S-2. Implement Organics Diversion Program

GHG Mitigation Potential

Small

Potentially small reduction in GHG emissions from management pathways

Co-Benefits (icon key on pg. 34)

Climate Resilience

Organics diversion programs can increase the amount of compost produced, which can go toward gardens and farms and help improve food and crop production. Compost can also help increase soil carbon storage, which can in turn improve biodiversity and groundwater storage.

Health and Equity Considerations

If possible, work with local food banks and shelters to ensure that edible food goes to people first.

Measure Description

This measure will implement an organics diversion program to reduce the volume of organic waste sent to landfills. An organics diversion program lowers the landfill disposal rate of food waste (both edible and non-edible), food soiled paper, yard waste, and non-hazardous wood waste. Decomposition of organic waste in landfills produces CH_4. Increasing organic waste diversion from landfills thus reduces GHG emissions.

Scale of Application

Project/Site and Plan/Community

Implementation Requirements

Waste management practices to support organics diversion may include construction and management of a composting facility (citywide scale), providing residential and business composting pickup services (citywide scale), community outreach (citywide scale and project scale), or providing clearly marked triple bin locations (waste, recycling, composting) (project scale).

Cost Considerations

Implementing organics diversion services, or utility scale composting, generates costs for collection, processing, and management of the materials to be composted, and can include the construction of new composting facilities or transportation for the materials to reach a plant that can accommodate them. However, expanded composting also reduces costs associated with waste processing, landfill management, pollution control, and waste-stream greenhouse gas emissions. The resulting compost can also take the place of fertilizer, saving costs on land management inputs and increasing agricultural yields.

Expanded Mitigation Options

Diversion of edible food to food banks is another viable organics diversion program but is not specifically captured by the current quantitative method for this measure.

GHG Reduction Formula

A = [E1 or E2] × D

$B_Z = A \times F_Z$

C = Input B_Z into U.S. EPA WARM

Composting can help reduce the use of nitrogen-based fertilizer, which results in GHG emissions during the manufacturing process (which involves use of natural gas) and release of nitrogen dioxide (NO_2) during use. These emissions are not quantified as part of this measure's methodology. Additional GHG reductions may be achieved if the diversion program reduces VMT and associated vehicle emissions. Refer to *Quantified Co-Benefits* below for further discussion.

GHG Calculation Variables

ID	Variable	Value	Unit	Source
Output				
A	Waste disposed by building type	[ ]	tons	calculated
B	Waste disposed by material type	[ ]	Tons	calculated
C	GHG reduction from recycling vs. composting waste	[ ]	MT CO_2e	calculated using U.S. EPA WARM
User Inputs				
D	Population	[ ]	resident or employee	user input
Constants, Assumptions, and Available Defaults				
E1	Annual residential waste disposal rates by location	Table S-1.1	tons per resident per year	CalRecycle n.d.(a)
E2	Annual statewide non-residential waste disposal rates by business type	Table S-1.2	tons per employee per year	CalRecycle n.d.(b)
F	Percentage of material z in waste stream	Table S-1.3	%	CalRecycle n.d.(c), 2020
z	Material type (e.g., glass)	N/A	-	-

Further explanation of key variables:

- (C) – U.S. EPA's (2020) WARM calculates the GHG emission impacts associated with various waste management practices, including recycling and composting. To estimate the GHG benefit of composting over landfilling, users input the tonnage of organic waste by material type into the Tons Landfilled column under the "baseline" scenario. The user then inputs the tonnage of organic waste by material type into the Tons Composted column under the "alternative management" scenario. The model calculates emissions under the baseline and alternative management scenarios of manufacturing, transportation and end-of-life landfilling, or diversion of organic waste and shows the net GHG savings in MT CO_2e.

- (E1) – Annual solid waste disposal rates for multi-family and single-family homes are provided in Table S-1.1 in Appendix C.
- (E2) – Annual non-residential waste disposal rates by business type are provided in Table S-1.2 in Appendix C.
- (F) – The composition of disposed waste by material type for residential and non-residential buildings is provided in Table S-1.3 in Appendix C.

GHG Calculation Caps or Maximums

None.

Example GHG Reduction Quantification

The user reduces GHG emissions by diverting organic waste from a landfill. In this example, the project is an Arts, Entertainment, & Recreation business with 100 employees (D).

$$A = 1.94\ \frac{\text{tons}}{\text{yr}\cdot\text{employee}} \times \mathbf{100\ employees} = 194\ \frac{\text{tons}}{\text{yr}}$$

$$B_{\text{food}} = 194\frac{\text{tons}}{\text{yr}} \times 34\% = 66.0\ \frac{\text{tons}}{\text{yr}}$$

$$B_{\text{yard trimmings}} = 194\frac{\text{tons}}{\text{yr}} \times 12\% = 23.3\frac{\text{tons}}{\text{yr}}$$

$$B_{\text{mixed organics}} = 194\frac{\text{tons}}{\text{yr}} \times 6\% = 11.6\frac{\text{tons}}{\text{yr}}$$

The user inputs the tons of waste by material type (B) into U.S. EPA's WARM in the Tons Landfilled column. The project will compost all materials, which is assumed in the alternative management scenario. Based on WARM, this business can mitigate up to 40 MT CO_2e by diverting waste from a landfill to compost facility.

Quantified Co-Benefits

VMT Reductions

Organics diversion programs may reduce waste transfer vehicle VMT if the compost facility is closer to the waste generation source than the landfill. The VMT reduction may be calculated using the following formula.

$$G = (\mathbf{H} \times \mathbf{I}) - (\mathbf{J} \times \mathbf{K})$$

VMT Reduction Calculation Variables

ID	Variable	Value	Unit	Source
Output				
G	Reduction in waste transfer vehicle VMT	[ ]	miles/day	calculated
User Inputs				
H	Daily waste transfer trips without the organics diversion program	[ ]	trips/day	user input
I	Waste transfer trip distance without the organics diversion program	[ ]	miles/trip	user input
J	Daily waste transfer trips under the organics diversion program	[ ]	trips/day	user input
K	Waste transfer trip distance under the organics diversion program	[ ]	miles/trip	user input
Constants, Assumptions, and Available Defaults				
	None			

Further explanation of key variables:

- (H, J) – The user should take care to properly account for all vehicle trips directly affected by implementation of the measure. This value may be the same with and without the diversion program.
- (I, K) – The user should take care to properly account for the full trip distance of the waste transfer vehicle. Note that if the trip distance increases with implementation of the organics diversion program (i.e., K>I), this measure would result in a VMT increase.

Users may translate VMT reductions (or increases) (G) to GHG emissions using emission factors from CARB's (2021) EMFAC model. Users should multiply the VMT reductions (or increases) by the appropriate vehicle emission factors. If the organics diversion program also reduces (or increases) the number of vehicle trips (i.e., J<H or J>H), users should quantify the resulting changes in process emissions using EMFAC.

Improved Air Quality

Composting can produce volatile organic compound (VOC) emissions in and around the composting site. This may result in worsened regional air quality. Increases in VOC emissions may be offset if the organics diversion program reduces waste transfer vehicle VMT. Users may translate VMT reductions (or increases) (G) to criteria pollutant emissions using emission factors from CARB's (2021) EMFAC model. Users should multiply the VMT reductions (or increases) by the appropriate vehicle emission factors. If the organics diversion program also reduces (or increases) the number of vehicle trips (i.e., J<H or J>H), users should quantify the resulting changes in process emissions using EMFAC.

Sources

- California Air Resources Board (CARB). 2021. *EMFAC*. Available: https://arb.ca.gov/emfac/. Accessed: September 2021.
- CalRecycle. n.d.(a) *Residential Waste Stream by Material Type*. Available: https://www2.calrecycle.ca.gov/WasteCharacterization/ResidentialStreams. Accessed: April 2021.
- CalRecycle. n.d.(b) *Disposal and Diversions Rates for Business Groups*. Available https://www2.calrecycle.ca.gov/WasteCharacterization/BusinessGroupRates. Accessed: January 2021.
- CalRecycle. n.d.(c) *Business Group Waste Stream Calculator*. Available https://www2.calrecycle.ca.gov/WasteCharacterization/BusinessGroupCalculator. Accessed: January 2021.
- CalRecycle. 2020. *2018 Facility-Based Characterization of Solid Waste in California.* Available https://www2.calrecycle.ca.gov/WasteCharacterization/Study. Accessed: January 2021.
- U.S. Environmental Protection Agency (U.S. EPA). 2020. Waste Reduction Model (WARM), Version 15. Available https://www.epa.gov/warm. Accessed: January 2021.