



INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990-2010

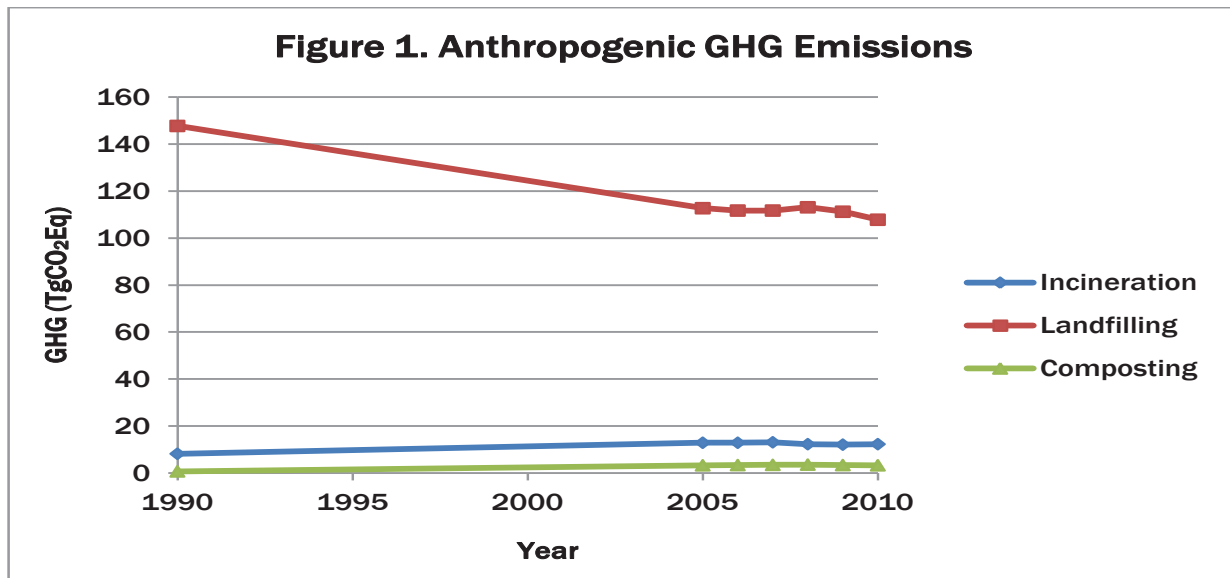
According to the latest greenhouse gas (GHG) inventory released on April 15, 2012, the waste management industry generated only 1.8 percent of the total anthropogenic GHG in the United States. Table 1 provides the anthropogenic GHG generated by the waste management industry (i.e., landfills, composting, and incineration).

Table 1. Anthropogenic GHG Generated by the Waste Management Industry in 2010

Compound	Waste Management Source	Emissions TgCO ₂ Eq
Methane (CH ₄)	Landfills ^a	107.8
	Composting	1.6
Nitrous Oxide (N ₂ O)	Incineration of waste ^b	0.4
	Composting	1.7
Carbon Dioxide (CO ₂)	Incineration of waste ^b	12.1
Total		123.6

^aIncludes both municipal solid waste and industrial waste landfills.
^bIncludes municipal solid waste and tires.

Municipal solid waste (MSW) and industrial waste landfills reduced their total anthropogenic methane (CH₄) emissions by more than 27 percent since 1990 (i.e., 147.7 TgCO₂Eq in 1990 to 107.8 TgCO₂Eq in 2010). Figure 1 provides the changes in anthropogenic GHG from 1990 to 2010.



NSWMA

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Figure 2 provides historic data on anthropogenic CH₄ emissions from the three largest sources (i.e., natural gas systems, enteric fermentation, and landfills) for the time period of 1990 to 2010. Landfills have been the third largest source of CH₄ emissions since about 1995 accounting for 16.2 percent of the total CH₄ emissions in 2010. While anthropogenic CH₄ emissions from natural gas systems and enteric fermentation have increased since 1990, emissions from landfills have decreased as a result of greater use of gas collection and destruction equipment. In fact, anthropogenic CH₄ emissions at landfills are less than half of the emissions from natural gas systems.

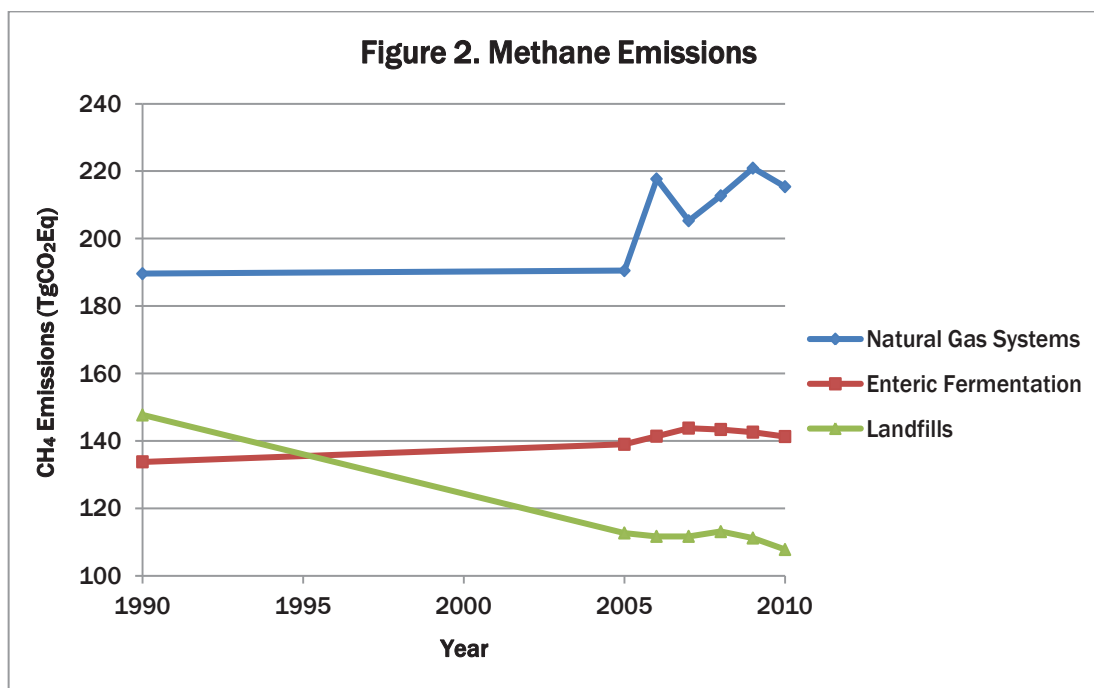


Table 2 provides the anthropogenic CH₄ generated by landfills and the reductions in GHG by control technology.

Table 2. Methane Emissions from Landfills (TgCO₂Eq)

Activity	CH ₄ Emissions
Generated	279.9
Recovered	
Gas-to-Energy	-79.8
Flared	-80.3
Oxidized	-12.0
Total	107.8

Landfills store carbon because of incomplete degradation of organic materials such as wood products and yard waste. In fact, 50 percent of the organic fraction in a landfill (i.e., paper, food and yard waste) does not degrade because lignin is recalcitrant and the cellulosic portion degrades slowly. In 2010, 13.3 TgCO₂Eq were stored in landfills. The amount of organics sequestered (i.e., grass, leaves, branches, and food scraps) in landfills in 1990 peaked at 24.2 TgCO₂Eq, declined to a low of 10.9 TgCO₂Eq in 2007 and 2008, and then increased through 2010. Table 3 presents the data for 2010.

Table 3. Organics Sequestered in Landfills (2010)

Carbon Pool	Amount Sequestered (TgCO ₂ Eq)
Yard Trimmings	9.3
Grass	0.9
Leaves	4.2
Branches	4.1
Food Scraps	4.1
Total	13.3

In addition to the standard GHG, indirect GHG (i.e., nitric oxide (NO_x), carbon monoxide (CO), non-methane volatile organic compounds (NMVOCs), and sulfur dioxide (SO₂)) are included in the inventory. These gases do not have a direct global warming effect, but indirectly affect terrestrial radiation absorption by influencing the formation and destruction of the ozone layer, or, in the case of SO₂, by affecting the absorptive characteristics of the atmosphere. Table 4 provides the indirect GHG for waste combustion and waste disposal. Since 1990, most indirect GHG emissions have remained relatively constant. The only indirect GHG to show a significant decline was for NMVOCs at waste disposal sites (i.e., 673 Gg in 1990 to 235 Gg in 2009). The decrease is probably attributable to increased landfill gas collection and destruction equipment.

Table 4. Indirect Greenhouse Gases

Gas	Total		Waste Combustion		Waste Disposal		Percent of Total	
	Gg	Percent	Gg	Percent	Gg	Percent	Gg	Percent
NO _x	11,467	14.2	128	1.1	2	0.02	130	1.1
CO	51,431	63.6	1,403	2.7	7	0.01	1,410	2.7
NMVOCs	9,313	11.5	159	1.7	76	0.82	235	2.5
SO ₂	8,599	10.6	24	0.3	1	0.01	25.0	0.3
Total	80,810	100.0	1,714	2.1	86	0.11	1,800	2.2

The GHG inventory report is available at: www.epa.gov/climatechange/emissions/usinventoryreport.html



For nearly 50 years, the National Solid Wastes Management Association (NSWMA) has been representing the interests and issues of the waste services industry. From haulers to landfill operators and consultants, NSWMA represents every segment of the business. Members include companies that provide solid and healthcare waste collection, processing, recycling, and disposal services, and companies providing professional and consulting services to the industry.

NSWMA's Landfill Institute is a policy-making group consisting of members who own and operate landfills, or engineers and attorneys offering services to landfills.

For more information on NSWMA's *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010*, contact Edward W. Repa, PhD, Director, Environmental Programs, at 202-364-3773 or erepa@nswma.org. April 2012.
