

# The U.S. should phase out landfilling, as China and the E.U. are doing

May 5 2021, by Nickolas J. Themelis

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A waste-to-energy power plant in Ningbo, China, combusts 2,250 tons of waste per day. Credit: Nickolas Themelis

Around the world, economic development has been accompanied by the generation of about 2 billion tons of urban waste each year. The developed nations have put a lot of effort into sorting out recyclable materials, but there are [practical and economic limits](#) as to how much of the waste can be recycled. According to EPA and other reports, the U.S. recycling plus composting rate has leveled out at about 32%. In the European Union, the rate is closer to 46%.

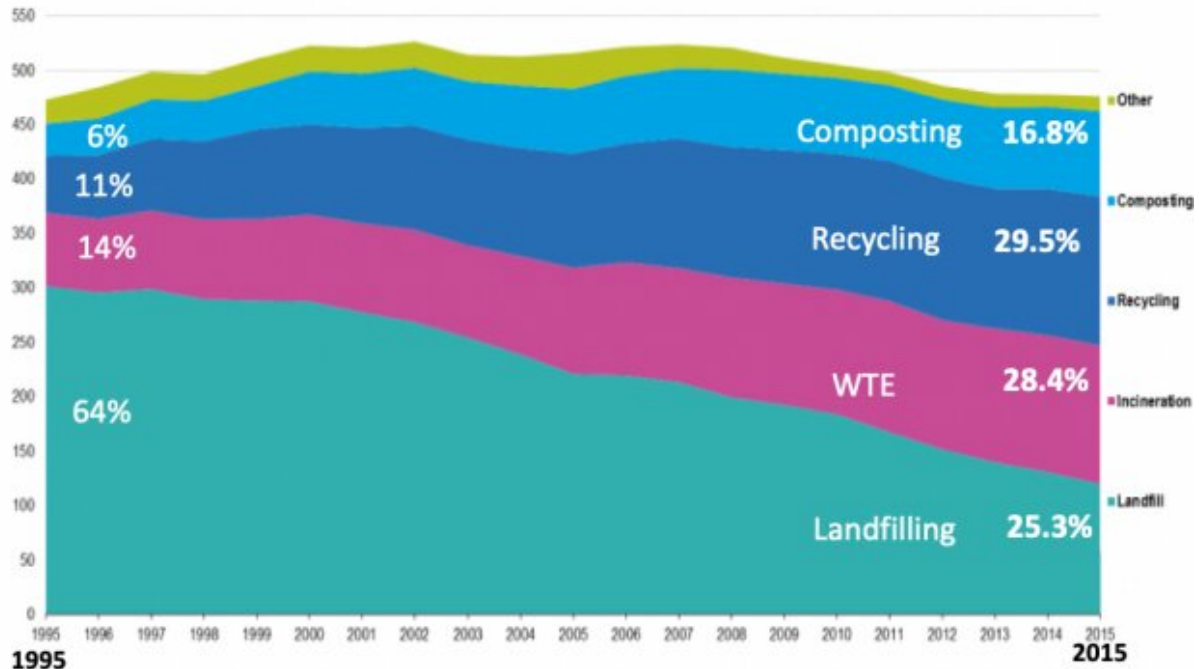
What remains after the recycling of urban wastes is a [major problem and budget concern](#) for all cities of the world. Cities typically have two options for getting rid of these non-recyclable leftovers: landfilling in traditional landfills or regulated "sanitary" landfills, or using post-recycling wastes as the fuel of [waste](#)-to-energy power plants that produce electricity or heat and recover metals and minerals.

Globally, an estimated 50% of collected urban wastes are landfilled and 20% are combusted in waste-to-energy power plants. How much waste is discarded on land and water is not known, but it has resulted in a major environmental problem, exemplified by the so-called "garbage patch" in the Pacific Ocean which is estimated to cover an area larger than Texas.

Studies from the Earth Engineering Center of Columbia University, which was the first to concentrate on waste-to-energy technology, have shown conclusively that using post-recycling urban waste as a fuel and harnessing the energy from that process is environmentally far superior to landfilling. There are three main reasons why:

- Landfilling produces 0.5-1 ton more greenhouse gas emissions than combustion with energy recovery.
- Landfilling requires the permanent transformation of "virgin" land to landfills.
- There is potential for future contamination of surface and groundwater by closed landfills.

**Changes in E.U. generation & disposition of MSW, 1995-2015**  
*(Eurostat data; graph by Earth Engineering Center, Columbia)*



2015 EU MSW generation: 243 million tons    2015 EU population: 510 million  
 y-axis: kg per capita

In 2015, the E.U. recycled or composted 46% of its municipal solid waste. The corresponding numbers for the U.S.: recycling plus composting: 32%; waste-to-energy: 8%; landfilling: 60%. Credit: Earth Engineering Center; data from Eurostat

The research work of the Earth Engineering Center led to the formation, in 2003, of the Waste to Energy Research and Technology Council (WtERT); this organization has by now grown to the Global WtERT Council (GWC) with sister organizations in several other countries, including China, India, Brazil, Germany, Italy, and Brazil. Studies from the Earth Engineering Center and GWC range from process engineering

to air pollution control systems, increased metal recovery, and beneficial use of the ash residues of combustion. They have included national surveys of waste generation and disposal in the U.S., U.K., Greece, and other nations. The results are available to the public through [our publications](#) and the [WTE Guidebook](#), funded by the International Development Bank and translated into four languages.

We are especially proud of the tremendous growth of waste-to-energy in China: Expanding from a capacity of 10 million tons in 2005, the Chinese waste-to-energy industry transformed 170 million tons of urban waste into energy in 2019. The growth of waste-to-[energy technology](#) in China has paralleled the country's advances in rapid rail transport and has been achieved by:

- Including waste-to-energy in the national plan for energy;
- Encouraging municipalities to build waste-to-energy plants;
- Providing a \$30/MWh credit for waste-to-energy electricity, an incentive over coal-fired electricity; and
- Funding academic research on waste-to-energy (a major player is Zhejiang University, host of our WtERT-China organization).

Functionally and environmentally, the Chinese waste-to-energy power plants are as good as those in the E.U. and U.S. A very recent Earth Engineering Center study of 1,164 operating landfills in the U.S. showed that in 2018, the landfills emitted 292 million metric tons of carbon dioxide—i.e., 5.5% of the U.S. energy-related emissions. For comparison, the carbon emissions of global aviation are estimated at 2.5% of global emissions.

Cities in developing countries can follow the Chinese example of moving from traditional landfills to waste-to-energy plants, thus skipping the intermediate step of sanitary landfilling. Some cities are already doing this—for example in Azerbaijan, Belarus, Ethiopia, Turkey and

Vietnam.

The U.S. transforms about 30 million square meters of the Earth, each year and forever, into landfills. Hopefully, the waste-to-energy progress made in China will compel [developed nations](#) of the West, such as the U.S., Canada, and Australia, to take similar measures and reduce landfilling.

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