concrete results, thanks to support from many businesses, homes, and NGOs in Tokyo. Even though Tokyo’s energy consumption has consistently been falling, CO2 emissions originating from electricity supplied to Tokyo have increased following the shutdown of nuclear power plants in the aftermath of earthquakes. Responding to this situation, TMG has set an energy consumption target (see page 3) in addition to the greenhouse gas emission target in order to clarify energy efficiency efforts by citizens and companies in Tokyo.

Three Programs Supporting Sustainable Building Policy

TMG has developed effective programs according to building type (new or existing) and size (large or small/medium).

At the core of Tokyo’s sustainable building policy, we have the Tokyo Cap-and-Trade Program for existing large facilities, the Carbon Reduction Reporting Program for small and medium facilities, and the Green Building Program for new buildings. Since 2000 when the Tokyo Metropolitan Environmental Security Ordinance was enacted, we have developed effective policies with step-by-step reviews and enhancements.

Energy-related CO2 Emissions in TOKYO

Tokyo’s energy-related CO2 emissions in FY 2016 amounted to 58.3 million tonnes, equivalent to the total emissions of Austria. Commercial and residential sectors constitute a large share of the CO2 emissions in Tokyo.
World’s First Urban Cap-and-Trade Program for Large Facilities

In April 2010, TMG introduced the Tokyo Cap-and-Trade Program, which sets mandatory CO2 emission reduction targets for large facilities. This program is not only the first cap-and-trade scheme in Japan but also the world’s first urban cap-and-trade scheme that covers the commercial as well as the industrial sector, including office buildings, which are often concentrated in megacities. Owners of facilities covered by the scheme are required to meet their emission reduction requirements through on-site energy efficiency measures or through emissions trading. Measurements, annual reporting, and verification are also required. CO2 emissions from covered facilities account for approximately 40% of those from the entire industrial and commercial sectors in Tokyo.

In the Tokyo Cap-and-Trade Program, facilities demonstrating outstanding performance in emissions reduction as well as in the introduction, use, and management of energy efficient equipment are certified as top-level facilities that receive lower compliance factors according to their rate of progress. The certification standards for top-level facilities represent the highest-level energy efficiency measures feasible at present, stipulating more than 200 different energy saving measures in the case of office buildings. In the second compliance period, 64 facilities were certified as top-level as of the end of FY 2017. An increasing number of facilities use the standards as reference guidelines for energy efficiency in design and renovation processes.

Examples of energy saving efforts at top-level facilities

- Energy efficient heat source equipment
- Energy efficient cogeneration
- Setting CO2 reduction targets, preparing CO2 reduction measures and plans
- Energy efficient air conditioning, ventilation control by CO2 concentration
- Energy efficient lighting (LEDs)
- Lighting with motion sensors
- Natural ventilation system
- High performance building shell

Results

In FY 2016, the total emissions of the facilities covered by the program were reduced by 26% from base-year emissions. Reductions continue in spite of an increase in aggregate floor area of more than 500,000 m². Approximately 80% of the covered facilities have already achieved reductions over and above their compliance factors for the second compliance period (15% or 17%).

<table>
<thead>
<tr>
<th>Period</th>
<th>Compliance factor</th>
<th>First compliance period</th>
<th>Second compliance period</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2010-FY 2014</td>
<td>8% for offices, 6% for factories</td>
<td>-13%</td>
<td>22%</td>
</tr>
<tr>
<td>FY 2015-FY 2019</td>
<td>17%</td>
<td>23%</td>
<td>26%</td>
</tr>
<tr>
<td>FY 2017-FY 2019</td>
<td>15%</td>
<td>22%</td>
<td></td>
</tr>
</tbody>
</table>

All covered facilities achieved their CO2 emission reductions (first compliance period)

Significant reductions were made through proactive efforts to save energy, such as introducing LED lighting, and 91% of the covered facilities were able to meet their reduction obligations through such initiatives. The remaining 9% of the facilities were able to meet their reduction obligations through emissions trading during the adjustment period.
SUSTAINABLE BUILDING POLICY_2

Carbon Reduction Reporting Program for Small and Medium Facilities

CO₂ emissions from small and medium facilities account for approximately 60% of the total of the combined industrial and commercial sectors in Tokyo, underlining the importance of reducing emissions from these facilities. TMG introduced the Carbon Reduction Reporting Program to help owners of small and medium facilities identify their CO₂ emissions and implement energy efficiency measures. Using data given in the reports, TMG provides Low Carbon Benchmarks to allow self-rating of emission levels for a specific business type and a Carbon Report that depicts energy efficiency levels in an easy-to-understand format.

Trend of emissions from covered facilities (excluding facilities that submit reports voluntarily)

Reduction in CO₂ emissions from small and medium facilities

SUSTAINABLE BUILDING POLICY_3

Green Building Program

By requiring owners who build large buildings to submit a Building Environmental Plan and disclosing an outline of the plan, this program encourages their voluntary environmental conservation efforts at the architectural planning stage and aims to form a market that attributes environmental performance labels to buildings. Under TMG’s evaluation criteria, building owners make three-grade evaluations in four areas of environmental considerations: rational use of energy, proper use of resources, natural environment conservation and mitigation of heat island effects.

LED Light Bulb Exchange Campaign

TMG is promoting a campaign to exchange each incandescent or fluorescent light bulb brought in by Tokyo residents for one LED light bulb at no charge, as well as giving energy efficiency advice at participating electronics stores and large home appliance stores in Tokyo. This will help citizens realize the energy efficiency of LED light bulbs, become more aware of energy efficiency, and promote energy efficiency in the home.

Creation of Cool Spots

In collaboration with business operators and municipalities ready to install fine mist generation equipment or plant more flowers and trees, TMG has been creating cool spots for heat mitigation to allow citizens and tourists to stroll comfortably during midsummer.

“Uchimizu” (Water Sprinkling)

Sprinkling water is part of the traditional Japanese culture. Sprinkling water in front of houses or stores lowers the temperature of the hot ground surface, helping mitigate the summer heat. TMG is making efforts to promote Uchimizu activities in conjunction with citizens and businesses in Tokyo.

Laying Solar Heat-Blocking Pavements

TMG has started laying solar heat-blocking pavements and water retaining pavements to mitigate road surface temperature rise during daylight hours. As of the end of March 2018, we have completed approximately 116 km in total, combating temperature rise caused by road surface heat.

Maintenance and Management of Trees

To ensure green leafy shade during the blazing hot summer, TMG works hard to properly maintain trees along Tokyo metropolitan roads as well as looking after the greenery in parks.

Urban heat island effects have continued in Tokyo as urbanization progresses. Ahead of the Tokyo 2020 Olympic and Paralympic Games, measures to reduce heat for citizens and tourists have become a critical challenge.

CO₂ emission levels in an easy-to-understand format.

0 3,000 3,500 4,000 4,500 5,000

Thousands of CO₂

Trend of emissions from covered facilities (excluding facilities that submit reports voluntarily)

Reduced by 13.2% below 2009 levels (Results from covered facilities that submitted reports for 8 consecutive years from FY 2010)

MITIGATION OF URBAN HEAT ISLAND

Urban heat island effects have continued in Tokyo as urbanization progresses. Ahead of the Tokyo 2020 Olympic and Paralympic Games, measures to reduce heat for citizens and tourists have become a critical challenge.

Annual mean temperature anomaly (ºC)

The daily mean maximum temperature in August, the month in which the Tokyo 2020 Games will take place, was 32.4ºC from 2010 to 2014.

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In 2016, power generated by renewable energy accounted for approximately 12.1% of the total electricity used in Tokyo. The introduction of solar power generation has been amplified through support projects of TMG with information available online through the Tokyo Rooftop Solar Register, and the Feed-in-Tariff (FIT) system started by the national government in 2012.

Further Expansion of Use in Harmony with Tokyo’s Characteristics
High land prices in Tokyo make it difficult to install large generators. However, densely built-up Tokyo has significant potential for setting up solar power generators. TMG supports local-production-for-local-consumption renewable energy.

Promoting the adoption of solar energy
Online information is provided by the Tokyo Rooftop Solar Register, which clearly shows buildings’ suitability for solar power generators and other equipment.

Efforts Made for Both Supply and Demand
As a massive electricity consumer, Tokyo depends on power sources in many other regions for much of its power supply. TMG will encourage the expanded adoption of renewable energy in Japan as well as in Tokyo through efforts in both supply and demand.

Promoting the use of other renewable energy
TMG provides online information on the potential for the adoption of geothermal heat and subsidizes the early stages of adoption. We also encourage energy use matching business characteristics, including the use of sewage heat, as well as small hydroelectric generation at water supply and sewage facilities.

Efforts on the supply side – measures for energy suppliers
To improve the environmental properties of electricity, TMG requires electricity suppliers for Tokyo to reduce CO2 emission factors, set targets for renewable energy volume, and report the results through the Environmental Energy Reporting Program.

Efforts on the demand side – mechanisms for consumers to select electricity from renewable energy
TMG depicts renewable energy sources for power through the Green Labeling for Condominiums program and stimulates consumers to select renewable energy by providing information about the advantages.
CREATING A HYDROGEN-BASED SOCIETY

Hydrogen is a clean energy that emits only water when used, helping reduce environmental load as well as contributing to a diversified energy mix, with a spillover effect on economy and industries, and response to emergencies. When the use of hydrogen derived from renewable energy, rather than depending on fossil fuels, is made practical in the future, hydrogen-based energy will be a definitive step towards a low-carbon society.

To realize a hydrogen-based society, a JPY 40 billion fund has been set up to support efforts to be made through to the Tokyo 2020 Olympic and Paralympic Games.

Promoting the Use of Fuel-Cell Vehicles and Buses

TMG will create an initial demand for the vehicles and buses with financial support from both the national government and TMG, as their high prices are expected to be a challenge for the immediate future. Since March 2017, five fuel-cell buses have been introduced on regular routes on Tokyo metropolitan bus lines.

Targets for FCVs

- 6,000 vehicles by 2020
- 10,000 vehicles by 2025
- 200,000 vehicles by 2030

Through massive financing and effective use of its site, TMG will encourage the spread of hydrogen stations. They will be primarily installed in downtown Tokyo, in areas with a concentration of Olympic and Paralympic arenas, and along transportation routes for athletes and officials.

Targets for Hydrogen Stations

- 35 stations by 2020
- 80 stations by 2025
- 150 stations by 2030

Promoting the Installation of Hydrogen Stations

Promoting the Use of CO₂ Free Hydrogen

To take full advantage of hydrogen energy in realizing a low-carbon society, we need to aggressively introduce hydrogen derived from renewable energy sources. For the production and future use of CO₂-free hydrogen, TMG will encourage facilities in Tokyo to install equipment for using hydrogen derived from renewable energy and consider hydrogen supply systems that use renewable-energy-sourced power from Tohoku and other regions.

Effective Use of Hydrogen Stimulated by the Tokyo 2020 Games

TMG will install hydrogen stations in the Olympic Village after the Tokyo 2020 Games to supply hydrogen to FCVs and Bus Rapid Transit (BRT). To realize the first full-scale hydrogen supply system in Japan and make it a model for achieving a hydrogen society, TMG will introduce new technologies, including hydrogen pipelines and next-generation hydrogen fuel cells.

Education Center

At the end of July 2016, TMG opened an education center to promote the spread of information about hydrogen energy, and allow citizens and facilities in Tokyo to learn more about the significance, technologies, safety, and future of a hydrogen-based society. It also helps small and medium operators of hydrogen stations learn the skills necessary to operate their stations successfully and safely, as well as promoting facility tours at home and abroad.

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