Redundancy and Inconsistency in Voluntary, State, and Federal Greenhouse Gas Reporting for Landfills

Extended Abstract 33050

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INTRODUCTION

Although greenhouse gas (GHG) emissions quantification, reporting, and reduction is at the forefront of environmental topics today, there is no consistent methodology by which to quantify and report landfill GHG emissions on either the voluntary or mandatory (state or federal) side. This paper will highlight examples of these issues, including reporting done under the 2006 California Assembly Bill 32 (AB32)[1], the U.S. Environmental Protection Agency (EPA) GHG Reporting Program (GHGRP)[2], state (including Massachusetts[3], Washington[4], and others), and local air districts GHG reporting programs.

This paper will address how the implementation of multiple reporting regulations with different methodologies and requirements has caused redundancy and inconsistency for facilities, both for GHG reports, as well as impacts to other landfill regulation/reports. In most cases, the GHG reporting programs are only emissions reports and are not tied to any kind of emission limit. However, the reports can be influence the Title V and Prevention of Significant Deterioration (PSD) permitting programs, which require that GHG be evaluated during permit revisions or renewals to determine if a source is a major source of GHG under those programs, and some jurisdictions do create limits of GHG emissions based on reported potential emissions. Most of these programs, including the GHGRP, CARB's reporting program, and the Climate Registry (TCR), release the reported emissions data to the public.

Landfill GHG reports will vary significantly from one program to another. This variation is due to the regulations themselves. ***Table 1*** summarizes major reporting elements from several reporting programs. There is even significant variation between the California GHG reporting, which is derived from the GHGRP, and the GHGRP itself.

SAME SITE, DIFFERENT REPORTS

One challenge faced by landfills reporting GHG emissions is the variability in the methods used to calculate GHG emissions. Technical challenges can include metering, waste categorization, and documentation, but public perception is a potentially bigger challenge. When a site's reported emissions differ from one report to the next, the public can lose faith in the accuracy of those reports, even in cases where the site has met the reporting requirements for each program.

Table 1. GHG Reporting Requirements for Selected Programs

Parameter	GHGRP	California	Massachusetts	Climate Registry Government Protocol[5]
GHGRP Derived?	not applicable	Yes	No	No
Landfills Categorically Included?	Yes	No	No	No
Verification Required?	No	Yes	Yes	Yes
Sources Included	LF (2 methods), GSC	GSC	LF, GSC, PC	LF, GSC, PC
Sources Excluded	flares, small sources	flares, small sources	none	none
All Contiguous Locations?	Yes	Yes		
Gases Excluded	CO_2 in landfill gas	CO_2 in landfill gas	none	none
Methane GWP	25	21	21	21
FOD Method?	Yes	No	No	No
Recovery Method?	Yes	No	Yes	Yes
Non-emission data collection?	Yes	Yes	No	

LF = landfill

GSC = general stationary combustion

PC = portable combustion

Same Site, Different Methods

There is no universal methodology for reporting GHG emissions from landfills. While this is technically true for any GHG emitter reporting to multiple programs, the difference for most reporters is slight variation in emission factors or heating values used in fuels. The calculation methods and fundamental assumptions will stay the same for each report, and large differences in reported emissions are likely to be small.

Landfills pose a special challenge when calculating emissions because a large portion of their emissions is fugitive landfill gas (LFG) that escapes through the surface. It is impossible to directly measure fugitive emissions with any accuracy, so GHG inventory methodologies are forced to infer emissions based on the methane recovery and methane generation, but methane generation cannot be directly measured either. Methodologies generally take one of two approaches to calculating methane generation and the resulting fugitive emissions. The first method is a first order decay (FOD) model[6], similar to the Landfill Gas Emissions (LandGEM) model developed by the EPA. This approach calculates the methane generation based on the

annual quantity and type of waste accepted at the landfill, then estimates the amount of methane generated as that waste decomposes. The second approach to estimating methane generation can only be used at landfills with gas collection systems and relies on estimating the collection efficiency of the system, comparing that to the amount of LFG recovered, and calculating the LFG generation.

These two different approaches can yield very different emissions. The GHGRP requires that landfills use both methods to calculate emissions; results can be relatively close, or they can differ by orders of magnitude for the same site, reporting under the same regulation, for the same year. Results using different reporting programs will show even more variation. Methods using a FOD-derived model or a recovery-based method can also arrive at different results due to variation in the parameters used. Collection efficiencies can range from 50 percent to 95 percent, with several programs utilizing a default collection efficiency of 75 percent for all landfills, regardless of the site characteristics and operations.

Same Site, Different Sources

The reported emissions for a landfill will vary under different reporting programs due to the sources included in the emissions. The biggest source of GHG emissions at most landfills is the landfill itself, but the fugitive emissions are not considered under some programs. The CARB GHG reporting regulation excludes fugitive landfill emissions and only includes stationary combustion from sources that are reported under the Federal GHGRP.

Some programs have carved out niches for certain types of sources. The GHGRP's exemption of flares is the most notable of these exemptions, but exemptions for mobile and portable sources, emergency equipment, start-up fuels, and "de minimis" sources are common as well. The EPA's exclusion of GHG emissions from flares exempts the most common stationary combustion source at landfills. Most voluntary GHG inventory methods require all combustions sources to be reported, and combustion emissions from flares should be reported for Title V and PSD permitting.

Reporting programs may allocate emissions among sources differently as well. For example, a landfill may export LFG to a neighboring wastewater treatment plant where it is used to replace natural gas or fuel an engine. That exported gas would be reported by the wastewater treatment facility under most mandatory programs, but a municipality could attribute those emissions at the treatment plant to the landfill in its emissions report.

Same Site, Different Gases

Reporting programs treat each species of GHG differently. The greatest difference is the treatment of biogenic carbon dioxide (CO_2). Biogenic CO_2 is CO_2 from sources that are part of the normal carbon cycle and does not represent a release of carbon that was stored either in fossil fuel or carbonaceous minerals. It includes fuels such as ethanol, biodiesel, and LFG-derived CO_2. LFG itself is 50 percent biogenic CO_2. CO_2 from the combustion of the methane in LFG is also considered biogenic. Treatment of the CO_2 differs significantly between reporting programs.

The GHGRP virtually ignores the CO_2 fraction of LFG. It is not included in reported emissions from landfills or as part of combustion. However, when combustion of LFG occurs in a reportable device (i.e. most devices except flares), the CO_2 resulting from the combustion of the methane is reported, but it is inventoried separate from non-biogenic CO_2.

Again, this exempted gas serves to confuse the issue of permitting under federal Title V and PSD programs. These permitting programs require that biogenic emissions be included in the inventory, but the biogenic emissions are not included in determining whether a source is major under either program. However, this status could change due to pending legal cases.

By comparison, most voluntary reports include all biogenic CO_2, including both the CO_2 in the LFG and the CO_2 emitted by combustion of the LFG.

Finally, the GHGRP treats methane and non-CO_2 GHG differently from any other inventory when converting emissions of those gases to their CO_2 equivalent. Each GHG has a different degree of impact on global warming, but these impacts are converted into CO_2 equivalent (CO_2e) through the use of the global warming potential (GWP) of each gas. Most reporting programs were developed using the GWPs from the Intergovernmental Panel on Climate Change's (IPCC) 1996 Second Assessment Report[7], but in 2014, the GHGRP was amended to use the GWPs from the IPCC 2007 Fourth Assessment Report[8], effectively increasing the impact from methane by 19 percent. The IPCC has a Fifth Assessment Report, released in 2013, as well, which has different GWPs.

SAME SITE, SAME DATA

Finally, sites can find themselves submitting the same data several times. The state of Washington, for example, requires reporters to submit their GHGRP reports to the state as well, and is perhaps the most streamlined example of this type of redundant reporting. California is an example where this type of duplicate reporting is not as streamlined, and there is a much greater potential for a site to run into problems with the small differences in reporting programs.

California significantly changed its GHG reporting regulation starting with the 2011 GHG inventory year. The revision was primarily to align the California GHG regulation with the GHGRP, but the California regulation now references a version of the GHGRP that has been revised since then. Essentially, the California regulation is a version of the GHGRP frozen in time. California also requires significantly more supplemental information to be reported by sites, and it requires that reporters have their emissions verified by an independent third party. California also uses its own online GHG reporting tool, which differs significantly from the tool used for federal reporting. Finally, the EPA and CARB have made different determinations about the regulations such as the EPA's determination that propane was not a petroleum product listed in the GHGRP. This frozen version of the regulation and the alternate reporting tool results in reporters tracking the same data, but reporting it two different ways and resulting in different emissions. These differences are driven by California's cap-and-trade GHG regulation, which is unique in the United States.

SUMMARY

Landfills are essential public services, which are not only one of the most regulated industries in the U.S. but also one of the only industry sectors which have reduced their emissions footprint beyond 1990 levels. Many municipal solid waste (MSW) landfills already have gas collection and control which destroys GHG emissions under current regulations that are imposed by local air districts, states, and the federal government. The landfill industry is currently one of only a few sectors under EPA federal GHG reporting required to report fugitive emissions. Despite existing stringent regulations, the landfill industry was hit harder than any other industry under the federal GHGRP, with over 1,600 landfills reporting out of 8,200 total reporters. Only the oil and gas sector has more reporters.

State, local, and voluntary reporting requirements add and duplicate GHG reporting requirements, but with potentially different reported emissions. These differences can confuse reporters, regulators, and the public. While those familiar with the regulations and reporting requirements may be able to understand the differences, conflicting data can easily be misinterpreted by regulators unfamiliar with the reporting programs or a public hostile to a site.

REFERENCES

1. Mandatory Greenhouse Gas Emissions Reporting. California Code of Regulations. Title 17, Division 3, Chapter 1, Subchapter 10, Article 2.

2. Mandatory Greenhouse Gas Reporting. Code of Federal Regulations, Part 98, Title 40, 2013.

3. Air Pollution Control. Code of Massachusetts Regulations. Chapter 310, Section 7.71.

4. Reporting of Emissions of Greenhouse Gases. Washington Administrative Code, Chapter 173-441.

5. The Climate Registry. Local Government Operations Protocol, Version 1.1; 2010.

6. Municipal Solid Waste Landfills. Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources. U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, 1998.

7. Intergovernmental Panel on Climate Change. Climate Change 1995: The Science of Climate Change; 1996.

8. Intergovernmental Panel on Climate Change. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change; 2007.

9. Intergovernmental Panel on Climate Change. Climate Change 2013: The Physical Basis, 2013.