

Summary Report for the Third Stakeholder Webinar on Updates to Methodology Improvements for MSW Landfills (August 16, 2017)

EPA develops an annual report called the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* (Inventory).¹ This report tracks total annual U.S. emissions and removals by source, economic sector, and greenhouse gas (GHG) going back to 1990. One sector in the annual report is the waste sector, which includes municipal solid waste (MSW) landfills, industrial landfills, composting, and wastewater. With each Inventory report, EPA strives to improve the data inputs and calculations used. The national GHG Inventory is submitted to the United Nations in accordance with the United Nations Framework Convention on Climate Change (UNFCCC). Additional information about the GHG inventory reporting requirements can be found on the UNFCCC GHG Inventories Reporting Requirements page at the following link:

http://unfccc.int/national_reports/annex_i_ghg_inventories/reporting_requirements/items/2759.php.

On August 16, 2017, EPA held a stakeholder webinar on the Inventory data and methodology for the waste sector, with a focus on MSW landfills to discuss the methodological changes made to the 1990–2015 Inventory and considerations for methodological improvements to future inventories.

1. Purpose of the Targeted Waste Sector Stakeholder Outreach

The August 16, 2017 webinar provided an overview of the methodological changes to the solid waste section of the 1990–2015 Inventory while also soliciting input on how these methodological changes could be refined for future Inventory years. The following items were discussed:

- a. Improvements to the scale-up factor applied to the Inventory to account for landfills not reporting to Subpart HH (MSW Landfills) of the Greenhouse Gas Reporting Program (GHGRP)
- b. Re-assessment of the current oxidation factor (10%) used by the Inventory for the years 1990–2004 based on an analysis of GHGRP Subpart HH data
- c. Re-assessment of the current degradable organic carbon (DOC) value of 0.20 used by the Inventory for the years 1990–2004 based on a comprehensive review of waste characterization studies.

The slides from the webinars are posted on the [EPA Website](#) at:

<https://www.epa.gov/ghgemissions/stakeholder-webinar-waste-sector-data-and-methodology-us-greenhouse-gas-inventory>. The remainder of this report summarizes the August 16, 2017 webinar content.

2. Summary of the Webinar

The EPA opened the webinar with a summary of the four major methodological changes made to the 1990–2015 Inventory. These four changes were:

- Using net methane emissions as directly reported via subpart HH of the GHGRP for 2010–2015
- Applying a 12.5% scale-up factor to account for emissions from MSW landfills that are not required to report under Subpart HH

¹ The latest GHG Inventory report is available at <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2015>.

- Back-casting net methane emissions from Subpart HH for 2005–2009
- Using the first order decay model for 1990–2004 with revised MSW generation data.

The GHGRP accounts for a percentage of emissions from MSW landfill facilities. In order to use the GHGRP data for the Inventory, but still continue to achieve the UNFCCC criteria of Inventory completeness, an additional method was needed to account for emissions from facilities that are not required to report to the GHGRP. EPA used a scale-up factor to approximate emissions from these non-reporting landfills.

Details regarding the methods for estimating the scale-up factor are provided in the 1990–2015 Waste Chapter of the Greenhouse Gas Inventory and were briefly summarized during the webinar.

- First, EPA used the Excel FORECAST function and reported GHGRP data for 2010–2015 to back-cast emissions for the years 1990–2009.
- Then, EPA removed construction and demolition and inert wastes from waste disposal quantities based on the State of Garbage survey for 2001–2008. EPA also revised 2009 data based on the Environmental Research and Education Foundation’s (EREF) 2010 MSW generation and disposal estimates.
- Finally, the waste model was re-run for the full 1990–2014 time series. EPA found a linear trend in these new, adjusted results between 2005 and 2009 and used this trend as a basis for back-casting GHGRP net emissions over this limited time frame. The GHGRP emissions were back-casted to merge the previous and new methodologies to be consistent with good practice on methodological improvements provided by the IPCC 2006 Guidelines.
- The final scale-up factor of 12.5% was the average difference between the GHGRP emissions and the revised 1990–2014 Inventory emission estimates for the years 2005–2014.

Given the limited time available to fully assess the scale-up factor during the preparation of 1990–2015 Inventory, EPA is revisiting the scale-up factor in order to more fully evaluate options. To do this, EPA investigated the universe of landfills to identify those that do and do not report to the GHGRP with the aim of quantifying total waste-in-place and estimating a scale-up factor based on either a) the percentage difference of waste-in-place, or b) the percentage difference in net methane emissions.

The EPA created a master list of landfills comprised of data from the Waste Business Journal 2016 Directory, the Landfill Methane Outreach Program (LMOP) 2017 database, and the dataset developed by EPA’s Office of Air Quality Planning and Standards for recent regulatory efforts on the New Source Performance Standards and Emission Guidelines for MSW landfills. EPA initially identified 1,779 facilities as non-reporting landfills, but noted several limitations of the datasets used in the analysis (e.g., lack of granularity of landfill type—MSW versus industrial versus C&D, naming variations across datasets).

To estimate waste-in-place from non-reporting landfills, the following data elements are required: the year the landfill first accepted waste, the closure year (unless the landfill is still accepting waste), and the waste acceptance rate (either by daily acceptance, or total waste-in-place). Of the 1,779 non-reporting landfills, the EPA identified 1,072 landfills with all three data requirements, 270 landfills had one missing element (EPA made assumptions on the start or closure year for these facilities to estimate waste-in-place), and 437 facilities had more than 1 missing data element (a waste-in-place estimation could not be completed for these facilities).

The 1,342 landfills for which waste-in-place was able to be calculated, comprised 11% of the total waste-in-place for MSW landfills. The estimated net emissions as calculated by the waste model were 34% of total net emissions. The total net emissions referenced here are the total net emissions from the GHGRP for MSW landfills plus net emissions from the non-reporting landfills. When adjusted to remove C&D and inerts, the waste-in-place from these facilities comprised 9% of the total waste-in-place, and 26% of total net emissions.

The EPA is considering various options for the scale-up factor, including the following:

- 12.5%, the difference between back-casted GHGRP emissions and 2010-2014 emissions
- 11%, the total waste-in-place
- 9%, the waste-in-place adjusted to remove inerts and C&D waste
- 34%, the estimated emissions from total waste-in-place, and
- 26%, the estimated emissions from waste-in-place adjusted to remove inerts and C&D waste.

Feedback was requested on the options for the scale-up factor for use in the 1990–2016 Inventory.

In the final section of the webinar, the EPA discussed two more potential revisions to the solid waste inventory: improvements to the current oxidation factor and DOC value for the years 1990–2004.

Kate Bronstein of RTI International discussed EPA's activities to re-assess the current oxidation factor of 10% used in the Inventory for 1990–2004. Both literature and GHGRP data were reviewed, specifically for older and smaller landfills. Older facilities were considered facilities with pre-1990 start dates. Smaller facilities were considered landfills with less than 4 million tons of waste in place. The literature generally focuses on landfills that would be eligible to report under the GHGRP and provides evidence for higher oxidation rates at these specific facilities. Bench-scale studies also provide evidence for higher oxidation rates. EPA understands that methane leakage from landfill gas collection systems is a factor in the methane oxidation rate, and that applying an appropriate oxidation factor over the time series needs to account for the various types of landfills in the United States (e.g., landfills with and without gas collection systems, open and closed landfills).

When looking specifically at the GHGRP data, there do not appear to be any large differences in the reported oxidation rates based on facility size, or location in the US. The GHGRP allows facilities to use oxidation factors as presented in the rule (0%, 10%, 25%, or 35%). Facilities can either elect to calculate their methane flux using the equations provided in the rule to determine the appropriate oxidation factor, or they can use the 10% default oxidation factor. A significant portion of the GHGRP facilities are using the 10% as their oxidation factor for all Subpart HH equations. The overall average oxidation value for older, smaller facilities across the three equations that facilities can use in their subpart emissions total was 18.2%; while the average oxidation value for all facilities reporting to the GHGRP in 2015 was 19.5%. EPA is considering increasing the oxidation factor to 20% for 1990–2004 based on evidence from the literature, and the average oxidation factor currently applied in the Inventory via the GHGRP data for 2005–2015. Feedback was requested on this proposed methodological change for oxidation in the Inventory calculations.

The third methodological improvement EPA is considering entails a review of waste characterization studies from landfills since 1990. EPA has compiled the database and will develop an analysis plan to determine if and how waste composition has changed since 1990, and by climate and region. The end

goal is to determine whether revisions to the inventory DOC value of 0.20 for 1990–2004 are supported. The study is underway and will be completed within the next year.

EPA closed out the webinar by reviewing the upcoming timeline for items applicable to the solid waste inventory:

- An additional webinar to be held in fall 2017
- Inventory Waste Chapter to be sent to expert/targeted reviewers in October/November 2017
- Comments will be addressed and updated, as necessary, for Public Review in January/February 2018
- Comments will be addressed and updated, as necessary, for the Final Inventory report submitted to the UN by April 15, 2018.

EPA then opened the webinar to questions, asking webinar participants for input on the various options presented for improvements to the scale-up factor, reactions from webinar participants regarding potential changes to the inventory oxidation factor and DOC values for 1990–2004, and notice of any additional data sources which EPA should be considering regarding any of these items.

3. Next Steps

The EPA will consider any stakeholder input, additional data sources, and proposed options in developing the next draft of the MSW landfill section of the 1990–2016 Inventory which will be distributed for expert review. Stakeholders are also welcome to provide comment on the draft Inventory methodology and emissions estimates during the public review comment period in early 2018.