

Methane Emissions from Solid Waste Disposal

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Landfill Gas Generation

- Disposal of wastes can produce significant amounts of methane
- Bacteria decompose wastes into
 - cellulose, amino acids, and sugars
- Products fermented into
 - gases, and short-chain organic compounds
- Bacteria convert fermentation products into
 - Landfill Gas: CO_2 and CH_4

Methane at SWDS

Anaerobic Managed Sites

(control over placement of waste, scavenging, fires, and cover, mechanic compacting or leveling of waste)

$$\text{MCF} = 1.0$$

Deep, Unmanaged Sites

(not managed, but 5 meters or deeper, or on high water table)

$$\text{MCF} = 0.8$$

Semi-Aerobic Managed Sites

(control over placement of waste, and permeable cover, leachate draining system, regulating pondage, and gas ventilation system)

$$\text{MCF} = 0.5$$

Shallow, Unmanaged Sites

(not managed and less than 5 meters deep)

$$\text{MCF} = 0.4$$

Landfill Gas

~ 50%

Methane (CH₄)

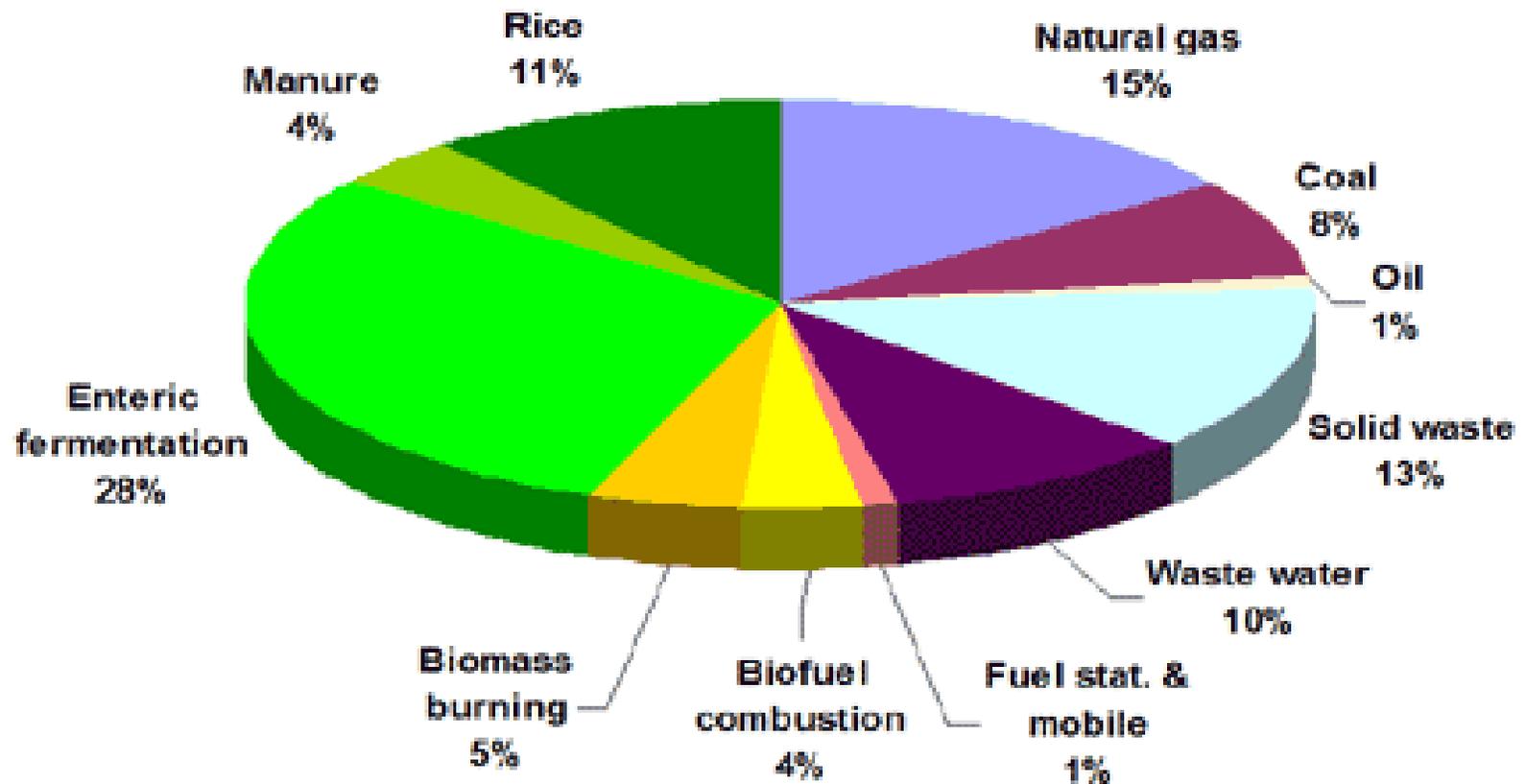
- Global Warming Potential of 21
- Anthropogenic
 - Formed as a result of management of wastes by humans

~ 50%

Carbon Dioxide (CO₂)

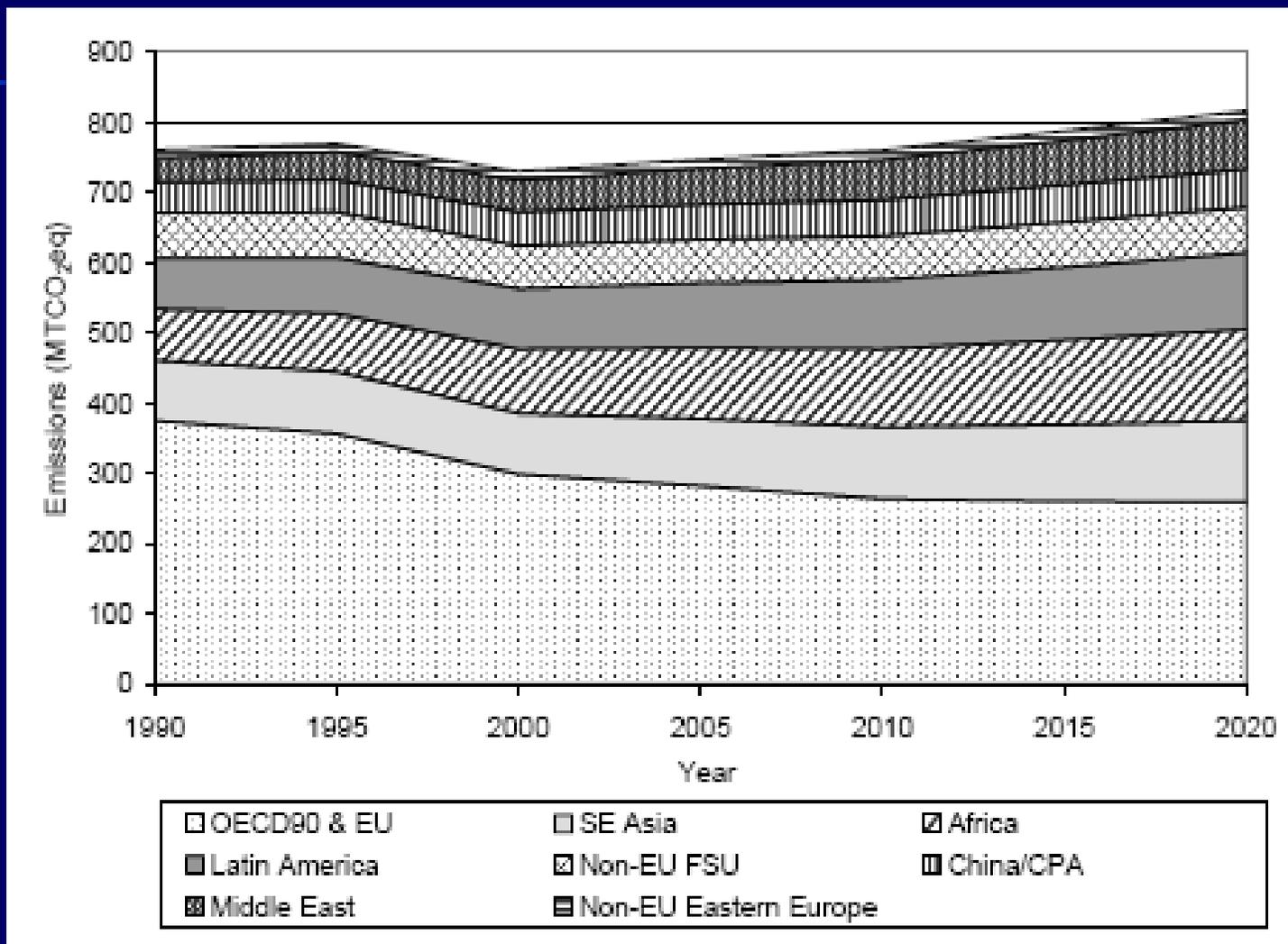
- Global Warming Potential of 1
- Biogenic
 - Waste would have produced CO₂ without human management

Global Anthropogenic CH₄ Budget by Source in 2000



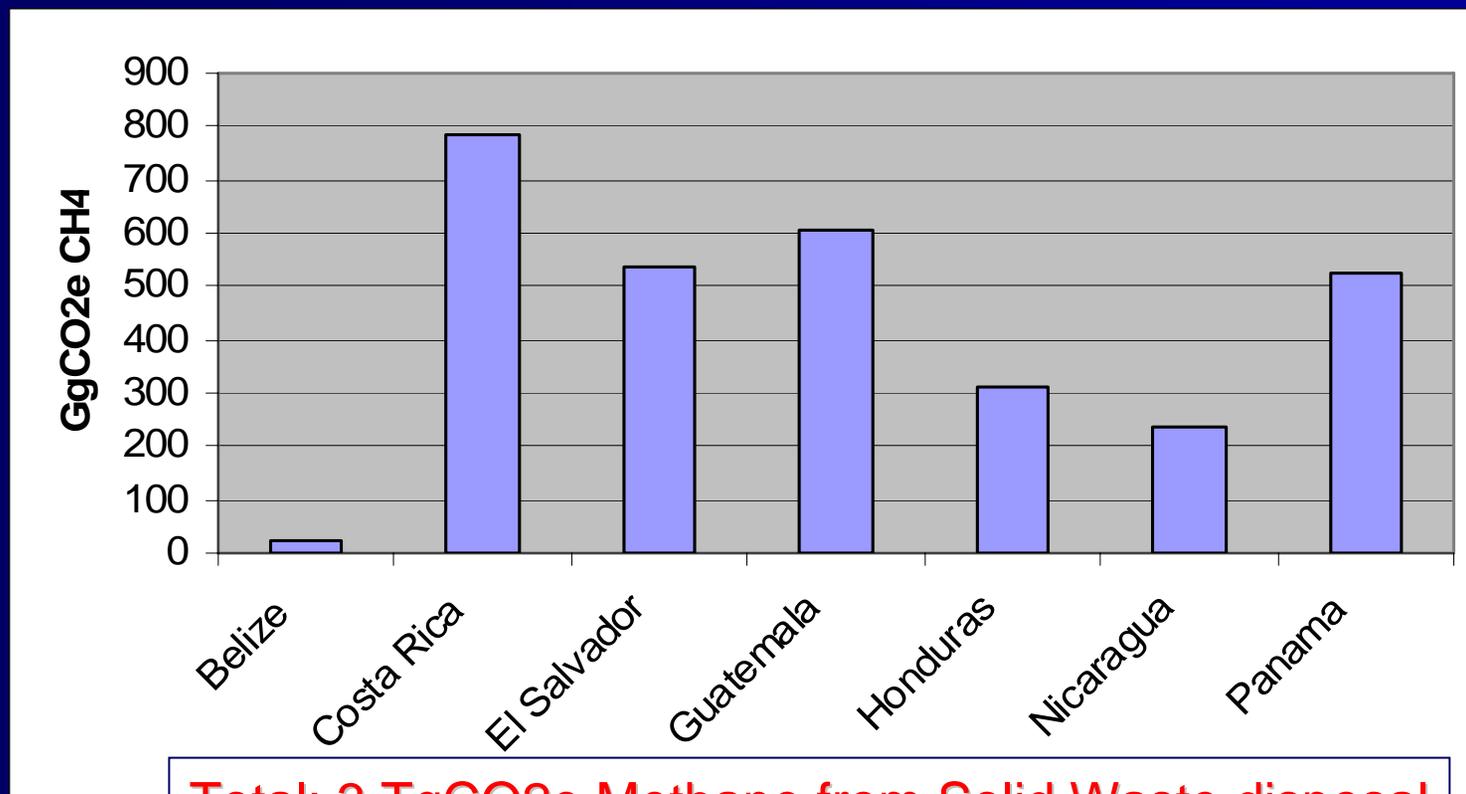
Total CH₄ emissions in 2000 = 282.6 Tg CH₄

Projected Global Emissions of CH₄ from Solid Waste Disposal



SWDS CH₄ emissions in the Region

- From 1st National Communications to UNFCCC



Total: 3 TgCO₂e Methane from Solid Waste disposal

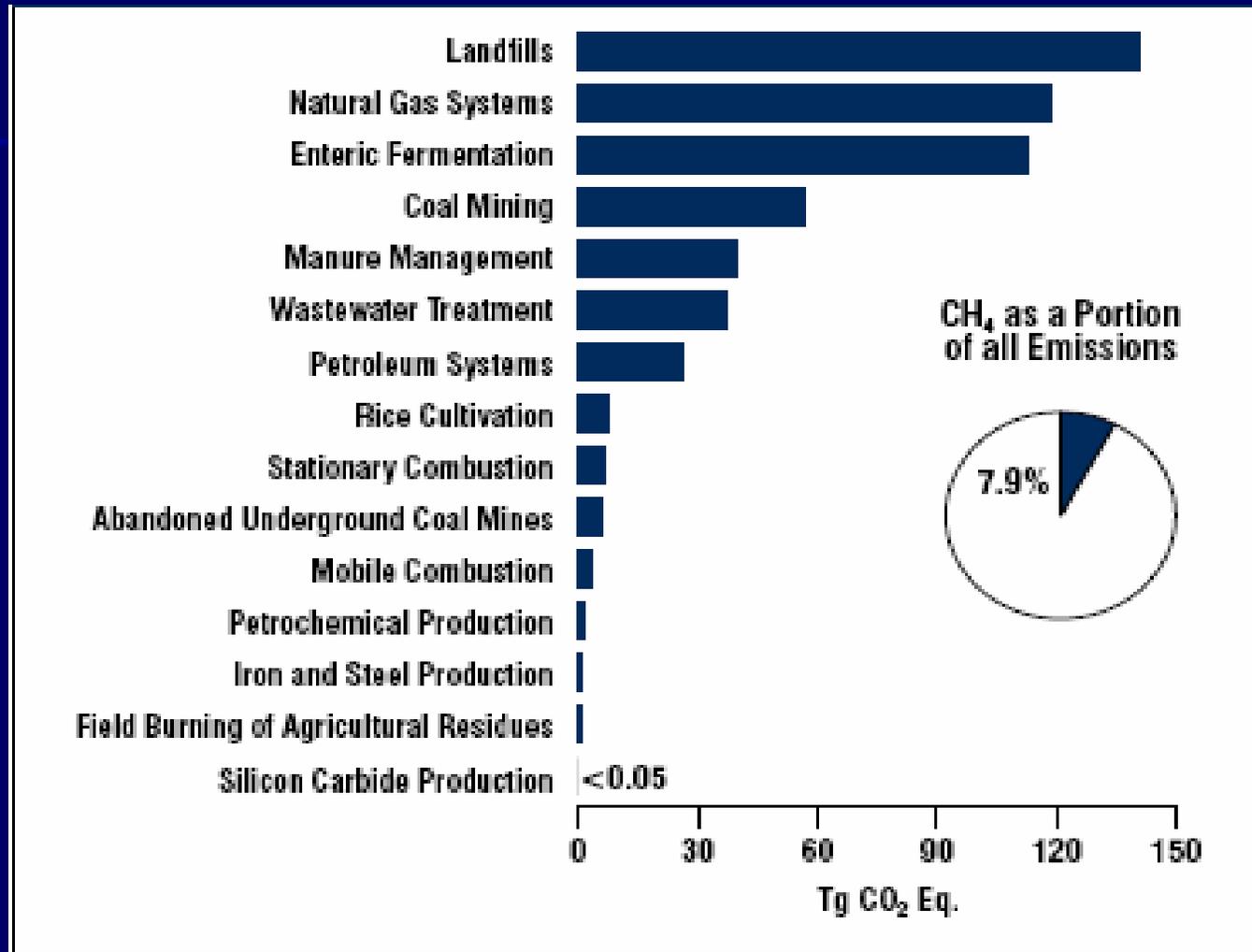
*1994 data for most countries, 1990 for Guatemala, 1995 for Honduras, 1996 for Costa Rica

SWDS CH₄ emissions in the Region

- Belize <1% of national GHG emissions
- Costa Rica 7.9% national GHG emissions
- Others 2.0-3.5% national GHG emissions

- U.S. = 2%

U.S. National Methane Emissions



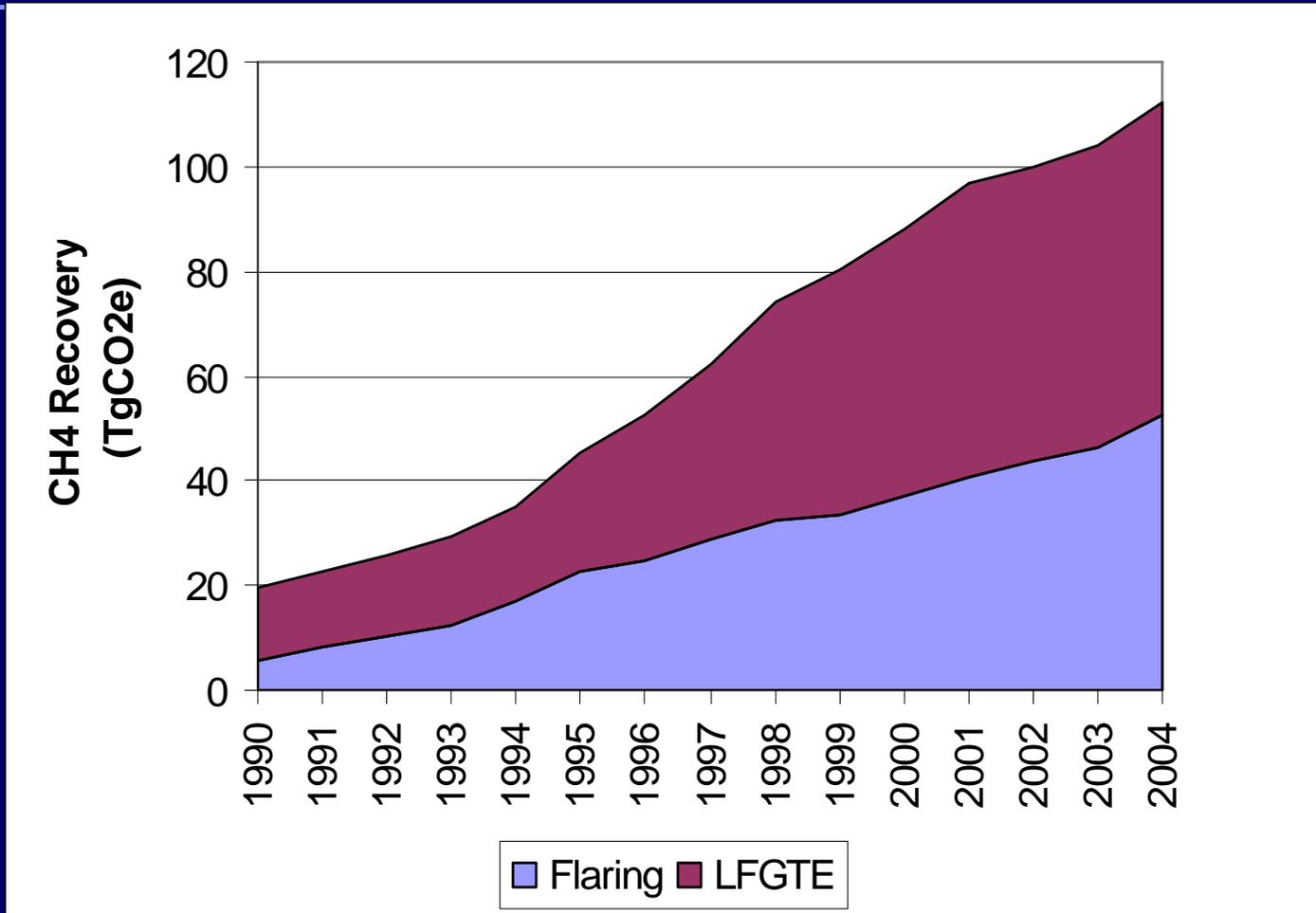
• Landfills largest anthropogenic source of CH₄: 140.9 TgCO₂e emitted in 2004 From Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2004

Emissions Avoided by CH₄ Recovery

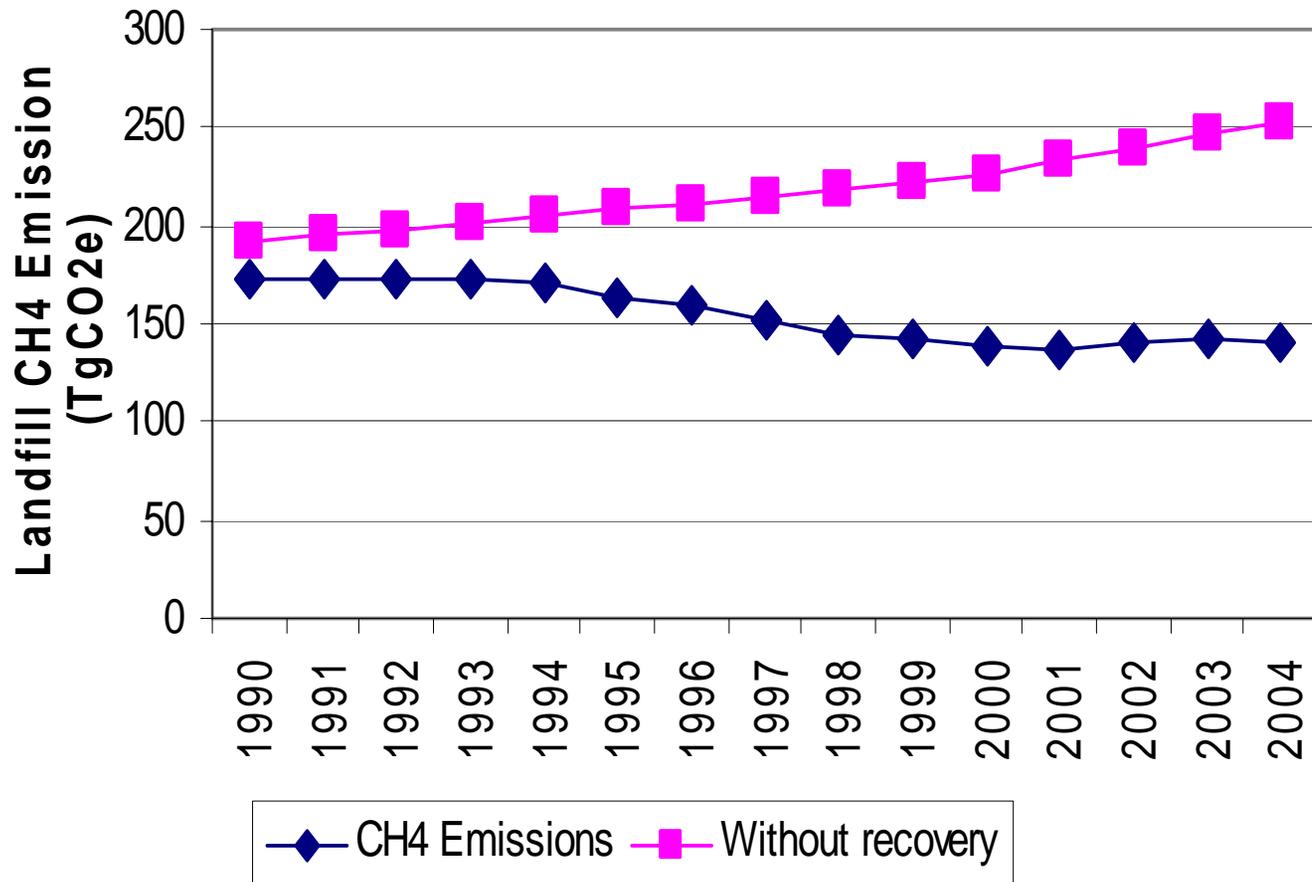
Example: U.S. 2004 emissions calculations (Tg CO₂e)

| | |
|---------------------------|----------------|
| MSW Landfills | 251.2 |
| Industrial Landfills | |
| Total Potential Emissions | 17.6 |
| Emissions | 268.8 |
| Recovered | |
| Gas-to-Energy | (59.7) |
| Flared | (52.5) |
| Oxidized | (15.7) |
| Total Reductions | (127.9) |
| Net Emissions | 140.9 |

U.S. CH₄ Recovery is Increasing



Effect of CH₄ Recovery on U.S. Landfill Emissions Estimates



For more information

- International Greenhouse Gas Emissions:
http://www.epa.gov/nonco2/econ-inv/international.html#global_anthropogenic
- National Emissions Reports
http://unfccc.int/national_reports/items/1408.php