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# Acting Local!

## An Evaluation of the First Compliance Period of Tokyo's Carbon Market

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An Evaluation of the First Compliance Period of Tokyo's Carbon Market

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While the Paris COP21 Agreement blazes the trail for global climate policy, bottom-up market-based initiatives like the Tokyo Metropolitan Government Emissions Trading Scheme (TMG ETS) are still valuable supplements. The program has just finished its first compliance period: It's high time for an interim evaluation.

## I. Introduction

Megacities' key role in climate protection has been emphasized by renowned institutions such as the World Bank.[2] Cities already account for more than 70% of global energy-related carbon dioxide ($CO_2$) emissions, while their potential for cost-efficient emission reductions is amongst the highest. Hence, ambitious climate policy has to target metropolis' energy consumption with a special focus.

In economics, recent contributions to the environmental federalism debate consider such activities reasonable.[3] While early arguments warned of a deregulation race to the bottom due to geographical externalities,[4] more recent works see municipalities as policy laboratories, which can tailor policies to residents' preferences and to particular infrastructural needs.[5]

Carbon markets promise emission reductions at low cost[6] and despite of start-up problems, EU and US cap-and-trade schemes have gradually been reviewed and improved. Moreover, basically, carbon markets can be designed in a sustainable way.[7] Not least, domestic schemes can be linked in order to establish a global carbon price, which might

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[2] World Bank, *Cities and Climate Change* (Washington D.C.: World Bank, 2010).

[3] Wallace E. Oates, *Environmental Policy and Fiscal Federalism* (Cheltenham/Northampton: Edward Elgar, 2004).

[4] Richard Stewart, "Pyramids of Sacrifice? Problems of Federalism in Mandating State Implementation of National Environmental Policy", 86 *The Yale Law Journal* (1977), 1196.

[5] Jonathan Adler, "The Fable of Federal Environmental Regulation – Reconsidering the Federal Role in Environmental Protection", 55 *Western Reserve Law Review* (2004), 93.

[6] Thomas Tietenberg, *Emissions Trading* (Washington D.C.: Resources for the Future, 2006).

[7] Sven Rudolph et al., "Towards sustainable carbon markets – Requirements for effective, efficient, and fair emissions trading schemes", in Larry Kreiser et al. (eds.): *Carbon Pricing, Growth and the Environment – Critical Issues in Environmental Taxation, Vol. XI* (Cheltenham/Northampton: Edward Elgar, 2012), 167.

lower total compliance costs).[8] To this effect, the recent spreading of domestic carbon markets across the world and different governance levels is promising.

The development of local carbon markets has been led by Japan's capital.[9] Still the world's biggest metropolitan area with total emissions levels of 65 million tons in 2011, Tokyo utilized the opportunity provided by Japan's 1999 Omnibus Decentralization Act and adopted its own climate policy program with a 25% reduction target for 2020 (base 2000). Tokyo's carbon market is outstanding in three ways: It was the world's first local megacity carbon market; it still is the only mandatory carbon market with an absolute volume cap in Japan; and it was the first carbon market focusing on commercial activities and the end-use of energy.

So is the TMG ETS a promising project for reducing metropolitan $CO_2$ emissions, and how has it done in the first compliance phase?

## II. TMG ETS Design and Phase I Achievements

While a national carbon market eventually failed in Japan in 2010,[10] Tokyo launched its scheme in the same year after an exemplary political discussion process based on a unique design:[11] Due to commercial activities' big emissions' share, the mandatory program focuses on $CO_2$ emissions from the end-use of energy in large office buildings, thus covering around 1,200 facilities and a share of 21% of Tokyo's total $CO_2$ emissions. The caps were set at a level of 6% and 15% below base-year emissions for the first (2010-2014) and second (2015-2019) phase. Participants pick the base period themselves, using average emissions of three executive years between 2002 and 2007, the total cap then resulting from adding up individual facility targets. Instead of handing out emission allowances, the TMG ETS defines reduction obligations, and only if these obligations are exceeded, tradable excess reduction credits (ERC) are issued. Thus, basically, emissions rights are

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[8] Matthew Ranson and Robert N. Stavins, "Linkage of greenhouse gas emissions trading systems", *Climate Policy* DOI: 10.1080/14693062.2014.997658.

[9] Tokyo Metropolitan Government, *Tokyo Cap-and-Trade Program* (Tokyo: TMG, 2010).

[10] Sven Rudolph and Friedrich Schneider, "Political barriers of implementing carbon markets in Japan – A Public Choice analysis and the empirical evidence before and after the Fukushima nuclear disaster", 15 *Environmental Economics and Policy Studies* (2012), 211.

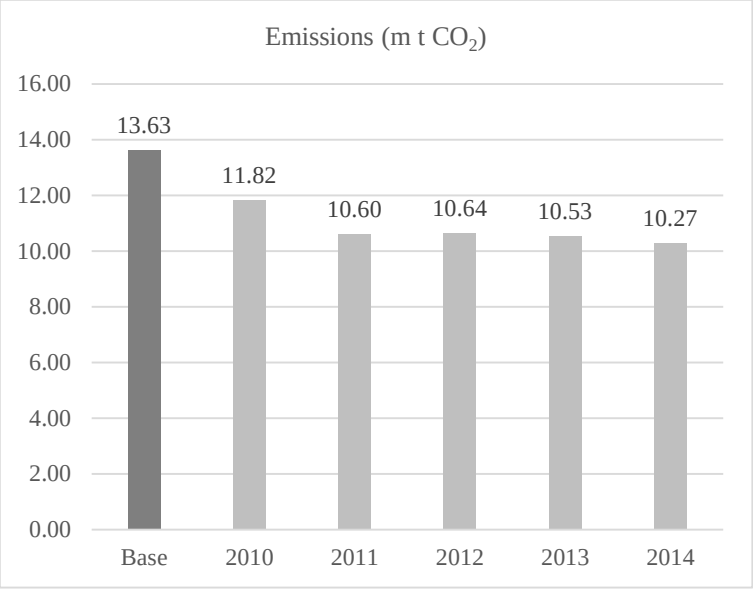
[11] Tokyo Metropolitan Government, *Tokyo Cap-and-Trade Program for Large Facilities (Detailed Documents)* (Tokyo: TMG, 2015); Yuko Nishida and Ying Hua, "Motivating Stakeholders to Deliver Change", 39 *Building Research & Information* (2011), 518; Sven Rudolph and Takeshi Kawakatsu, "Tokyo's greenhouse gas emissions trading scheme – a model for sustainable megacity carbon markets?", in Larry Kreiser et al. (eds.): *Market-Based Instruments – National Experiences in Environmental Sustainability – Critical Issues in Environmental Taxation, Band XIII* (Cheltenham/Northampton: Edward Elgar, 2013), 77.

granted free-of-charge. Banking of credits is allowed, while borrowing is prohibited. Only four types of offsets are accepted from small-and-midsize companies, from renewable energy projects, from installations outside of Tokyo but inside Japan, and from the linked Saitama prefecture neighboring Tokyo. Since 2011, bilateral trading of credits is allowed, while no use of a stock exchange is made; but the TMG supports facilities by supply-demand-matching fairs. Non-compliance is penalized by a fine of up to 500,000 ¥, a 1.3 times ex-post shortage coverage, and the publication of facilities' names.

At first glance, the TMG ETS seems to be a well-designed local carbon market, especially considering its innovative character of focusing on the end-use of energy in big buildings. In 2014 the first compliance period ended, and although trading for this period is possible until mid-2016, most data is already available. An analysis of this data in many ways supports the view that the TMG ETS is a major success.

Regarding environmental effectiveness, the TMG ETS has produced impressive emission reductions in the first compliance period.[12] Total emissions of covered facilities in Tokyo have been steadily reduced from 13.61 m t in the base period to 10.27 m t in 2014 (Fig. 1).

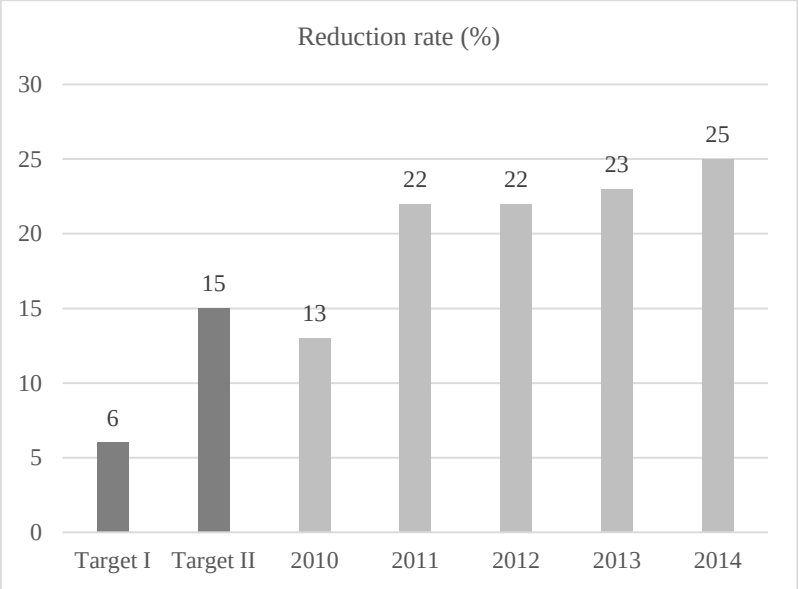
**Figure 1**




Even more, the reduction rate in the first year 2010 (13%) was much higher than the Phase I target rate (–6%), and from 2011 onwards reduction rates have even significantly exceeded the Phase II target (–15%); by 2014 emissions had been reduced by 25% (Fig. 2).

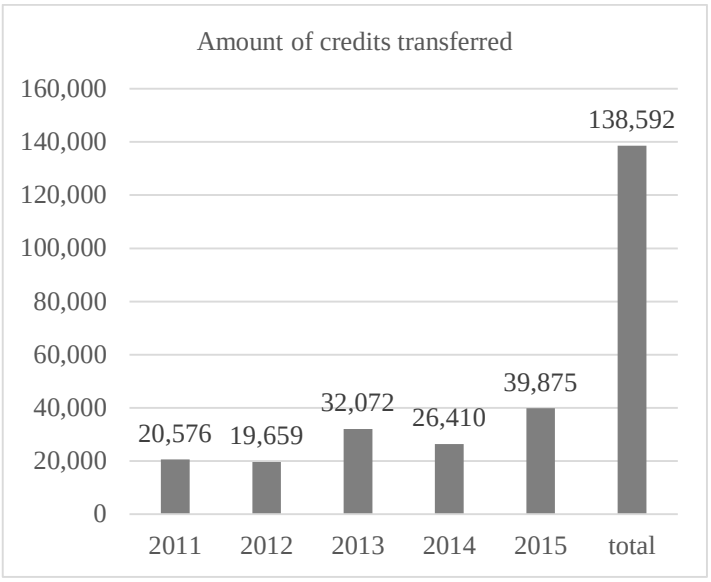
[12] TMG, *Tokyo Cap-and-Trade Program achieves 25% reduction after 5th year* (Tokyo: TMG, 2010).

**Figure 2**




Certainly some of the reductions can be attributed to energy saving activities after the Tohoku Earthquake and the nuclear melt-downs in Fukushima in March 2011. However, major measure were already implemented before the catastrophe, went beyond the required savings, and continued after the relaxation of the respective energy saving requirements thus indicating the effect of the TMG ETS. Last, by February 2016 over 90% of all facilities have surpassed their Phase I reduction targets and even 76% have already complied with their Phase II obligations.

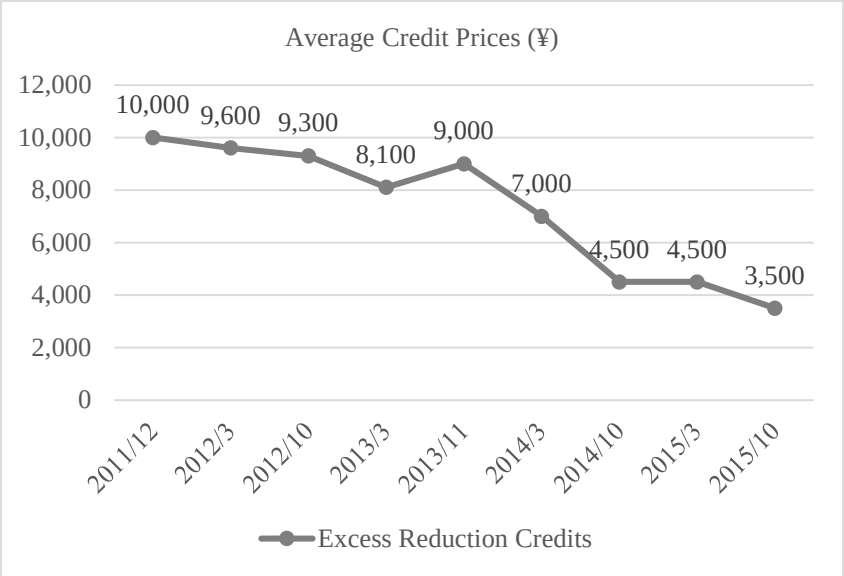
**Figure 3**




In terms of economic efficiency, the $CO_2$ reduction credit market has been getting more and more active, and actual credit prices have decreased to a level way below ex ante

expectations.[13] The number of credits transferred between independent facilities have increased to an all-time high of almost 40,000 in 2015, adding up to around 138,600 in sum for Phase I (Fig. 3). A similar increase can be detected for the number of individual transactions, resulting in 28 cases in 2015. More trading is expected in 2016, as credit transfers are still accepted for Phase I compliance until June of this year. Internal calculations show a total shortage of 200,000 to 300,000 t at around 10% of facilities for Phase I; they have to be covered by trading until June 2016. Surveys conducted amongst facilities show a willingness-to-sell at current prices for about 520,000 t. In addition to actual credit transfers, the number of excess reduction credit issuances have also increased to about 521,000 credits in 2015. $CO_2$ prices were expected to be 100-150 US$ in ex ante studies, but they are now down to 3,500 Yen or 31.5 US$ for excess reduction credits (ERC) after an almost steady decline since 2011 (Fig. 4).[14]

**Figure 4**




## III. Conclusions

Megacities play an increasingly important role in climate policy. As a national leader in environmental policy, Japan's capital Tokyo established the world's first local carbon market focused on the end-use of energy in big buildings in 2010. To a large extent the program is well designed and promises significant emission reductions at low cost.

[13] TMG, "Credit prices and transfers" (internal information provided by TMG, Tokyo, 2016).
[14] Note: 100¥ = 0.9 US$.

This view is supported by data from the first compliance period, which ended in 2014. Total emissions have been reduced by a total cumulative amount of 14 m t, actual emission rates have even exceed the targets, and compliance is close to 100% for Phase I. Credit trading activities have steadily increased, while the market price for emission reduction credits is now lower than one fourth of the ex ante expected price and has steadily declined since the first year of trading.

Naturally, as the TMG ETS represents a global pilot project, there is room for improvements. In order to take full advantage of the environmental and economic capabilities of cap-and-trade, the TMG ETS could be enhanced by

- extending the scope to other sectors and gases and by tightening the cap in order to increase the mitigation effect;
- phasing-in auctions in order to the comply with the polluter-pays-principle and in order to raise revenues for environmental, economic, or social purposes;
- allowing trading of all allowances and by using an established stock exchange in order to facilitate market trading and cost minimization.

Most importantly, however, other metropolises should follow the Tokyo example and instigate a process of ambitious bottom-up markets for carbon emissions.