

CARB Tier 1 OW Calculator Public Comments

Prepared by Life Cycle Associates, LLC

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Dear CARB Staff,

We would like to express our appreciation for publishing the proposed Tier 1 simplified calculators and providing an opportunity for public comment. We apologize for the delay in submitting our comments, but we hope that you will still consider our input.

Our comments and recommendations are summarized below.

Recommendation: Allow for the option to model avoided composting of “Other” feedstocks

The proposed Tier 1 OW Calculator has the same waste categories as the previous calculator: Urban Landscaping Waste, Food Scraps, and “Other.” While this may seem to allow for flexibility, in practice the “Other” category can only be used to model avoided landfilling and not avoided composting. The original intent of the Tier1 OW calculator was to reflect the diversion from landfilled material where Urban Landscaping Waste and Food Scraps included a avoided composting component. The introduction of SB 1383 does not invalidate the landfill avoidance for these materials as the actions under SB 1383 are implemented on a municipality-wide basis.

Composting of diverse materials has expanded in California since the implementation of SB 1383. California composts varied materials such as soiled paper products, bio-plastics, agricultural residues, and food processing wastes. These materials contribute to California's compost production and play a role in the state's waste management strategy. To accommodate the diversity of compost in California, we propose adding the optionality to model avoided compost in the Tier 1 OW Calculator.

Figure 1 provides an example of a potential location for this use defined input.

Section 3: Static Operational Data	
3.1 Electricity Grid Region	
3.2 Grid Electricity EF (gCO ₂ e/kWh)	558
3.3 Low-CI Electricity EF (gCO ₂ e/kWh)	N/A
3.4 Distance to CNG Station (miles)	N/A
3.5 LNG Facility ID	N/A
3.6 Distance to LNG Facility (miles)	N/A
3.7 Liquefaction EF (gCO ₂ e/gallon)	N/A
3.8 LNG Trucking Distance (miles)	N/A
3.9 LNG Truck Type	N/A
3.10 OOW - % Diverted from Landfill	
3.1X OOW - % Diverted from Composting	
3.11 OOW - TDOC (% dry basis)	55%
3.12 OOW - DANF (%)	55%
3.13 Landfill Gas Collection Efficiency (%)	Default
	75%

Proposed addition of static operational data input for other organic waste – fraction diverted from composting

Figure 1. Proposed location of user defined input for organic waste diverted from composting.

While avoiding landfilling avoids methane emissions, avoiding composting has the additional benefit of avoiding nitrous oxide emissions, a powerful short-term climate pollutant, and an important part of California’s goals under both SB 1383 and the LCFS. By not allowing a credit for

avoided N₂O for other waste streams, CARB will hinder the development of projects aiming to reduce high GWP climate pollutants in the state.

Comment: Composting emissions factors are outdated and calculated using flawed methodology

In the proposed regulation, as in the current regulation, the composting emission factors for methane (CH₄) and nitrous oxide (N₂O) are the same for food scraps and urban landscaping waste. However, CARB has made adjustments to the emission factors for both N₂O and CH₄ in the new regulation (see Table 1).

Table 1. Emission factors for composting in the current and proposed Tier 1 calculators.

Emission Factor	Current Tier 1	Proposed Tier 1
gCH ₄ /wet ton	3,719.46	1,960.00
gN ₂ O/wet ton	81.65	70.47

Upon reviewing the provided references for the proposed composting factors in the new Tier 1 calculator, several issues become apparent.

1. The References Provided are Outdated

The references used for composting emission factors range in age from 10 to 26 years (see Figure 2). This is problematic for several reasons:

1. These references do not account for advancements in data collection and analysis techniques.
2. Changes in composting practices, technologies, and regulations over time may not be captured in older references, resulting in inaccurate assessments. This is especially true in California where compost has seen a dramatic change since the implementation of SB 1383.
3. Environmental conditions and factors influencing emissions will vary, making outdated references unreliable.

Table 3. Fugitive CH₄ emissions from composting.

Reference	Feedstock	Emission factor (gCH ₄ /kg)
Beck-Friis et al (2000) ^a	Household organic mixed with coarsely chipped branches and bushes	7.63
Hellmann et al (1997) ^b	Organic MSW with bush, leaves and grass clippings	0.17
Amlinger et al (2008) ^c	Green waste, sewage sludge and biowaste	0.21
San Joaquin Valley Air Pollution Control District (2013) ^d	Central California Green waste	2.90
South Coast Air Quality Management District (2001) ^e	Southern California Green waste	0.41
South Coast Air Quality Management District (2001) ^f	Southern California Green waste	0.45

Table 4. Fugitive N₂O emissions from composting.

Reference	Feedstock	Emission factor (gN ₂ O/kg)
Beck-Friis et al (2000) ^a	Household organic mixed with coarsely chipped branches and bushes	0.1
Hellmann et al (1997) ^b	Organic MSW with bush, leaves and grass clippings	0.022
Amlinger et al (2008) ^c	Green waste and grass	0.13
San Joaquin Valley Air Pollution Control District (2013) ^d	Central California Green waste	0.046

Figure 2. Screenshots of proposed Tier 1 calculator references for fugitive CH₄ and N₂O emissions from composting.

2. Average Values do not Accurately Reflect Waste-Specific Emission Factors

From a review of the references provided with the proposed Tier 1 OW calculator, it is clear that CARB has used an average of the literature references (see Figure 3).

Table 3. Fugitive CH₄ emissions from composting.

Reference	Feedstock	Emission factor (gCH ₄ /kg)
Beck-Friis et al (2000) ^a	Household organic mixed with coarsely chipped branches and bushes	7.63
Hellmann et al (1997) ^b	Organic MSW with bush, leaves and grass clippings	0.17
Amlinger et al (2008) ^c	Green waste, sewage sludge and biowaste	0.21
San Joaquin Valley Air Pollution Control District (2013) ^d	Central California Green waste	2.90
South Coast Air Quality Management District (2001) ^e	Southern California Green waste	0.41
South Coast Air Quality Management District (2001) ^f	Southern California Green waste	0.45
Average		1.96
Emissions		0.049 MTCO₂E/ short ton

Table 4. Fugitive N₂O emissions from composting.

Reference	Feedstock	Emission factor (gN ₂ O/kg)
Beck-Friis et al (2000) ^a	Household organic mixed with coarsely chipped branches and bushes	0.1
Hellmann et al (1997) ^b	Organic MSW with bush, leaves and grass clippings	0.022
Amlinger et al (2008) ^c	Green waste and grass	0.13
San Joaquin Valley Air Pollution Control District (2013) ^d	Central California Green waste	0.046
Average		0.075
Emissions		0.021 MTCO₂E/ short ton

Proposed Tier 1 composting emission factors

Methane (CH ₄)	1,960	gCH ₄ /wet short ton feedstock
Nitrous Oxide (N ₂ O)	70.47	gN ₂ O/wet short ton feedstock

Averages are converted from g/kg to g/short ton. However, the wrong conversion factor is applied

Figure 3. Screenshots of proposed Tier 1 calculator source for Fugitive CH₄ and N₂O emissions from composting and proposed composting emission factors.

The utilization of an average value for composting emission factors from various references in the proposed Tier 1 calculator raises concerns for the following reasons:

1. The emission factors from different studies exhibit significant variations across studies, and thus the average is a poor measure of central tendency.
2. The alignment between CARB's designations ("Food Scraps" or "Urban Landscaping Waste") and the references is unclear. The references encompass categories that potentially include food scraps but are not solely composed of them, such as "Household organic mixed with coarsely chipped branches and bushes" or "Organic MSW with bush, leaves, and grass clippings (see Figure 4).

Table 3. Fugitive CH₄ emissions from composting.

Reference	Feedstock	Emission factor (g _{CH₄} /kg)	
Beck-Friis et al (2000) ^a	Household organic mixed with coarsely chipped branches and bushes	7.63	These feedstocks do not align with the categories in the proposed tier 1 calculator “food scraps” and “yard trimmings”
Hellmann et al (1997) ^b	Organic MSW with bush, leaves and grass clippings	0.17	
Amlinger et al (2008) ^c	Green waste, sewage sludge and biowaste	0.21	
San Joaquin Valley Air Pollution Control District (2013) ^d	Central California Green waste	2.90	These feedstocks align with “yard trimmings.” However, the emission factors should not be averaged with the above feedstocks
South Coast Air Quality Management District (2001) ^e	Southern California Green waste	0.41	
South Coast Air Quality Management District (2001) ^f	Southern California Green waste	0.45	

Figure 4. Screenshot of references used to calculate composting emissions factors.

- Organics in California jurisdictions encompass materials not included in these studies, such as food-soiled papers and compostable plastics.

Recommendation: Allow for User Defined Composting Emission Factors

Since the previous regulation, the motivation to measure site-specific emission factors from composting facilities have increased. Facilities can employ various sampling methods such as the Flux chamber method or funnel method to obtain accurate measurements of baseline emissions. Facilities can measure the baseline CH₄ and N₂O with CARB approval. This would be similar to CARB’s approval of the method for determining the heating value of distillate bottoms, which require measurements and CARB approval.

Therefore, we recommend that CARB include user-defined fields for composting CH₄ and N₂O emissions based on actual measurements subject to verification. This will allow facilities equipped with real data to accurately reflect their avoided emissions from composting (see Figure 5). In cases where facilities do not have site-specific data for emission factors, CARB could consider providing default values based on updated and comprehensive studies.

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Proposed addition of static operational data input for fugitive N₂O and CH₄ emissions factors for composting

Figure 5. Proposed location of user-defined input for CH₄ and N₂O composting emissions factors

We appreciate your attention to these comments and recommendations. We believe that implementing these changes will lead to more accurate calculations of baseline emissions. Thank you for considering our input.

Sincerely,



Anna Redmond
Project Manager
Life Cycle Associates, LLC



Stefan Unnasch
Managing Director
Life Cycle Associates, LLC