

## CASE 4

# Yokohama, Japan

### Waste Reduction by Engaging Stakeholders in the Private Sector and Civil Society

For Eco<sup>2</sup> cities, the case of Yokohama offers information on ways to realize significant environmental and economic benefits by engaging private sector and civil society stakeholders. Yokohama is the largest city in Japan (figure 3.28).<sup>1</sup> It reduced waste by 38.7 percent between fiscal years<sup>2</sup> 2001 and 2007, despite the growth of 165,875 people in the city's population. This reduction in waste is attributable to the city's success in raising public awareness about environmental issues and the active participation of citizens and businesses in Yokohama's 3Rs program (reduce, reuse, and recycle).<sup>3</sup>

Yokohama has been able to shut down two incinerators because of the significant reduction in waste. The incinerator closures have saved US\$6 million<sup>4</sup> in annual operating costs and US\$1.1 billion that would have been needed to renovate the incinerators (table 3.4) (City of Yokohama 2006). Around 5 percent of the fiscal year 2008 budget of the Resources and Wastes Recycling Bureau, the city's waste management entity, was derived from the sale of recycled material (US\$23.5 million). In addition, the city raises US\$24.6 million annually by selling the electricity generated during the incineration process (City of Yokohama 2008a).

Yokohama's success demonstrates that a city may achieve waste reduction through the cooperation of its stakeholders, particularly citizens. Reducing waste also results in significant cuts



**Figure 3.28 The Yokohama Waterfront**

Sources: Yokohama Convention and Visitors Bureau (left) and City of Yokohama (right).

## Profile of Yokohama

### Yokohama

- The largest city in Japan after Tokyo
- Population (2009): 3.65 million
- Land area: 435 km<sup>2</sup>
- Population density (2009): 8,409 persons per km<sup>2</sup>
- The Port of Yokohama was opened to international trade in 1859, the year the government of Japan decided to abandon its isolationist policy and initiate modernization and the opening to foreign cultures. The city is celebrating the 150th anniversary of the port's opening in 2009.
- In 2005, about 21 percent of the population was commuting out of the city for purposes of employment or education.
- The population becomes quite involved in participatory civil activities.
- In 2008, the city was selected as one of Japan's Eco-Model Cities.



**Map 3.6 Location of Yokohama**

Source: Map Design Unit, General Services Department, World Bank.

**Table 3.4 The Power of Stakeholder Engagement in Yokohama, Fiscal Years 2001–07**

Total waste reduction	623,000 tons (-38.7 percent)
Economic benefit	US\$1.1 billion in capital costs saved because of two incinerator closures
	US\$6 million in operating costs saved because of two incinerator closures
	Life of landfill sites was extended
CO <sub>2</sub> reduction	840,000 tons

Source: Author compilation (Hinako Maruyama).

in greenhouse gas emissions. In addition, a city may cut expenditures by reducing waste, while generating revenue from the recyclables and by-products resulting from waste treatment. Encouraged by these achievements, Yokohama now aims to reduce greenhouse gas emissions to lead Japan toward the national reduction target and demonstrate its place as one of the Eco-Model Cities.<sup>5</sup>

## Background and Approaches to Waste Reduction

Yokohama's population has increased slowly by 0.5 to 1 percent per year. Population growth and the associated economic activities have gener-

ated more waste, and this has put pressure on the city's landfill sites, which have limited capacity. In 2000, the city had seven incinerators (of which six were in operation) and two landfill sites (an inland site and a sea reclamation site). To reduce the environmental impact of incineration and landfill disposal and to nudge Japanese society toward a zero waste cycle, Yokohama started the G30 Action Plan in 2003. The G30 plan aims to reduce waste by 30 percent by fiscal year 2010, using fiscal year 2001 waste quantities as baselines.

The G30 plan identifies the responsibilities of all stakeholders—households, businesses, and the city government—to reduce waste through the 3Rs based on polluter pay schemes and extended producer responsibility principles (City of Yokohama 2003). The plan provides integrated approaches to reduce waste that are supported by detailed action programs. For example, Yokohama citizens must separate waste into 15 categories and properly dispose of each category of waste at designated places and times. Businesses are requested to provide products and services that produce less waste and to implement the 3Rs actively. The city, which is one of the largest entities producing waste, is committed to decreasing

waste and to working with citizens and businesses as a model player.

To disseminate the G30 approach, the city conducts environmental education and promotional activities that enhance public awareness and foster collaborative action to achieve the G30 goal. To promote adequate waste separation, the city has undertaken public activities, including more than 11,000 seminars among neighborhood community associations—80 percent of Yokohama’s population participates in neighborhood community associations—to explain waste reduction methods such as the segregation of waste (City of Yokohama 2008b; see figure 3.29). In addition, about 470 campaigns have been held at railway stations; about 2,200 awareness campaigns have also been organized in the mornings at local waste disposal points; and so on (City of Yokohama 2006). Campaign activities have been initiated along local shopping streets, at supermarkets, and at various events (figure 3.29). The G30 logo is posted in all city publications, on city-owned vehicles, and at city events.

As a result, the waste reduction target of 30 percent was achieved in fiscal year 2005, five years earlier than expected (fiscal year 2010). By fiscal year 2007, waste had fallen 38.7 percent relative to 2001, despite the growth in the population by 165,875 people over the period (table 3.5, figure 3.30).



**Figure 3.29 Public Awareness Campaigns for Waste Reduction and Separation in Yokohama**

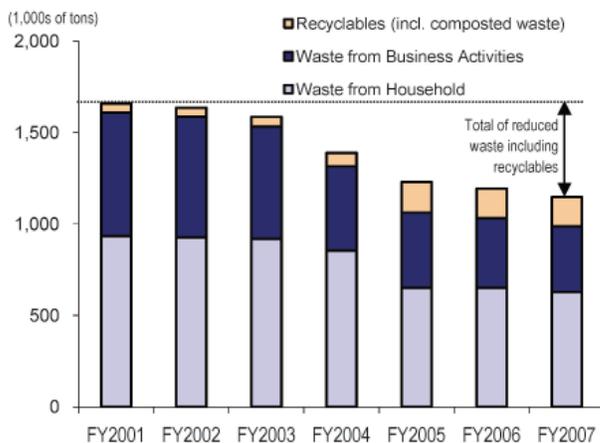
Source: City of Yokohama.

**Table 3.5 Waste in Yokohama, Fiscal Years 2001–07**

INDICATOR	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007
Population (millions)	3.46	3.50	3.53	3.56	3.58	3.60	3.63
<b>General waste, excluding recyclables (1,000s of tons)</b>	1,609	1,586	1,532	1,316	1,063	1,032	987
Waste from households (1,000s of tons)	935	928	919	855	651	652	628
Waste from business activities (1,000s of tons)	674	658	613	461	412	380	359
<b>Collected recyclables, including compost waste (1,000s of tons)</b>	50	50	53	72	166	162	160

Sources: City of Yokohama (2008a); City of Yokohama statistics portal, <http://www.city.yokohama.jp/me/stat/>.

Note: FY = fiscal year.



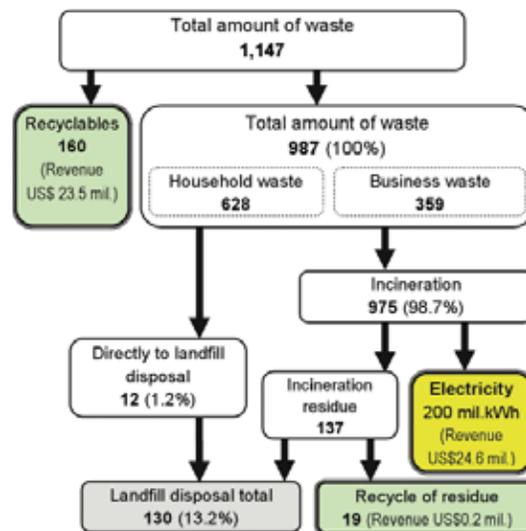
**Figure 3.30 Waste Reduction in Yokohama, Fiscal Years 2001–07**

Sources: Author compilation (Hinako Maruyama) based on City of Yokohama (2008a); City of Yokohama statistics portal, <http://www.city.yokohama.jp/me/stat/>.

## The Environmental Benefits of Waste Reduction

In Yokohama, almost 99 percent of nonrecyclable waste is brought to incinerators for treatment (figure 3.31). Waste treatment is the largest contributor to carbon dioxide (CO<sub>2</sub>) emissions among the city’s public works activities, which include office work, waste treatment, water provision, sewage treatment, and public transportation. For instance, CO<sub>2</sub> linked to waste treatment comprised 54.8 percent of total CO<sub>2</sub> emissions from city public works in fiscal year 2000.

According to Yokohama’s life-cycle assessment, the waste reduced between fiscal years 2001 and 2007 was equivalent to avoiding 840,000 tons of CO<sub>2</sub> emissions. This included 760,000 tons of avoided CO<sub>2</sub> emissions from obviated waste collection, incineration, and landfill disposal and 110,000 avoided tons of CO<sub>2</sub> from recycling waste. Incinerators produce electricity from heat and steam generated by burning waste, then reuse this electricity for their own operations or sell it to electricity companies or other facilities. However, because reduced waste results in less incineration and electricity production, the electricity company that purchased electricity from incinerators



**Figure 3.31 The Waste Flow in Yokohama, Fiscal Year 2007**

Source: Author compilation (Hinako Maruyama) based on City of Yokohama (2008a, 2008c).

Note: The amounts in bold are thousands of tons. kWh = kilowatt-hour; mil. = million.

must produce additional electricity. In Yokohama, this additional supply of electricity was equal to 30,000 tons of CO<sub>2</sub>; thus, the balance of avoided CO<sub>2</sub> is 840,000 tons (table 3.6), which is equivalent to the amount of CO<sub>2</sub> that 60 million Japanese cedar trees are able to absorb in one year. Planting that many cedar trees would require an area of approximately 600 square kilometers, an area 27 percent larger than the city (City of Yokohama 2009).

## The Economic Benefits of Reduced Waste

In 2000, the city had seven incinerators, but, by 2006, two incinerators had been shut down owing to significant reductions in waste. This closure represented a savings of US\$1.1 billion in capital expenditures that would have been needed to reconstruct and renovate the two incinerators. It also saved annual operating expenditures of US\$6 million (that is, US\$30 million

**Table 3.6 CO<sub>2</sub> Reduction through Waste Reduction, Fiscal Years 2001–07**

tons

INDICATOR OF REDUCTION	QUANTITY OF CO <sub>2</sub>
CO <sub>2</sub> reduction because of reduced waste collection, incineration, and landfill	760,000
CO <sub>2</sub> reduction because of recycling	110,000
CO <sub>2</sub> increase caused by the additional supply of electricity by the electricity utility	(-30,000)
Total CO <sub>2</sub> reduction	840,000

Source: City of Yokohama (2009).

in savings from obviated annual operating costs, minus US\$24 million in expected annual expenditures for intermediate waste treatment and separation costs, recycling, contracting, and so on) (City of Yokohama 2006).

Yokohama has two landfill sites. When the G30 was planned in 2003, it was forecast that the landfills would have 100,000 cubic meters of capacity remaining in 2007 and would be full by 2008. However, owing to the waste reduction achieved, the two sites had 700,000 cubic meters of capacity remaining in 2007. The value of the additional capacity of 600,000 cubic meters is equivalent to US\$83 million (City of Yokohama 2006). In addition, the development of a new landfill site or reclamation area in the sea has been postponed.

### The Economic Benefits of the Efficient Use of Resources

The city's five incinerators produce heat and steam during the incineration of waste. The heat and steam are used to operate the incinerators, including the heating, cooling, and generation of hot water, and to power adjacent public facilities, including an indoor pool and elder care facilities. Turbines in the incinerators produce electricity from the steam. In fiscal year 2007, the incinerators produced 355 million kilowatt-hours of electricity. Of this power, 42.2 percent was reused by the incinerators; 55.4 percent was sold to electricity companies

under competitive tendering; and 2.4 percent was harnessed by nearby public facilities, such as a sewage treatment plant, sludge recycling facility, and seaside line railway. In fiscal year 2007, US\$24.6 million was earned by selling 200 million kilowatt-hours of electricity, which is equivalent to one year of electricity for 57,000 households (City of Yokohama 2008a).

Yokohama began earning revenue by selling recyclables, such as cans, bottles, paper, furniture, and electronic appliances, as well as reusable metal and material produced from incinerated ash. Collected recyclables are sold to private companies for additional treatment and reuse. Incineration ash is recycled into construction materials. About US\$23.5 million in revenue is secured by selling recyclables to treatment companies (City of Yokohama 2008a).

As a result of these measures, about 10 percent of the US\$480 million budget of the Resources and Wastes Recycling Bureau in fiscal year 2008 came from selling recyclables (US\$23.5 million) and electricity generated from incineration (US\$24.6 million) (City of Yokohama 2008a, 2008c).

To promote efficient waste management, the city also began contracting key activities (such as waste collection and transportation) to the private sector, which often provides higher-quality services at lower cost. Between 2003 and 2005, the city saved US\$26.4 million in operating costs by contracting services to the private sector (City of Yokohama 2006).

## Lesson Learned in the Yokohama Case

The Yokohama case shows that the cooperation of stakeholders, particularly citizens, is important in achieving city targets. Of course, substantial and consistent efforts are needed at the grassroots level to raise the awareness of citizens and businesses and to attempt to change behaviors. However, the measures in Yokohama have not required new technology or huge investments. Moreover, cities can count on citizen power to make headway once people understand relevant issues, change their behavior, and become active players in implementing plans.

Encouraged by the achievements of the G30, Yokohama now aims to continue to reduce greenhouse gas emissions to lead Japan and demonstrate its qualities as one of the country's Eco-model Cities. In Yokohama's 2008 Climate Change Action Policy, CO-DO 30, the city aims to reduce greenhouse gas emissions by more than 30 percent by fiscal year 2025 and by more than 60 percent by fiscal year 2050 (relative to the levels in fiscal year 2004) (City of Yokohama 2008d). Action plans are being established on the basis of seven approaches to realize the plan's targets.<sup>6</sup> In addition, Yokohama aims to increase its use of renewable energy by a factor of 10 relative to fiscal year 2004 baselines. Citizens are actively participating in these activities, including by purchasing city-issued bonds to fund the construction of a new wind power generator. Finally, in light of Yokohama's reduced waste and the need to soon undertake costly renovations of an aged incinerator, the city is planning to close one more incinerator by fiscal year 2010 and, henceforth, use only four incinerators. More reductions in CO<sub>2</sub> emissions and operational savings are expected.

## Notes

1. In Japan, there are several hierarchies and categories of administrative areas defined with such terms as *prefecture*, *city*, *county*, *ward*, *town*, and *village*. Among those areas in Japan categorized as *city*, Yokohama has the largest population.
2. Yokohama's fiscal year runs between April and March of the following year.
3. In this case study, waste denotes waste produced by households or businesses (commercial and services). Industrial waste is not included. See also City of Yokohama (2008a) and Yokohama statistics portals, <http://www.city.yokohama.jp/me/stat/> and <http://www.city.yokohama.jp/me/stat/index-e.html>.
4. In this case study, \$ = ¥100 was used for currency calculation.
5. The government launched the Eco-model Cities Initiative in 2008. A total of 13 cities were selected to serve as model cities. The selection was based on (a) achievement of a difficult target in the reduction of greenhouse gases, (b) a comprehensive and original approach that may be replicated by other cities, (c) appropriate local conditions and features, (d) the feasibility of the target and the plans and wide stakeholder participation, and (e) long-term and sustainable implementation. Apart from Yokohama, the cities of Iida, Kita-Kyushu, Kyoto, Minamata, Miyakojima, Obihiro, Sakai, Toyama, and Toyota; the towns of Kasihara and Shimokawa, and the Tokyo Ward of Chiyoda were selected.
6. The seven approaches are (a) living: to change society with anti-climate-change actions among individuals; (b) business: to change society with anti-climate-change business styles; (c) building: to plan and develop a city through energy-efficient building construction; (d) transportation: to promote city planning and development to create an attractive city where people may travel on foot, by bicycle, or on public transportation and to promote anti-climate-change measures with regard to automobiles; (e) energy: to increase recyclable energy ten-fold; (f) city and green areas: to plan and develop a green city through urban heat island measures and so on; and (g) city hall: to develop an anti-climate-change city hall.

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