

Tokyo, Japan

Reducing emissions through green building

To transform into a low-carbon city, the Tokyo Metropolitan Government is implementing comprehensive energy efficient programs for buildings. Buildings in the commercial sector are a major contributor of CO₂ emissions in Tokyo and this needs to be addressed. The Cap and Trade Program establishes total emission reduction obligations for existing commercial buildings. The Green Building Program includes a series of energy efficiency measures for newly built buildings both commercial and residential. From a sustainable urban development perspective, these have been the catalyst for increasing the demand for new low-carbon buildings.

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Abstract

The Tokyo Metropolitan Government (TMG) recognized that a shift towards a low-carbon city in terms of Tokyo's corporate activities and urban design is essential for maintaining growth, dynamism and its natural environment. At the same time, TMG's efforts to strengthen climate change mitigation measures is an essential part of its responsibilities as the governing entity of a megacity. In recognizing that the major cities of developed countries need to lead the world in establishing a low-carbon society, characterized by large-scale CO₂ reductions, TMG launched the Cape & Trade (C&T) and Green Building Programs.

The Green Building Program sets up a series of measures through which accurate information on energy performance is given to users, investors and other stakeholders. Buildings with good performance are then positively valued by market mechanisms. The key aim of the C&T Program is to reverse the rising emissions trends. This is achieved by putting caps (total emission reduction obligations) on buildings in the commercial sector. As a result of these programs, the demand for innovative energy efficient technology and new low-carbon building models in Tokyo, has increased.

Importance of energy efficient buildings in cities

Energy consumption in buildings reportedly accounts for as much as 40 percent of total global energy consumption. Thus, constructing low-carbon buildings is critically important in achieving reductions in CO₂ emissions. Approximately 20,000 m² of floor space are built in Tokyo every year. This makes Tokyo one of the busiest cities in the world regarding construction. Considering that buildings constructed today will exist for more than 30 years (average life span), the energy performance of new buildings will have a significant impact on Tokyo's future emission trends.

As mentioned, commercial sector buildings are a major source of CO₂ emissions in Tokyo. The commercial sector expanded its share of CO₂ emissions from 29 percent in the 1990 to 37 percent in 2006. On current trends, this is set to continue. Reducing building's CO₂ emissions, especially in the commercial sector, is therefore an important challenge for Tokyo.



Population/Land area

~13.2 million (June 2011)
2,187km²

Municipal budget

Approx. Yen: 12,422,290
US\$ 507 million

Tokyo joined ICLEI in 1997

Case Study



Photo: © TMG

Tokyo, Japan - World's largest urban agglomeration.

City context

The Tokyo metropolitan region is the world's most populous urban agglomeration. As the capital city of Japan, it is the country's political, economic and cultural center. Although the city occupies only 0.6 percent of Japan's total land area, it is home to more than 10 percent of the country's population and it accounts for over 4 percent of Japan's total GHG emissions. This volume is comparable to the national emissions of some Scandinavian countries such as Denmark or Norway. Therefore, it is essential that Tokyo leads the way in mitigation measures aimed at reducing emissions. TMG has taken on a leading role in mitigation initiatives both in Japan and worldwide.

When compared with the nationwide sector-based CO₂ breakdown, Tokyo's emissions are characterized by a low rate in the industrial sector (Japan 36%, Tokyo 9%) and a high rate in the residential (Japan 13%, Tokyo 26%), commercial (Japan 18%, Tokyo 37%) and transportation sectors (Japan 20%, Tokyo 26%). Based on these characteristics, the Japanese central government concentrates its mitigation policy initiatives on the industrial and energy conversion (production) sectors, while TMG, in contrast, focuses on the commercial sector. Since 1990, nationwide emissions in the commercial sector have increased substantially, even though there have been reductions in the industrial sector.

Tokyo's Cape & Trade and Green Building Programs

Green Building Program

It took more than six years to establish the C&T Program. In 2000, the Department of General Affairs and the Bureau of Environment (BOE) of TMG introduced Tokyo's CO₂ Emissions Reduction Program. By targeting large-scale facilities (those that use over 1,500 kiloliters of crude oil annually) this program established a scheme for planning voluntary mitigation measures whose disclosure requirement is mandatory. Participating facilities of this program would set a target (based on average emissions in a consecutive three-year period) and devise a plan to implement the basic reduction measures set by TMG. However, the average target levels remained around 3 to 4 percent among participating facilities; only about a quarter achieved emissions reductions which were greater than 5 percent. TMG attributes this to the fact that total emissions reductions were not mandatory. The C&T Program aimed to remedy this issue.

During the policy-making process, TMG took a participatory approach, actively gathering opinions from businesses, industry groups, environmental NGO/NPOs, academics and engineers. Expert panels, public comment collections and stakeholder meetings defined the consultation process. However, when TMG announced the intention of introducing the C&T Program in 2002, businesses and industry groups strongly disagreed with the plan. Some industry groups, such as the Japanese Federation of Economic Organizations (Keidanren) argued that

it had the potential to restrict Tokyo's economic activities and some businesses, such as property businesses and developers, considered the proposed caps to be excessive and unfair.

Data and documents gathered through the mandatory reporting scheme of the Tokyo CO₂ Emissions Reduction Program were made public and used by the BOE to counter-argue that fair cap setting, allowance allocation and rational implementation of the program were possible. Furthermore, the BOE actively negotiated with businesses and industry groups. A key stakeholder was the Tokyo Chamber of Commerce and Industry (TCCI). Despite its initial refusal, TCCI came to see that there could be supportive measures in the plan and argued for formally certified offset credits, in terms of emissions reductions, for small and midsize facilities within the Tokyo area. This created an environment where powerful local constituencies could foresee benefits to be reserved strictly for them. In the end, TCCI formally accepted the program, and this influenced the decision-making of the legislative branch of the Tokyo Metropolitan Assembly.

Furthermore, strong leadership from Governor Ishihara, who was strongly committed to the process, was extremely influential. Ishihara revealed his intention to introduce the C&T Program even if he faced resistance from certain industry groups. He also maintained his adversarial position with the national government by stating "TMG will do what the national government should be doing". This made the BOE officials more certain that their C&T legislation, taking place prior to the national C&T legislation, would also be legitimized by other administrative branches in TMG. Although Keidanren and some other stakeholders were still opposed to the program, the Tokyo Metropolitan Assembly unanimously decided to approve the C&T legislation in 2008 (see text box page 2 for full program outlines)

Green Building Program

In contrast to the C&T Program, there was little disagreement among the stakeholders when the BOE introduced the Green Building Program in 2000. BOE recognized that the national energy efficiency standards were not effectively implemented. They were not well tailored to Tokyo's unique regional characteristics and most of the targeted buildings in Tokyo were not given incentives to over comply with the lowest standard. Thus, the BOE established a mandatory disclosure scheme of large-scale buildings' energy performance with its own rating system (see text box for full program outlines). The mandatory scheme assured that the measures taken by owners and developers of the buildings are evaluated fairly by the market.

Results

The C&T and Green Building Programs contribute to TMG's policy goal to reduce CO₂ emissions by 25 percent below 2000 levels by 2020. The exact reductions achieved by the C&T Program are yet calculated since the program's first compliance period ends in 2014. However, data available indicates that in 2009, under the Tokyo's CO₂ Emissions Reduction Program, the targeted large-scale facilities had planned to reduce their reductions by 10 percent compared to the base-year emissions. According to the BOE, this means that approximately 59 percent of the facilities can be expected to comply with their reduction obligations.

Tokyo's Green Building Program

The Green Buildings Program requirements apply to owners of newly built buildings with over 5,000 m² total floor area. Owners and developers of such buildings are required to construct buildings that incorporate environmentally friendly designs based on the TMG green building design guidelines.

The owners must also prepare Building Environmental Plans explaining and rating their environmental designs (based on the TMG standards) and submit these plans one month prior to building permission applications. The Building Environmental Plan of each building is posted online via the TMG website. Buildings are rated using three grades (grades 1-3) and displayed using charts.

The most recent version of the program, implemented in 2010, focused on energy to cope with the effects of climate change and ensures mainly that:

1. Minimum energy performance standards are set higher than the national standards.
2. A feasibility study is required to introduce on-site renewable energy technologies.

Owners and developers are required to submit proposals to TMG and publish a report on their examination process for having solar energy facilities introduced in prospective buildings.

Along with the Green Buildings Program, TMG launched the Energy Certificate Program for Energy Conservation (for non-residential buildings) and Green Labeling Program for Condominiums, which require owners and sellers to display labels and explain the environmental performance of buildings (see Figures 1 and 2).

Tokyo's Cap & Trade Program

Targeted large-scale facilities and buildings represent less than 1% of all the business entities located in Tokyo, but they account for about 40% of all CO₂ emissions from the industrial and commercial sectors in Tokyo. Therefore, TMG prioritized CO₂ emissions reductions from large-scale facilities and buildings in the industrial and commercial sectors. Approximately 1,340 facilities are covered by the C&T Program and a 6 to 8 percent reduction requirement applies during the first compliance period 2010-2014 and a prospective 17 percent reduction requirement during the second compliance period 2015-2019. If a facility exceeds its reduction requirement, the excess reduction as a credit is allowed to be sold.

Four types of such credit are defined by the program:

1. Surplus reductions achieved by other targeted facilities.
2. CO₂ reductions voluntarily achieved by small and medium-scaled facilities in Tokyo.
3. Surplus reductions achieved by facilities outside Tokyo.
4. Environmental value generated through the use of renewable energy (renewable energy credits).

Green electricity and heat certifications are acknowledged as type 4 renewable energy credits. This has the effect of boosting the volume of renewable energy supply generated outside Tokyo, while helping to meet demand for renewable energy within Tokyo.

Energy efficiency. The Green Building Program, which started in 2002, has so far included more than 1,300 buildings and has resulted in improvements in insulation and the use of energy efficient technology. As Figure 1 shows, the number of lower performance buildings (Grade B, C; 1) is decreasing while the number of higher grade buildings (Grade A, AA; 2, AAA; 3) is increasing.

Planning and implementation. In addition, the TMG policy report (Tokyo Climate Change Strategy) asserts that there are interactive functions between measures for newly-built buildings and the requirement of total emissions reduction for existing buildings. The C&T and Green Building Programs together cover both the planning and implementation stages of the buildings' mitigation measures, inducing owners and developers to look into what and how to comply with the programs requirements and to install even voluntary over-compliance measures as early and progressively as possible. Two-thirds of the buildings under the Green Building Program now exceed the thermal performance (insulation efficiency) criteria provided under Japan's Rational Use of Energy Act. Furthermore, the performance of condominiums is improving steadily.

Green buildings. Examples of such 'green buildings' include those that have plans for a large-scale installation of solar panels, new radiation cooling/heating systems and LED lighting. Even in buildings that already have the lowest levels of CO₂ emissions, equipment is being upgraded to reduce emissions further when extension wings or annexes are constructed.

Greening the market. TMG sees those examples as "the dawning of a new era of green buildings" in which new business opportunities for the construction industry and developers are created. Likewise, the C&T Program is also creating new business models to stimulate economic activity. Such new businesses can include consultations on acquiring emission reduction credits for energy efficiency measures by small and medium sized business facilities and for the validation and trading of various credits. TMG's experiences show that linking various sustainable programs on new buildings, which enables wide-ranging implementation and enforcement, may well be an effective strategy for incentivising comprehensive change and for creating a competitive market for sustainable designs.

Lessons learned

Accurate data collection and historical records are vital. The TMG's mandatory emissions disclosure scheme highlighted (Tokyo CO₂ Emissions Reduction Program) that was implemented prior to the C&T Program yielded a large database of information on targeted facilities. It highlighted sources for individual energy consumption including specific machinery and infrastructure. The detailed breakdown via a database allowed TMG to calculate emissions and identify best practices for energy efficiency, enabling TMG to make evidence-based arguments and to assert that emission reduction targets were possible.

Legal requirements. The same lesson applies to the Green Building Program. TMG ascribes the program's success to the creation of a mandate for owners to report and disclose Building Environmental Plans. The resulting cumulative data on the buildings' environmental and energy performance gave TMG the information it needed to decide how to extend the scheme to different buildings and strengthen measures for more effective implementation. From this perspective,

it was important to institutionalize relevant instruments as legally-binding requirements.

Stakeholder interaction provides tailored solutions.

Interacting with relevant stakeholders is of the utmost importance, in terms of tailoring the programs to the needs of individual businesses and to create effective incentives. Voluntary mitigation efforts may have yielded minimal success in achieving emissions reduction goals, however, by including stakeholders from the beginning the targets and reduction measures were appropriate and achievable. This policy process also gave the stakeholders the opportunity to learn more about the capabilities to improve their own mitigation measures.

A nationally uniform standard is not appropriate. National standards have the benefit of creating economies of scale by stimulating the wider dissemination of environmental technologies, technological innovation and cost reduction strategies. However, at the same time, standards for energy efficient buildings may vary by region and climate. The pace at which such standards are met may differ by region. Given these region-oriented characteristics, it is important that the national government defers to the local governments decision-making capabilities to override the nationwide standard with their own more stringent and appropriate standards.

Replication

The Green Building Program may easily be replicated, once a rating system and standards for each area are appropriately established. Indeed, as of 2009, 21 out of 65 local governments (prefectural governments and government-ordinance-designated cities) had introduced the program. However, the degree to which implementation and enforcement is legally-binding differs among jurisdictions. As of August 2011, 15 local government programs use formal ordinances.

On the other hand, it has been much more difficult for other local governments to mimic the C&T Program. Although TMG tries to diffuse its program to 9 local governments in the Tokyo Metropolitan Area, information sharing has not led to new schemes being introduced. The exception is the Saitama prefecture's program where selling certain credits between Tokyo and Saitama is permitted. Introduced in 2010, the Saitama's program, however, does not put caps on its targeted facilities and buildings, and only stipulates that the facilities are to meet their emission reduction targets voluntarily. TMG asserts that the C&T and Green Building Programs have worked in tandem, offering a policy model that features the best mixture between mandatory obligations and market-oriented voluntary measures. This is what is required for successful replication.

Budget and finance

The introduction of the C&T Program incurred large costs but the exact figures of the budgets and staffing have not been finalized. To expand its measures for mitigating climate change, TMG established a fund with 50 billion yen (US\$



Figure 2 TMG green labelling program for apartment buildings.

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610 million). Effective implementation of climate change policy requires broad, cross-cutting organizational supports sustained by many different parts of the administration. The fund is being used to provide them with budgetary incentives to cooperate with one another, making such organizational support real and robust. This allowed a successful implementation of the C&T Program.

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