



Waste BOG Report

Joint 1st and 2nd IPCC Expert Meeting
on Short-Lived Climate Forcers (SLCFs)

Virtual sessions, 13-20 October 2021

Outline

- 1. Key Messages & Issues*
- 2. Sectoral Issues*
- 3. Cross-Sectoral Issues*

Waste IPCC Categories

4.A Solid Waste Disposal

Emissions from waste decomposition at solid waste disposal sites

4.B. Biological Treatment of Solid Waste

Emissions from the biological treatment of solid waste (e.g., composting & anaerobic digestion)

4.C. Incineration and Open Burning of Waste

Emissions from the combustion of solid and liquid waste in controlled incineration facilities (incineration) or from the combustion of unwanted combustible materials directly into the air (open burning)

4.D. Wastewater Treatment and Discharge

Emissions from the treatment and discharge of domestic, commercial, and industrial wastewater

4.E. Other waste

No sources currently considered in the GHG GLs

Key Messages from the Waste BOG

Key Categories

- Of the five Waste categories, 4.C. Waste Incineration & Open Burning of Waste is a dominant source of air pollutant emissions. Efforts to develop robust estimates of activity data and EFs for this category should be prioritized

Impact/Importance of Waste Emissions

- Waste emissions from many categories (e.g., landfill fires, landfill flares, open burning) have a greater impact at the local level (e.g., local air quality impacts next to landfills), than at the national or global level.

Uncertainties

- Limited activity and EF data result in large uncertainties in air pollutant emissions from the waste sector, BUT these uncertainties should not limit efforts to develop robust emission estimates for Waste

Key Issues from the Waste BOG

Methodological Approach

- Available methods (e.g., IPCC, EMEP, USEPA NEI) for many categories may be applicable to a Tier 1 approach (or as a starting point to develop a Tier 1 approach)
- Flexible reporting while maintaining the IPCC principles of emissions allocation may be beneficial for categories where emissions can't be derived at the sub-category level (e.g., emissions from waste incineration with or without energy recovery)

Activity Data

- There is **limited activity data** on the amount of waste burned (and burned per capita), composition of waste, smouldering or burning conditions, waste disposal approaches in rural areas, etc.,
- For Open Burning
 - The definition of the **fraction of waste burned (B_{frac})** needs to be clarified
 - The estimation of **the fraction of population burning waste (P_{frac})** should be revised
 - The classification of materials included in the **definition of agricultural waste burning or land clearing** needs to be clarified so that emissions can be apportioned to the correct sector (AFOLU/Waste) without double counting or missing emissions

Emission Factors

- **Tier 1 EFs** for many categories will need to be **region or technology specific** (e.g., open waste burning, biological treatment, etc.,)
- Some regional EF estimates are available (e.g., EMEP/EEA and US EPA), but others will need to be developed based on measurements of real conditions

Highlights of Sectoral Issues

#1) 4.A – Solid Waste Disposal

Emissions from waste decomposition at solid waste disposal sites

#2) 4.B – Biological Treatment of Solid Waste

Emissions from the biological treatment of solid waste (e.g., composting & anaerobic digestion)

Sectoral Issue #1

4.A – Solid Waste Disposal (proposed changes)

Emissions from waste decomposition, landfill fires, and flaring at solid waste disposal sites

Sub-Categories

- **4.A.1 – Managed Waste Disposal Sites**
 - 4.A.1.a – Landfill fires (PM (BC/OC), NO_x, CO, NMVOC, SO₂)
 - 4.A.1.b – Flaring (PM (BC/OC), NO_x, CO, NMVOC, SO₂)
 - 4.A.1.c – Decomposition (CO, NMVOC, NH₃)
- **4.A.2 – Unmanaged Waste Disposal Sites**
 - 4.A.2.a – Landfill fires (PM (BC/OC), NO_x, CO, NMVOC, SO₂)
 - 4.A.2.b – Flaring (n/a)
 - 4.A.2.c – Decomposition (CO, NMVOC, NH₃)
- **4.A.3 – Uncategorised Waste Disposal Sites**
 - 4.A.3.a – Landfill fires (PM (BC/OC), NO_x, CO, NMVOC, SO₂)
 - 4.A.3.b – Flaring (PM (BC/OC), NO_x, CO, NMVOC, SO₂)
 - 4.A.3.c – Decomposition (CO, NMVOC, NH₃)

Sectoral Issue #2

4.B – Biological Treatment of Solid Waste

(proposed changes)

Emissions from the biological treatment of solid waste (composting & anaerobic digestion)

Sub-Categories

- **4.B.1** – Composting (NH_3 , CO, NMVOC)
- **4.B.2** – Anaerobic Digestion (NH_3)

Possible Cross-Sectoral Issues

4.A Solid Waste Disposal
(2 issues)

4.B. Biological Treatment of Solid Waste
(3 issues)

4.C. Incineration and Open Burning of Waste
(4 issues)

4.D. Wastewater Treatment and Discharge
(1 issues)

4.E. Other waste
(2 issues)

Possible Cross-Sectoral Issues

4.A Solid Waste Disposal

1. (Energy) Emissions from biogas collected from landfills and used for energy should be in Energy, not Waste
2. (Energy) Emissions from energy used to manage landfill sites should be in Energy, not Waste

Possible Cross-Sectoral Issues

4.B. Biological Treatment of Solid Waste

1. (AFOLU) Emissions from anaerobic digestion of manure on farms (storage, digestion, post-storage) should be included in AFOLU, not Waste.
2. Emissions from anaerobic digestion of manure in treatment plants (co-digestion with municipal waste, or transported to an offsite treatment facility) should be included in Waste, not AFOLU.
3. (Energy) Emissions from combustion of biogas collected for energy use (energy or transport) should be in Energy, not Waste.

Possible Cross-Sectoral Issues

4.C. Incineration and Open Burning of Waste

1. (AFOLU) Emissions from agricultural waste burning *on farms/orchard, etc. of crop residues (e.g., cereal crops, peas, beans, soya, sugar beet, oil seed rape, etc.), wood, pruning, slash, leaves, plastics, and other general wastes (not transported offsite), should be included in AFOLU, not Waste.*
 1. Note: The definition of agr. waste burning needs to be discussed further
2. (Energy) Emissions from agricultural waste burning for energy should be considered in Energy, not Waste.
3. Emissions from waste incineration (to avoid double counting) ...
 1. with energy recovery should be included in Energy, not Waste
 2. without energy recovery should be included in Waste, not Energy
 3. Note: if it is difficult to split emissions between (1) and (2), it will be important that all waste incineration emissions are reported either under Energy OR Waste and record where emissions are reported
4. (AFOLU) Emissions from small-scale biomass burning (e.g., land clearing not at farms) at the site of production, should be included in AFOLU, not Waste
 1. Note: issues of allocation/categorization that may need to be further discussed

Possible Cross-Sectoral Issues

4.D. Wastewater Treatment and Discharge

1. (Energy) – Emissions from the combustion of biogas collected for energy recovery purposes should be included in Energy, not Waste
 1. Note: If flared (without energy recovery), included in Waste

Possible Cross-Sectoral Issues

4.E. Other Waste

1. (Energy/Waste) – There are emissions from different uses/treatment of sludge (e.g., co-firing with coal in cement industry (Energy), landfilling (Waste), biological treatment (Waste))
2. (AFOLU) – Emissions from sludge spreading should be included in the AFOLU sector, not Waste.



Any Questions?

Thank you to the Waste BOG participants:

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List of Key Knowledge Gaps

4.A Solid Waste Disposal

- **Activity Data**
 - no known guidance available to help countries estimate the amount of waste burned at landfills
 - It may be difficult to find information about flaring efficiencies and volumes at landfills
- **EFs**
 - There will be a need to develop regional EFs for landfill fires, flares, and decomposition (using available methodologies as a starting point)
- **Other**
 - The significance of NH₃ from decomposition needs to be investigated further
 - Landfill fires and flaring - It is unclear how activity and EF data change for different landfill types (e.g., managed vs. unmanaged), but weighted correction factors for different site types may be appropriate to use (analogous to CH₄ GHG GLs). This needs to be investigated further.
 - The definition of landfill type may also impact whether there is flaring at unmanaged landfill sites

List of Key Knowledge Gaps

4.B Biological Treatment

- **Activity Data**
 - Limited data, especially on amount of greenwaste (composting)
 - Need to know the amount of N in the feedstock (waste + manure), which might vary regionally (anaerobic digestion)
- **EFs**
 - There will be a need to develop regional EFs for composting (using available methodologies as a starting point)
 - Lack or limited data about N in feedstocks constraints quality of EFs
- **Other**
 - Feedstock storage emissions (length of storage period, if stored at all at the AD site) – consistency with AFOLU to avoid potential double counting

List of Key Knowledge Gaps

4.C Incineration and Open Burning of Waste

- **Activity Data**
 - The assumption of no urban burning need to be re-evaluated
 - The equation to estimate the amount of waste open burned needs to be reviewed and the definition of Bfrac clarified
- **EFs**
 - Waste Incineration - Need to be technology dependent and account for abatement efficiencies
 - Available EFs for open burning are not likely globally applicable
 - Need to develop non-laboratory EFs for tire burning (for tire burning outside of landfills)
- **Other**
 - Waste incineration - Emissions will depend on incineration conditions (e.g., waste moisture content, level of smolder, etc.) and these impacts on EF will need to be considered further
 - Open burning - Emissions will depend also on environmental conditions (e.g., soil moisture content, meteorology, etc.) and these impacts on EF will need to be considered further

List of Key Knowledge Gaps

4.D Wastewater Treatment and Discharge

- Activity Data

- It is unclear whether the total amount of wastewater treated at facilities (EMEP method) or the wastewater flow rate (USEPA NEI method) is more readily available nationally or globally

- EFs

- Available EFs (NMVOC, NH₃ (EPA-only)) are not specific to domestic or industrial treatment. Domestic EFs for NH₃ from EMEP are for latrines only.

- Other

- If Landfill leachate is treated onsite at the landfill include under 4.D.2, [if treated wastewater is directed to another treatment facility include under 4.D.1.]

List of Key Knowledge Gaps

4.E Other Waste

- Activity Data
- EFs
 - Global Tier 1 EF may be able to be derived for car fires
 - A Tier 1 EF for building fires is likely not globally applicable
- Other