Zero-Landfill Circular Treatment of Western Tokyo's Municipal Solid Waste

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The growing challenge of municipal solid waste (MSW) requires a transformation from the traditional linear economy to the circular economy. Japan is known as a pioneer in the circular economy, and Western Tokyo (population: about 4 million) is recognized as a frontrunner in MSW management in Japan. The essentials of Western Tokyo's MSW treatment processes are shown in **Figure 1**. Recyclables are recovered as materials for recycling. Non-recyclables are incinerated at intermediate treatment facilities, where energy and metals are recovered. All incineration ash generated at the facilities is recycled into Eco-cement. The amount of waste sent to landfills in Western Tokyo has remained at zero since 2017, and its recycling rate is significantly higher than those of Central Tokyo and Japan.

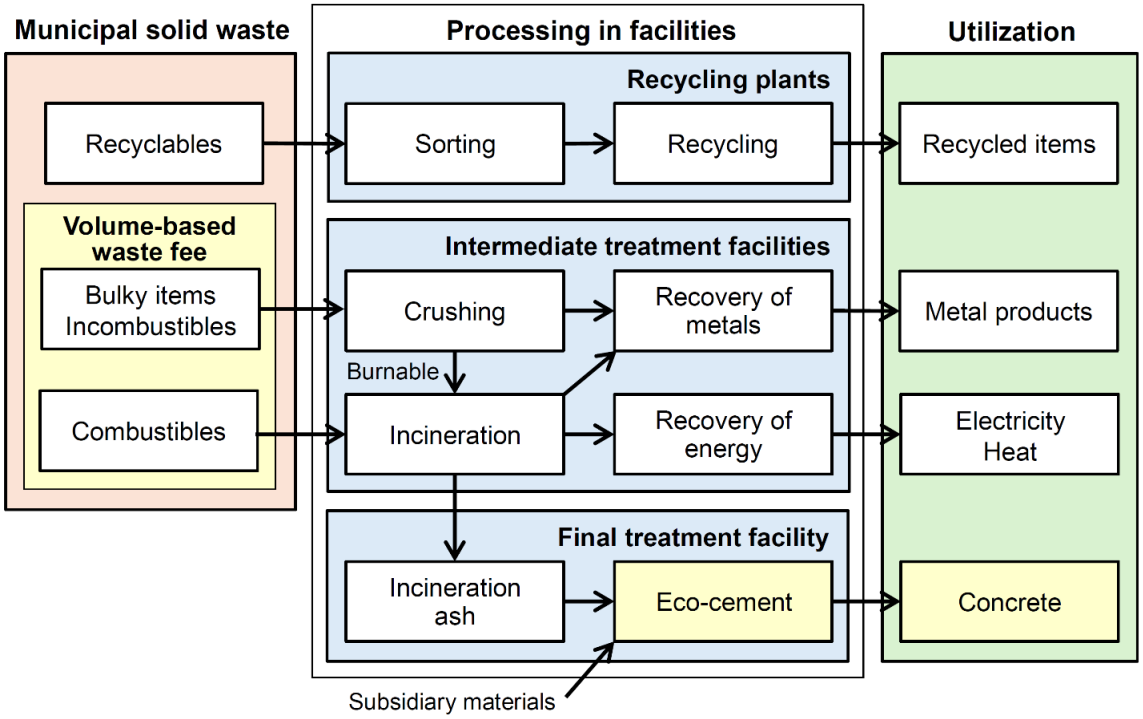

Figure 1. Main processes of treating municipal solid waste (MSW) in Western Tokyo.

Fujihira K. Zero-Landfill Circular Treatment of Western Tokyo's Municipal Solid Waste. September 2026. Institute of Environmentology. https://www.kankyogaku.com/docs/circular-msw-treatment-english.pdf

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Western Tokyo

Western Tokyo, also known as the Tama region, is located in the inland part of Tokyo Prefecture. As shown in **Figure 2**, the Tokyo Prefecture mainland comprises Central Tokyo and Western Tokyo. Central Tokyo (population: about 10 million) is Japan's administrative and commercial hub. On the other hand, Western Tokyo is characterized as a satellite urban area of Central Tokyo, and its population density tends to decrease the farther one moves westwards from Central Tokyo.

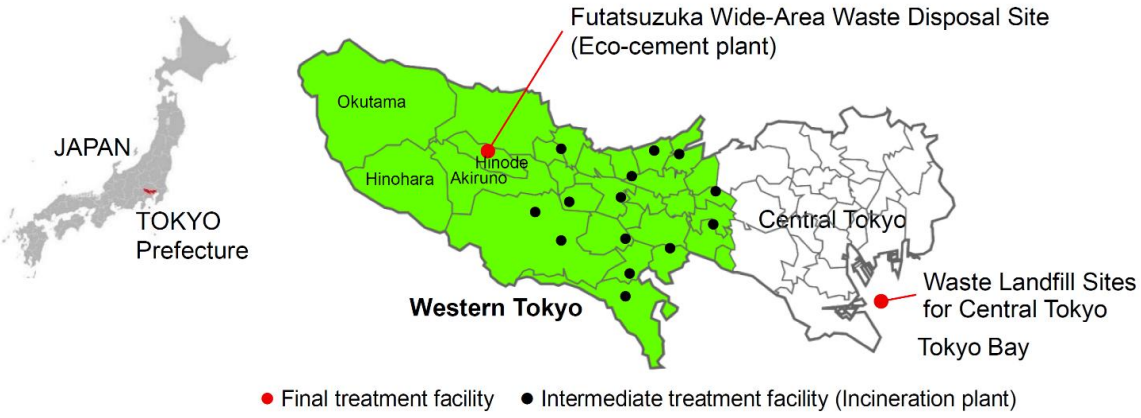

Figure 2. Locations of Western Tokyo and the final and intermediate treatment facilities.

MSW treatment methods in Western Tokyo

Of the 30 municipalities in Western Tokyo, 26 municipalities—excluding the four in the westernmost area (Okutama, Hinohara, Akiruno, Hinode) treat MSW using the same methods (**Figure 1**). "Recyclables," such as cans, bottles, and paper, are collected separately and recycled. "Bulky items and non-combustibles," as well as "combustibles," are collected and transported to intermediate treatment facilities. Bulky items and non-combustibles are crushed, and metals are recovered. The remaining burnable materials are sent to the incinerator. Combustibles, such as paper waste, non-recyclable plastics, and kitchen garbage, are placed directly into the incinerator. Energy generated during incineration is recovered as electricity and heat. Metals recovered from crushed bulky items and incombustibles, as well as incineration residue, are recycled into metal products. All the incineration ash generated at the fourteen intermediate treatment facilities shown on the map (**Figure 2**) is transported to the final treatment facility, Futatsuzuka Wide-Area Waste Disposal Site, and recycled as raw material for "Eco-cement."

While the waste treatment methods in Western Tokyo and Central Tokyo are basically the same, there are two significant differences: (1) adoption of a volume-based waste fee system for non-recyclable waste, and (2) a method of treating incineration ash. In **Figure 1**, these two points are highlighted in yellow.

Whereas a volume-based waste fee system has been adopted for non-recyclable waste in Western Tokyo, it has not yet been adopted in Central Tokyo. In Western Tokyo, only non-recyclable waste placed in pre-purchased, municipality-designated collection bags is collected. The fee level is significantly higher than the average charged by other Japanese municipalities that have adopted a volume-based waste fee system. On the other hand, in Central Tokyo, all waste placed in any bag is collected.

The other remarkable difference concerns the treatment method for incineration ash generated at intermediate treatment facilities. In Central Tokyo, the majority of incineration ash is disposed of at the Waste Landfill Sites in Tokyo Bay (**Figure 2**, right). In contrast, as described above, all incineration ash generated in Western Tokyo is recycled into Eco-cement and used for concrete.

Eco-cement

In 1998, the Futatsuzuka Wide-Area Waste Disposal Site (**Figure 3a**) was established in Hinode Town as the final treatment facility. On the site, the Eco-cement plant (**Figure 3b**) was constructed and started operation in 2006. The Eco-cement plant can produce about 130,000 tons of Eco-cement annually. The plant uses about 90,000 tons of incineration ash annually as the primary raw material for the Eco-cement. In 2024, 18 years after the plant started operations, cumulative shipments of Eco-cement exceeded 2,000,000 tons.

Figure 3. (a) Futatsuzuka Wide-Area Waste Disposal Site. **(b)** Eco-cement plant. ©Tokyo Tama Regional Association for Waste Management and Resource Recycling

The Japanese Industrial Standard (JIS) for Eco-cement was established and certified as JIS R 5214 in 2002. Products made with Eco-cement are marked with the emblem shown in **Figure 4a**. **Figures 4b-d** show examples of precast concrete products made with Eco-cement. **Figures 4e** and **4f** show interlocking blocks made with Eco-cement and installed interlocking blocks, respectively.

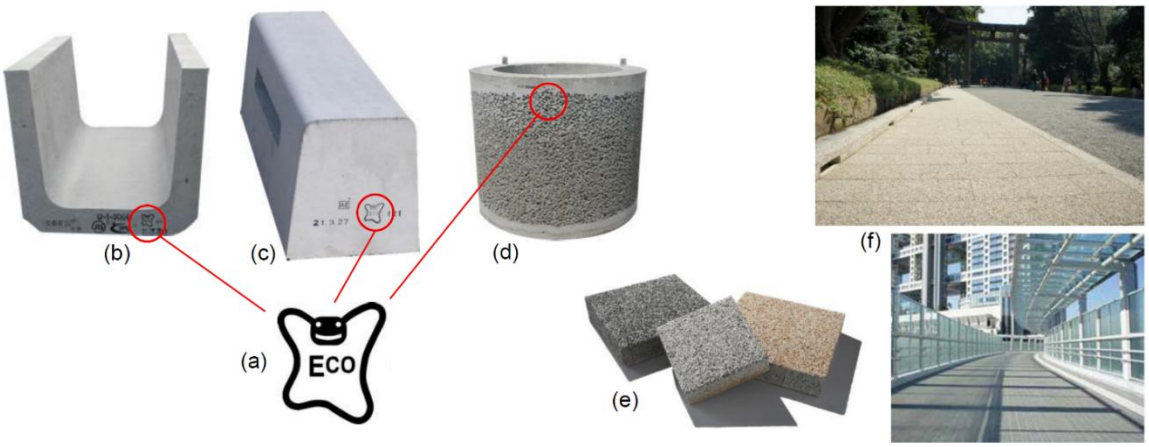

Figure 4. (a) Emblem of Eco-cement. (b) U-gutter. (c) Street drainage block. (d) Porous concrete product. (e) Permeable interlocking blocks manufactured with Eco-cement. (f) Examples of interlocking block installation. ©Taiheiyo Cement Corporation.

Changes in recycling rates

Western Tokyo has significantly higher total recycling rates than Central Tokyo and Japan (**Figure 5**). The total recycling rate in Western Tokyo rose sharply until around 2010 and has since remained at around 37%. The Eco-cement production and higher-priced, volume-based waste fee system for non-recyclables are believed to influence Western Tokyo's higher recycling rates.

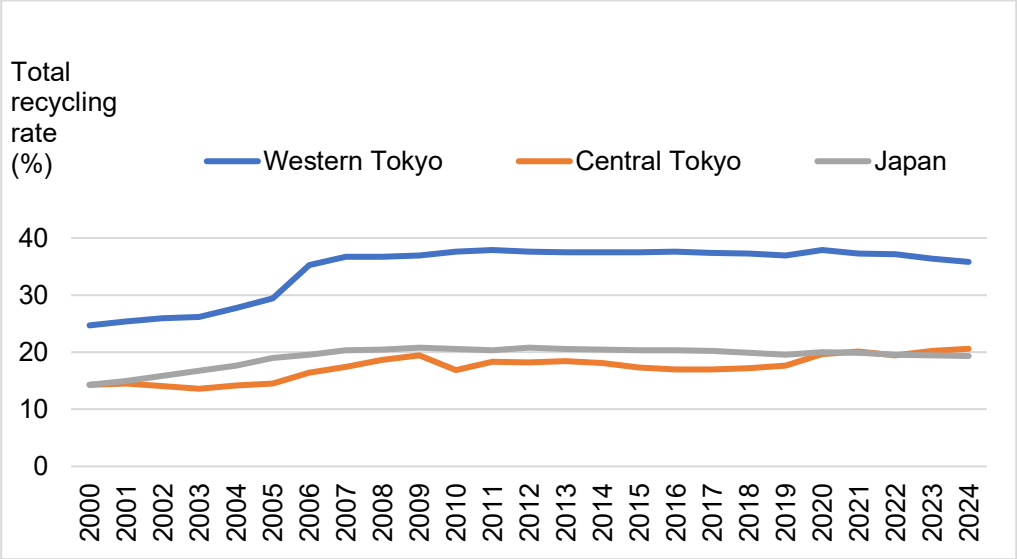

Figure 5. Changes in total recycling rates (Western Tokyo, Central Tokyo, and Japan).

For more details:

Fujihira K. Zero-Landfill Circular Municipal Solid Waste Management in Western Tokyo. https://www.kankyogaku.com/docs/zerolandfill-circular-msw-management.pdf