



Fact Sheet

Moving Targets

“You need to look at the full cycle of solid waste management...you send the trucks out to collect the trash, bring it to the landfill, and, ultimately, the trash, as it decomposes, provides the fuel for the trash itself.”

Robert Ferrier
Deputy Director of the Environmental
Services Department
City of San Diego

Greenhouse gas emissions from the collection and transportation of waste and recyclables equaled 918,000 metric tons of carbon equivalent (MTCE) in 1997—accounting for 9 percent of the total net greenhouse gas emissions from waste management that year. These emissions result largely from the combustion of diesel in vehicles that transport mixed waste and recyclables from the waste source to transfer, disposal, or recovery facilities.

Clean Energy Transportation

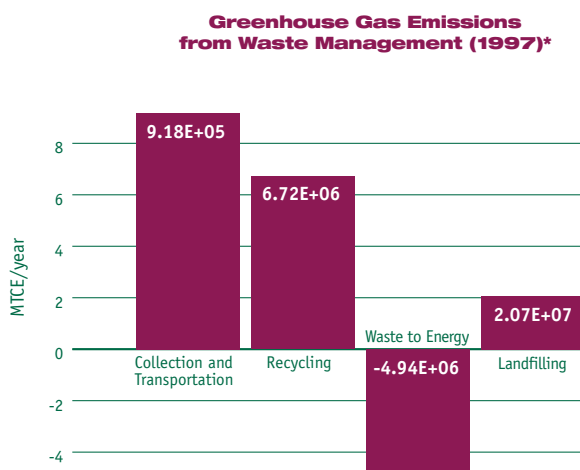
Innovative waste management programs have proven that route optimization and the conversion of landfill gas to liquefied natural gas (LNG) for use as vehicle fuel can substantially curb greenhouse gas emissions. Route optimization aims to decrease travel distance, and, thus, reduce fuel consumption. Alternatively, the use of LNG directly targets the source by replacing diesel with a clean burning alternative fuel. The City of San Diego, a ClimateWise participant publicly committed to reducing greenhouse gas emissions, has implemented several cutting-edge programs with these aims.

Route Optimization

Improving collection efficiency by optimizing routes can significantly reduce vehicle fuel consumption and collection costs associated with solid waste management. Fuel consumption is on the rise because more trucks and collection loops are needed to pick up increasing quantities of waste and recyclables. These effects are exacerbated by reliance on inefficient collection routes. In turn, increased fuel consumption will lead to increased greenhouse gas emissions and higher costs.

A study undertaken by the Solid Waste Association of North America found that collection costs typically represent the single largest percentage of MSW management budgets, comprising 39 percent to 62 percent of total system costs.

Cities can reduce greenhouse gas emissions and improve the system's cost effectiveness by designing compact collection routes, equalizing workloads between different routes, minimizing the distance traveled from the unloading site, and considering traffic patterns along the route. Computer technologies such as Geographic Information System street maps and customer databases are now available to ease the arduous task of manually re-routing collection vehicles.



* Negative emissions indicate net carbon storage.
Source: IWSA draft report, “The Impact of Municipal Solid Waste Management on Greenhouse Gas Emissions in the United States.”

Switching from Diesel to Landfill-Derived Fuel

Using landfill methane to fuel collection vehicles reduces the consumption of diesel fuel, the major source of waste-related transportation emissions. Landfills emit methane, a greenhouse gas, due to the anaerobic decomposition of municipal solid waste. Recent technological advances have made it possible to collect this landfill gas and process it into clean burning liquefied natural gas (LNG).

The City of San Diego, in a 1997 agreement with Clean Air Partners, committed to converting 54 heavy-duty refuse collection trucks to dual fuel LNG-Diesel engines. The city's waste managers viewed the conversion of landfill gas to LNG as an opportunity to fulfill this commitment and "close the loop" by using waste to generate the fuel used to collect more waste.

San Diego entered into a public-private partnership with Applied LNG Technologies USA (ALT) to produce LNG from landfill gas at an existing city landfill. ALT is developing a LNG fueling facility capable of producing 3,000 gallons of LNG per day.

Benefits

Route optimization can significantly reduce vehicle miles traveled and, correspondingly, fuel use, greenhouse gas emissions, and collection costs. Efforts in San Diego have saved an estimated 23,000 miles per year, or nearly 70,000 gallons of fuel, which reduces emissions of carbon dioxide by 788 tons.

Although San Diego has not estimated cost savings associated with improved routing, a 1999 EPA study found that improved routing in selected cities led to annual savings ranging from \$26,500 - \$452,000.

Decreasing the use of diesel fuel further reduces greenhouse gas emissions. Harvesting landfill gas lowers emissions by diverting methane from entering the atmosphere. In addition, using LNG reduces greenhouse gas emissions that would have been emitted by diesel vehicles. The City of San Diego projects that the fleet conversion will reduce diesel fuel consumption by 561,600 gallons per year, which equates to emissions reductions of 1,800 tons of carbon dioxide per year.

The City of San Diego expects that the reduced cost of LNG fuel will offset the additional costs of fueling stations. Projections based on the current cost of diesel at \$1.47 per gallon indicate that fuel cost savings will be \$220,000 during the first year of operation. These savings more than offset the \$135,000 it takes to lease the LNG fueling station. As diesel prices continue to rise and additional LNG vehicles are added to the collection fleet, fuel cost savings are expected to further increase.

Landfill gas conversion projects may prove particularly beneficial in municipalities with small landfills. At landfills where the absence of an adjacent power facility makes cogeneration problematic, a LNG fueling facility and storage tanks would provide fuel for the local fleet and the option of shipping any additional fuel for sale elsewhere.

Challenges

The start-up costs involved in efforts to optimize routes and/or establish a program to convert landfill gas to LNG fuel can be considerable. However, later economic benefits can offset an initial investment in computer-assisted routing or collection system analysis.

The City of San Diego overcame cost barriers by partnering with a private technology provider that was willing to take the risk of investing in a cutting-edge technology. The partnership with ALT guarantees a five-year supply of LNG at a fixed price and a LNG expert to operate and oversee the facility. Other municipalities similarly reluctant to spend public money on research and development projects could consider contracting with a private LNG provider.

Additional Information

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EPA Office of Solid Waste and Emergency Response, MSW management:

<http://www.epa.gov/epaoswer/non-hw/muncpl/coll-eff/>

EPA's Climate and Waste Program increases awareness of climate change and its link to waste management in order to (1) make greenhouse gas emissions a factor in waste management decisions and (2) employ waste management as a mitigation action for reducing greenhouse gas emissions. For additional information on EPA's Climate and Waste Program, see www.epa.gov/mswclimate.

