

Tokyo

The World's Carbon Markets: A Case Study Guide to Emissions Trading

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Brief History and Key Dates:

With a 2010 population of over 32 million, Tokyo's Metropolitan Government (TMG) is one of the largest local jurisdictions in the world.¹ Tokyo consumes as much or more energy than many countries, and, if it were a country, it would have the world's 15th largest GNP. In 2006, Tokyo emitted 59.6 MtCO₂—56.67 MtCO₂ (95%) from energy-related CO₂, placing it between Sweden (28th largest emitting country) and Norway (29th). Electricity generation accounts for 50% of emissions, oil 28%, and city gas 17%. Tokyo generates around one-fifth of Japanese GDP.²

TMG is the largest sub-national government in Japan; it is an administrative body that covers 62 municipalities, which include cities (including Tokyo, a city of over 13 million), towns, and villages.³ According to InSight at Pacific Community Ventures, Tokyo's status as a Japanese central hub for government and business activity inflates Tokyo's influence on national environmental activity.⁴

TMG emissions reduction efforts began in 2000 with the "Tokyo CO₂ Emissions Reduction Program," which was part of the "Tokyo Metropolitan Environmental Security Ordinance" and entailed mandatory reporting programs for targeting facilities, as well as a voluntary emissions reduction plan. This program covered large-scale buildings and businesses in the industrial and commercial sectors; these enterprises encompassed 1% of businesses, but 40% of CO₂ emissions, in Tokyo. While the program remained voluntary, beginning in 2005 covered facilities received ratings based on a five-tier scale: (1) AA—more than a 5% reduction planned; (2) A+—more than a 2% reduction planned; (3) A—basic measures planned; (4) B—zero-cost operational improvements planned; and (5) C—neither basic measures nor operational improvements planned. The average plan was for reductions of three to four percent, and about a quarter achieved reductions of above five percent.⁵ In 2007, in an effort to spur national climate action, TMG introduced a 10-year climate strategy with the primary mission of reducing CO₂ emissions.⁶

Tokyo began developing an Emissions Trading System (ETS) in 2002 under TMG's Bureau of Environment (BOE), which launched a project, titled "Creating an Emission Trading Market." This project led to two phases of voluntary ETS: Phase I (2002-2004) and Phase II (2005-2009). Phase I targeted large commercial buildings, and it required emissions reporting and the construction of a three-year reduction plan by participants. While emissions reduction remained voluntary in Phase II, this phase marked the initiation of web-based publication of facility plans, and it facilitated the TMG's ability to issue guidance. This program enhanced data collection and participant familiarity with cap-and-trade, thereby providing Tokyo with the necessary capacity for enacting an ETS that entailed mandatory caps in April 2010.⁷ See Figure 1 for an overview of Tokyo's emissions trading policy implementation trajectory.

2000: Ordinance Amendment for Mandatory Emissions Reporting	
<p>Emissions Trading System (ETS) Planning</p> <p>2002: Deliberations Begin</p> <p>June 2007: Launch of Tokyo Climate Change Strategy</p> <p>June 2008: Ordinance Amendment for ETS Implementation</p>	<p>2002-2004: Phase I of Voluntary System</p> <ul style="list-style-type: none"> • Emissions reporting • Voluntary emissions reduction setting • Three-year emissions reduction plan <p>2005-2009: Phase 2 of Voluntary System</p> <p>Public announcements and evaluations of reduction plans begin</p>
<p>2010: April 1, Start of ETS</p>	

Figure 1: Tokyo Emissions Trading System (ETS) Development⁸

Summary of Key Policy Features:

CAP/TARGET: The *TMG climate plan target* is 25% CO₂ reduction relative to 2000 levels by 2020, and 50% below 2000 levels by 2050.⁹ An emissions trading system that mandates **absolute CO₂ caps** is one means by which TMG hopes to achieve its target. The **goal for Phase I** (fiscal 2010-fiscal 2014) is 6% reduction relative to base year emissions, and the **Phase II** (fiscal 2015-fiscal 2019) **objective** is 17% reduction relative to base year emissions.¹⁰ The base year is the average CO₂ emissions from any three consecutive years between 2002 and 2007 that a covered entity selects.¹¹ Projections foresee a cap of 10.44 MtCO₂ in 2020, 9.7 MtCO₂ of which will cover existing facilities and 0.74 MtCO₂ is designated for new entrants.¹²

At the facility level, there are three categories for Phase I reduction targets:¹³

- Category 1-A (8% reduction target from base year): office buildings, public institutions, commercial buildings, lodging, educational facilities, medical facilities, etc.
- Category 1-B (6% reduction target from base year): air conditioning/heating from district cooling/heating plants.
- Category 2 (6% reduction target from base year): facilities that do not fit in Category 1.

SCOPE/COVERAGE: The Tokyo ETS covers 40% of the industrial and commercial **sectors'** CO₂ emissions, which equates to **20% of all of Tokyo's CO₂ emissions**. Almost **1,400 facilities** are covered, and office buildings comprise 80% of all covered facilities. These capped office buildings primarily include skyscrapers and government buildings. Capped facilities generate approximately 13 MtCO_{2e} annually. The ETS caps CO₂ emissions from both fuel consumption and electricity usage (based on an estimate of the emissions from producing that electricity, which in many cases will occur outside of the Tokyo municipality).¹⁴ Through 2020, there is a 0.74 MtCO₂ **allowance reserve** for new entrants.¹⁵

CO₂ reduction obligations apply to large-scale facilities, which are defined as individual buildings or facilities that annually emit upwards of a 1,500 kL crude oil-equivalent **threshold**. Such facilities must submit five-year reduction plans and annual progress reports. Medium/small-scale emitters must submit an annual energy efficiency report if they belong to a corporation that annually emits over 3,000 kL crude oil-equivalent; however, reductions are not mandatory for such facilities. If a company has one large facility and several smaller scale facilities, the large-scale facility is the only one that faces mandatory reductions.¹⁶ A facility may leave the ETS if its energy consumption from the previous year is below 1,000 kL, if energy consumption from the three prior years is below 1,500 kL, or if the

installation is shut down or suspended.¹⁷ The **point of regulation** within the Tokyo ETS is at the facility level, which is downstream; so, facilities producing and using energy and electricity within the municipality of Tokyo (ie. commercial buildings/factories) are regulated.¹⁸

The Tokyo ETS has two **phases**: Phase I (fiscal 2010–fiscal 2014) and Phase II (fiscal 2015–fiscal 2019). In Phase I, the only **covered gas** is CO₂; CO₂ from energy-related activity accounts for 95% of Tokyo GHG emissions. Other gases are scheduled to be added in the future.¹⁹

AUCTION OVERVIEW: Allowance **auctions** are not part of the first compliance period.²⁰

ALLOWANCE DISTRIBUTION: For the first compliance period (fiscal 2010–fiscal 2014), allowances were **freely distributed**. An allowance set-aside exists for new entrants, and new entrants receive allowances based on current emissions. Facilities that are in operation when the program is launched receive their allocation of allowances for a five-year compliance period at the beginning of each period. Allocation is determined via a **grandfathering** method that is based on past emissions. Equation (1) defines such allowance allocation:²¹

$$\text{Allowances} = (\text{Base Year Emissions}) \times (\text{Compliance Factor}) \times 5 (\text{years}) \quad (1)$$

“Base Year Emissions” equals the CO₂ emissions average of any three consecutive years from 2002 to 2007. The Governor of Tokyo determined the “Compliance Factor” for Phase I in March 2009.²² New participants in the Tokyo ETS are allocated allowances from a **new entrants reserve** free of charge, and special rules dictate their base year emissions.²³

Tokyo’s ETS does not distribute allowances ex ante. Instead, tradable credits are given after an individual facility overachieves its target. Until then, facilities do not have tradable allowances.²⁴

FLEXIBILITY PROVISIONS: The Tokyo ETS allows capped large-scale facilities to use unlimited **offset** credits both from uncapped small and medium enterprises within Tokyo, and from renewable energy certificates nationwide. Renewable energy certificates derive from a nation-wide Japanese program that evaluates the emissions reduction value of energy generated from renewable sources. The TMG prioritizes renewable energy as an effective offset, for renewable capacity construction enables clean operation even after the ETS is scheduled to terminate after Phase II. For electricity from wind, solar, geothermal, and small-scale hydropower, one ton of CO₂ reductions receives one-and-a-half (1.5) times the credits as emissions reductions from other sources of renewable energy. Use of offsets generated from Japanese installations outside of Tokyo is limited to one-third of a company’s obligations.²⁵ In the event of high allowance prices, international credits from the Clean Development Mechanism (CDM) and other units recognized under the Kyoto Protocol may be allowed as offsets, on the condition that domestic offsets from Tokyo-based small and medium-sized enterprises are also used.²⁶

Unlimited **banking** is allowed between compliance periods, but **borrowing** is not allowed.²⁷ In the absence of a national ETS, Tokyo supports linkage with neighboring prefectures, such as Saitama, Kanagawa, and Chiba.²⁸ Internationally, while Tokyo is a member of ICAP, **linkage** with other ETSS, such as the EU ETS, is likely to be difficult for a variety of reasons, including Tokyo’s focus on buildings. In addition, the TMG is not eager to link with international systems because of concerns over an influx of low-price allowances. Tokyo supports ETS implementation in other megacities of the world. Sydney, Singapore, Bangkok, and Taiwan have all expressed interest in the TMG ETS.²⁹

COST CONTAINMENT/VOLATILITY MANAGEMENT: Policies to prevent price surges entail increasing the range of eligible mitigation options in the market. TMG has accomplished this by promoting **offset programs**, such as renewable energy credits and emissions reductions from medium-sized Tokyo enterprises. The Solar Energy Bank

is performing measures to ensure the stable supply of Green Electricity (Heat) Certificates as offsets categorized as renewable energy credits. In addition, TMG initiated a two year program in 2009 that provided **subsidies** to support the beginning of a program that powers household appliances for 40,000 households via solar energy. Further measures to contain prices may be implemented at the discretion of the Tokyo Governor. Such measures might include increasing the facility-specific limit on credits from outside of Tokyo and/or enabling the use of Kyoto Protocol-eligible credits.³⁰

MARKET REGULATION AND OVERSIGHT: The Tokyo ETS requires the **annual reporting** of GHG emissions data to the Governor, as well as the **public disclosure** of this data. There is mandatory **independent verification** of these annual reports. In July 2009, the Guidelines for Calculating Greenhouse Gases for capped facilities, the Guidelines for Verifying Greenhouse Gases for registered verification agencies, and the Guidelines on Application Procedures for Registering as a Registered Verification Agency were established by the Governor of Tokyo.³¹ The Tokyo ETS uses a **registry** to manage emissions trading records and offset credits, and each capped facility, as well as brokers and entities that wish to participate but are uncapped, must establish an account within the system. Annual emissions and actual reductions are publicized once per year on the TMG website. A list of brokers for whom there is strong demand from capped facilities is also published.³²

Compliance assessment occurs at the end of each five-year compliance period. Facilities are only allowed to sell emissions allowances that are left over once a facility's annual emissions are accounted for.³³ Numerous **exchanges**, namely the Japan Climate Exchange³⁴ and the Tokyo Stock Exchange, are platforms for trades within the TMG cap-and-trade program.³⁵

Companies that fail to meet obligations in the first compliance period must further cut Phase II emissions by 1.3 times the Phase I shortfall.³⁶ If facilities fail to meet this revised target, they are fined. In addition, in order to maintain the overall integrity of the cap, TMG will then buy emissions allowances to compensate for the shortfall from offending installations, and then charge the noncompliant facility the cost of this transaction. Noncompliance **fin**es reach up to JPY\$ 500,000 (USD\$4,919.01, according to the 13 May 2013 exchange rate³⁷). Even after the payment of fines, facilities must reduce future emissions as previously mandated. Names of noncompliant facilities are published as a means of **shaming** environmentally irresponsible enterprises.³⁸

COMPLEMENTARY AND SUPPLEMENTARY MEASURES: The Tokyo ETS is a component within a larger Tokyo program to reduce CO₂ emissions by 25% relative to 2000 levels by 2020. Within the larger program, sectors have received specific targets, such as the transportation sector (-42%), the residential sector (-19%), and the industry/commerce sector (-17%). There are monetary incentives within the residential sector for heat pump water heaters and solar power, as well as for appliance labeling. For small- and medium-scale emitters, free energy audits are available and energy efficiency investments are 50% tax deductible.³⁹

Also active in Tokyo is the **Green Building Program**, enacted in 2000, which requires developers of buildings that are more than 5,000 square meters in floor area to submit green building proposals. These buildings are required to submit a "Building Environment Plan," which outlines the building's anticipated environmental performance and is published on the TMG website, prior to applying for a building permit. Soon after construction finishes, building owners must submit a completion report. Since 2002, 1,500 buildings have had their green building plans published, and these buildings have accounted for 30% of total floor area from new Tokyo buildings constructed since 2002.⁴⁰ These buildings must be 20 to 30 percent more efficient than conventional buildings.⁴¹ The Green Building Program pioneered the creation of a rating and reporting system of buildings' environmental performance, and it has spawned sister programs, such as the Green Labeling Program for Condominiums and the Energy Certificate Program.⁴² In 2010, the program increased its focus on climate change mitigation, and its energy efficiency standards are now above the national average. In addition, since 2010 covered buildings have been required to conduct feasibility studies of on-site renewable energy generation.⁴³

Items	Description	
Facilities covered	Newly planned large buildings over 5,000 square meters in total floor area	
Items Assessed	Categories	Items
	Energy	Building thermal load (insulation) Renewable energy devices (on-site renewables) Energy Efficiency systems (building equipment) Building energy management systems
	Resources, materials	Use of eco-friendly materials, ban on the use of fluorocarbons, longer building life, water recycling
	Natural environment	Greening, landscaping, bio-diversity, water conservation
	Heat-island effect	Heat emissions, ground service cover, wind environment
Rating	Each item is rated using three rating grades (1-3)	
Reporting, Disclosure	Environmental plan and rating results must be explored before applying for a building permit, ratings are displayed with chart on TMG website	

Figure 2—Design of Tokyo Green Building Program⁴⁴

ECONOMIC PROJECTIONS: In May 2010, the future average price for Tokyo ETS allowances was projected to be around USD \$150/tCO₂, which exceeds the average price of EU ETS permits by a multiple of around ten.⁴⁵

RESULTS: The Tokyo ETS, which was implemented in April 2010, is still in its early stages. The end of the first compliance period (the end of 2014) will provide important information for analyzing the program’s impact. The first allowance trades on the Japan Climate Exchange occurred in August of 2010, and price per ton of CO₂ was USD \$142, almost seven times larger than the European Climate Exchange price of USD \$20.62 during that same period. InSight at Pacific Community Ventures (January 2011) attributes these high trading prices in Tokyo to a lack of market liquidity combined with the fact that Japanese energy efficiency is already relatively high, thereby rendering improvements more expensive, but there is no consensus around this reasoning.⁴⁶ Only 17% of participating facilities had opened accounts on the registry as of April 2012.⁴⁷

According to Tokyo’s 2009 emissions data, covered entities had reduced emissions to 10% below 2000 levels, already surpassing the Phase I ambition of 6% reductions below 2000 levels. Of the 1,173 reporting facilities, 59% had achieved reductions beyond their Phase I targets and 41% had not.⁴⁸

As of March 31, 2012, 1,159 of the 1,348 covered facilities had submitted annual emissions reports for FY2010, the first year of the Tokyo ETS. For the 1,159 facilities that submitted reports, emissions were 9.764 MMtCO₂, down 13% from the base-year emissions of 11.209 MMtCO₂ (see Figure 3). About 64% of facilities that submitted reports reduced emissions by no less than the compliance factor for FY2010-FY2014, and 26% of facilities have reduced emissions by 17% or more, which is the expected compliance factor for the second compliance period (FY2015-FY2019).⁴⁹

FY2011 figures are even more encouraging than those from FY2010. For the 934 facilities that submitted reports by the end of November 2012, total emissions were 7.22 MtCO₂e, down 23% from the base-year value of 9.38 MtCO₂e. Furthermore, about 93% of facilities that submitted reports reduced emissions by more than the obligation factor for FY2010-FY2014, and 70% of facilities have reduced emissions by 17% or more.⁵⁰

According to Point Carbon (2013), in the 2012/2013 financial year, “scheme participants carried out six trades for a total of 19,659 tonnes of CO₂ equivalent, according to data emailed by the local government.”⁵¹

Usage of Facilities	Number of Covered Facilities	Base Year Emissions (t-CO ₂)	Emissions in FY2010 (t-CO ₂)	Emission Reduction Rate (%)	Reference: Average Base Year Emissions per Facility (t-CO ₂)
Commercial Sector	970	8,302,326	7,418,087	11%	8,559
Office	509	4,176,696	3,656,371	12%	8,206
Information Communication Center	32	375,389	373,260	1%	11,731
Broadcasting Station	5	96,099	90,204	6%	19,220
Commercial Facility	172	1,216,026	1,095,963	10%	7,070
Accommodation	41	475,318	437,529	8%	11,593
Educational Facility	57	470,686	447,350	5%	8,258
Medical Facility	64	542,639	503,563	7%	8,479
Cultural Facility	24	149,427	130,595	13%	6,226
Distribution Center	20	145,864	129,129	11%	7,293
Heat Supplier	46	654,182	554,123	15%	14,221
Industrial Sector	189	2,906,270	2,345,869	19%	15,377
Factory	134	2,253,308	1,756,379	22%	16,816
Waterworks/Sewerage	39	481,658	455,639	5%	12,350
Waste Management	16	171,304	133,851	22%	10,707
Total	1,159	11,208,596	9,763,956	13%	9,671

Figure 3 – Emissions and Reduction Rates in FY2010 by Usage of Facilities. Source: TMG, 2012⁵²

What Distinguishes this Policy?

UNIQUE ASPECTS:

1. Tokyo was the first large-scale **city** to implement an ETS; it is the first local GHG ETS that focuses on commercial activities and the end-use of energy. Rudolph (2012) underscores the importance of city-level climate action stating,

*“Cities already account for 70% of global energy-related carbon dioxide (CO₂) emissions, while on the other hand the potential for cost-efficient emission reductions is amongst the highest in buildings. In 2010, half of the world’s population lived in cities and the number is expected to increase to reach 70% by 2050, thus also increasing the climate impact of cities. Hence, future climate policy has to target energy consumption in big cities as one major focus.”*⁵³

2. The Tokyo ETS, unlike the EU ETS and RGGI, includes coverage of large-scale **office buildings**.⁵⁴
3. The Tokyo ETS sports **five-year compliance periods**. By contrast, the EU ETS and New Zealand have one-year compliance periods, and California has three-year compliance periods. According to the TMG Bureau of the Environment, this longer compliance period is meant to facilitate companies meeting caps via investments in energy conservation.⁵⁵
4. Tokyo’s ETS **does not distribute allowances ex ante**. Instead, tradable credits are given after an individual facility overachieves its target.⁵⁶
5. The **market price** for allowances in Tokyo has been extremely high. For example, in August 2010 the trading price for a ton of carbon (USD \$142) was seven times higher in Tokyo than in the EU (USD \$20.62).⁵⁷
6. A facility’s **Phase I target** is based on the categorization of the industry to which it belongs.

CHALLENGES:

1. Efforts to implement a ***national ETS in Japan were postponed*** in December 2010, and, at present, there does not appear to be much momentum surrounding such a policy.

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Disclaimer: The authors encourage readers to please contact them with any corrections, additions, revisions, or any other comments, including any relevant citations. This will be invaluable in strengthening and updating the case studies and ensuring they are as correct and informative as possible.

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