

# Tokyo: A Case Study

## Development of Emissions Trading Around the World

Last Updated: October 26, 2012

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### Brief History and Key Dates:

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

The Tokyo Municipal Government (TMG) is the largest sub-national government in Japan; it is an administrative body that covers 62 municipalities, which include cities, towns, villages, and a cumulative population of 13 million.<sup>3</sup> 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.<sup>4</sup>

TMG emissions reduction efforts began in 2000 with the "Tokyo CO<sub>2</sub> 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 CO<sub>2</sub> 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.<sup>5</sup> In 2007, in an effort to spur national climate action, TMG introduced a 10-year climate strategy with the primary mission of reducing CO<sub>2</sub> emissions.<sup>6</sup>

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.<sup>7</sup> See Figure 1 for an overview of Tokyo's emissions trading policy implementation trajectory.

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

**Figure 1: Tokyo Emissions Trading System (ETS) Development<sup>8</sup>**

### Summary of Key Policy Features:

**CAP/TARGET:** The *TMG climate plan target* is 25% CO<sub>2</sub> reduction relative to 2000 levels by 2020, and 50% below 2000 levels by 2050.<sup>9</sup> An emissions trading system that mandates *absolute CO<sub>2</sub> 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.<sup>10</sup> The base year is the average CO<sub>2</sub> emissions from any three consecutive years between 2002 and 2007 that a covered entity selects.<sup>11</sup> Projections foresee a cap of 10.44 MtCO<sub>2</sub> in 2020, 9.7 MtCO<sub>2</sub> of which will cover existing facilities and 0.74 MtCO<sub>2</sub> is designated for new entrants.<sup>12</sup>

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

- 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'* CO<sub>2</sub> emissions, which equates to **20% of all of Tokyo's CO<sub>2</sub> 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<sub>2</sub>e annually. The ETS caps CO<sub>2</sub> 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).<sup>14</sup> Through 2020, there is a 0.74 MtCO<sub>2</sub> allowance reserve for new entrants.<sup>15</sup>

CO<sub>2</sub> 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.<sup>16</sup> 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.<sup>17</sup> 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.<sup>18</sup>

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 CO<sub>2</sub>; CO<sub>2</sub> from energy-related activity accounts for 95% of Tokyo GHG emissions. Other gases are scheduled to be added in the future.<sup>19</sup>

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

**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<sup>21</sup>:

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

“Base Year Emissions” equals the CO<sub>2</sub> 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.<sup>22</sup>

**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 CO<sub>2</sub> 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.<sup>23</sup> 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.<sup>24</sup>

Unlimited **banking** is allowed between compliance periods, but **borrowing** is not allowed.<sup>25</sup> In the absence of a national ETS, Tokyo supports linkage with neighboring prefectures, such as Saitama, Kanagawa, and Chiba.<sup>26</sup> 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.<sup>27</sup>

**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.<sup>28</sup>

**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.<sup>29</sup> 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.<sup>30</sup>

*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.<sup>31</sup> Numerous *exchanges*, namely the Japan Climate Exchange<sup>32</sup> and the Tokyo Stock Exchange, are platforms for trades within the TMG cap-and-trade program.<sup>33</sup>

*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.<sup>34</sup> 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 *finest* reach up to JPY\$500,000 (USD\$6,306.76, according to the 13 November 2012 exchange rate<sup>35</sup>). 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.<sup>36</sup>

**COMPLEMENTARY AND SUPPLEMENTARY MEASURES:** The Tokyo ETS is a component within a larger Tokyo program to reduce CO<sub>2</sub> 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.<sup>37</sup>

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, or about 300 per year on average, have had their green building plans published. These buildings have accounted for 30% of total floor area from new Tokyo buildings constructed since 2002.<sup>38</sup> These buildings must be 20 to 30 percent more efficient than conventional buildings.<sup>39</sup> 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.<sup>40</sup> 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.<sup>41</sup>

Items	Description
<b>Facilities covered</b>	<b>Newly planned large buildings over 5,000 square meters in total floor area</b>
<b>Items Assessed</b>	<b>Categories</b>
	<b>Energy</b>
	Building thermal load (insulation) Renewable energy devices (on-site renewables) Energy Efficiency systems (building equipment) Building energy management systems
	<b>Resources, materials</b>
	Use of eco-friendly materials, ban on the use of fluorocarbons, longer building life, water recycling
	<b>Natural environment</b>
	Greening, landscaping, bio-diversity, water conservation
	<b>Heat-island effect</b>
	Heat emissions, ground service cover, wind environment
<b>Rating</b>	Each item is rated using three rating grades (1-3)
<b>Reporting, Disclosure</b>	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 Program<sup>42</sup>**

**ECONOMIC PROJECTIONS:** In May 2010, the future average price for Tokyo ETS allowances was projected to be around US\$150/tCO<sub>2</sub>, which exceeds the average price of EU ETS permits by a multiple of ten.<sup>43</sup>

**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 CO<sub>2</sub> was \$142, almost seven times larger than the European Climate Exchange price of \$20.62 during that same period. High Tokyo trading prices have been attributed to a lack of market liquidity combined with the fact that Japanese energy efficiency is already relatively high, thereby rendering improvements more expensive.<sup>44</sup> Only 17% of participating facilities had opened accounts on the registry as of April 2012.<sup>45</sup>

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.<sup>46</sup>

## 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 (CO<sub>2</sub>) 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.”<sup>47</sup>*

2. The Tokyo ETS, unlike the EU ETS and RGGI, includes coverage of large-scale **office buildings**.<sup>48</sup>
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.<sup>49</sup>

## 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. Hence, Tokyo is currently alone in Japan in terms of placing a mandatory cap on carbon emissions.
2. The **market price** for allowances in Tokyo has been extremely high. For example, in August 2010 the trading price for a ton of carbon (US\$142) was seven times higher in Tokyo than in the EU (US\$20.62).<sup>50</sup>

## Author Acknowledgements:

If you have any comments or suggestions for this case study, please do not hesitate to contact lead authors:

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The authors would like to thank Ruben Lubowski, Joe Billick, Clayton Munnings, Jennifer Andreassen, Richie Ahuja, and Cassandra Mitchell for very helpful comments and information for this case study. We take full responsibility for any remaining errors.

**Disclaimer:** This Discussion Draft is intended as a reference of factual information regarding this program and is envisioned as a work in progress as policies continue to evolve and new information becomes available. 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.

<sup>1</sup> World Atlas. "Largest Cities of the World – (by metro population)." Available at <http://www.worldatlas.com/citypops.htm>

<sup>2</sup> Rudolph, Sven and Takeshi Kawakatsu. 2012. "Tokyo's Greenhouse Gas Emissions Trading Scheme: A Model for Sustainable Megacity Carbon Markets?" MAGKS. Joint Discussion Paper Series in Economics. No. 25-2012. [http://www.uni-marburg.de/fbo2/makro/forschung/magkspapers/25-2012\\_rudolph.pdf](http://www.uni-marburg.de/fbo2/makro/forschung/magkspapers/25-2012_rudolph.pdf)

<sup>3</sup> Bureau of the Environment, Tokyo Metropolitan Government (March 2010). "Tokyo Cap-and-Trade Program: Japan's first mandatory emissions trading scheme." Available at [http://www.kankyo.metro.tokyo.jp/en/attachement/Tokyo-cap\\_and\\_trade\\_program-march\\_2010\\_TMG.pdf](http://www.kankyo.metro.tokyo.jp/en/attachement/Tokyo-cap_and_trade_program-march_2010_TMG.pdf)

<sup>4</sup> Thornley, Ben, David Wood, Katie Grace, and Sarah Sullivant (January 2011). "Impact Investing: A framework for policy design and analysis." Insight at Pacific Community Ventures, and The Initiative for Responsible Investment at Harvard University. Case Study 14: Tokyo Cap and Trade Program. Available at [http://www.pacificcommunityventures.org/uploads/misc/case\\_studies/14-Tokyo\\_Cap\\_Trade.pdf](http://www.pacificcommunityventures.org/uploads/misc/case_studies/14-Tokyo_Cap_Trade.pdf)

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<sup>6</sup> Tokyo Metropolitan Government (March 2010). "Tokyo Climate Change Strategy: Progress Report and Future Vision." Available at [https://www.kankyo.metro.tokyo.jp/en/attachement/tokyo\\_climate\\_change\\_strategy\\_progress\\_report\\_03312010.pdf](https://www.kankyo.metro.tokyo.jp/en/attachement/tokyo_climate_change_strategy_progress_report_03312010.pdf)

<sup>7</sup> Tokyo Metropolitan Government, Bureau of Environment (September 2011). "On the Path to a Low Carbon City: Tokyo Climate Change Strategy." Available at [http://www.kankyo.metro.tokyo.jp/en/A4\\_brochure\\_A4\\_0829.pdf](http://www.kankyo.metro.tokyo.jp/en/A4_brochure_A4_0829.pdf)

<sup>8</sup> *Supra*, Note 5.

<sup>9</sup> *Supra*, Note 2.

<sup>10</sup> *Supra*, Note 3.

<sup>11</sup> *Supra*, Note 7.

<sup>12</sup> *Supra*, Note 2.

<sup>13</sup> *Supra*, Note 5.

<sup>14</sup> *Supra*, Note 3.

<sup>15</sup> *Supra*, Note 2.

<sup>16</sup> *Supra*, Note 5.

<sup>17</sup> *Supra*, Note 2.

<sup>18</sup> *Supra*, Note 4.

<sup>19</sup> *Supra*, Note 3.

<sup>20</sup> Allianz (May 2010). "Japan's Cap-and-Trade Program for Carbon Emissions." Interview of Tokyo Government director of emissions trading Koji Miyazawa by James Tulloch. Available at <http://www.knowledge.allianz.com/environment/pollution/?586/japans-cap-and-trade-program-for-carbon-emissions>

<sup>21</sup> *Supra*, Note 3.

<sup>22</sup> *Supra*, Note 3.

<sup>23</sup> *Supra*, Note 3.

<sup>24</sup> Hood, Christina (November 2010). "Reviewing Existing and Proposed Emissions Trading Systems." OECD/IEA. Available at [http://www.iea.org/papers/2010/ets\\_paper2010.pdf](http://www.iea.org/papers/2010/ets_paper2010.pdf)

<sup>25</sup> *Supra*, Note 3.

<sup>26</sup> *Supra*, Note 2.

<sup>27</sup> *Supra*, Note 2.

<sup>28</sup> *Supra*, Note 3.

<sup>29</sup> *Supra*, Note 3.

<sup>30</sup> *Supra*, Note 3.

<sup>31</sup> *Supra*, Note 24.

<sup>32</sup> *Supra*, Note 4.

<sup>33</sup> *Supra*, Note 3.

<sup>34</sup> *Supra*, Note 20.

<sup>35</sup> Fx-rate.net (November 2012). "Yen to Dollar Conversion Table." Available at <http://fx-rate.net/JPY/USD/>

<sup>36</sup> *Supra*, Note 3.

<sup>37</sup> *Supra*, Note 24.

<sup>38</sup> *Supra*, Note 7.

<sup>39</sup> *Supra*, Note 3.

<sup>40</sup> *Supra*, Note 7.

<sup>41</sup> *Supra*, Note 7.

<sup>42</sup> *Supra*, Note 7.

<sup>43</sup> *Supra*, Note 20.

<sup>44</sup> *Supra*, Note 4.

<sup>45</sup> *Supra*, Note 2.

<sup>46</sup> *Supra*, Note 2.

<sup>47</sup> *Supra*, Note 2.

<sup>48</sup> *Supra*, Note 3.

<sup>49</sup> *Supra*, Note 3.

<sup>50</sup> *Supra*, Note 4.