

Determining the Sources of Greenhouse Gas Emissions from Landfills and How This Impacts Climate Change

Victoria Woods¹, Martin Stute²

¹*Columbia University*, ²*Lamont-Doherty Earth Observatory, Columbia University*

Greenhouse gas emissions are a major contributor to global warming, and cutting emissions can greatly benefit the Earth and its atmosphere. This paper investigates the sources of greenhouse gas emissions from landfills using radiocarbon dating, with a focus on the impact of methane and carbon dioxide. It addresses the limited existing research and highlights the potential of C-14 testing to distinguish the sources of emissions within landfill gas. Gas samples were collected from Croton Point Park Landfill and Clarkstown Landfill which will be sent to a lab for Accelerator Mass Spectrometry radiocarbon testing. By analyzing samples from the landfills at Lamont-Doherty using a Gas Chromatograph, varying concentrations of methane and CO₂ emissions were found. Though the concentrations do not show a full picture of emissions exiting the landfill, the flux of emissions for Croton Landfill could be determined using the concentration and outflow of gas. Croton converts its CH₄ into CO₂, leading to ~2160 tons of total CO₂ emissions annually, equivalent to the emissions of nearly 300 people over the same period. The radiocarbon results have yet to be acquired, but it is predicted that organic materials will be greater emitters than fossil-fuel based materials. This will allow for the allocation of additional resources towards reducing emissions from the most potent sources. The study's limitations, such as its localized scope and exclusive focus on methane and CO₂ emissions, are acknowledged. Overall, this research offers a possible solution to more effective waste management strategies and targeting emission sources to mitigate landfill-related greenhouse gas emissions.