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# 2021 SMM Tool Application for Educators

May 5th, 2021
University of Florida

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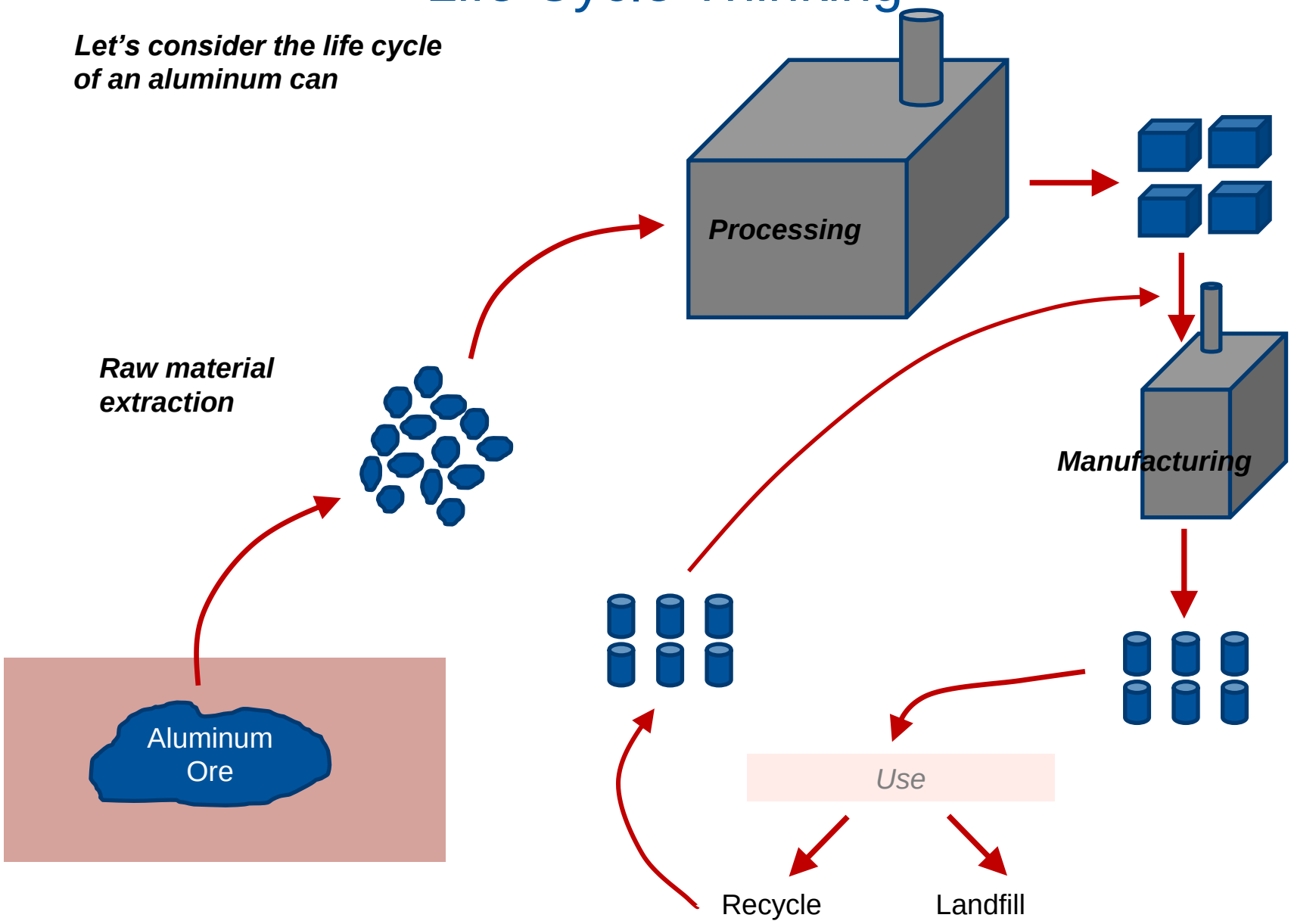
Florida Department of Environmental Protection

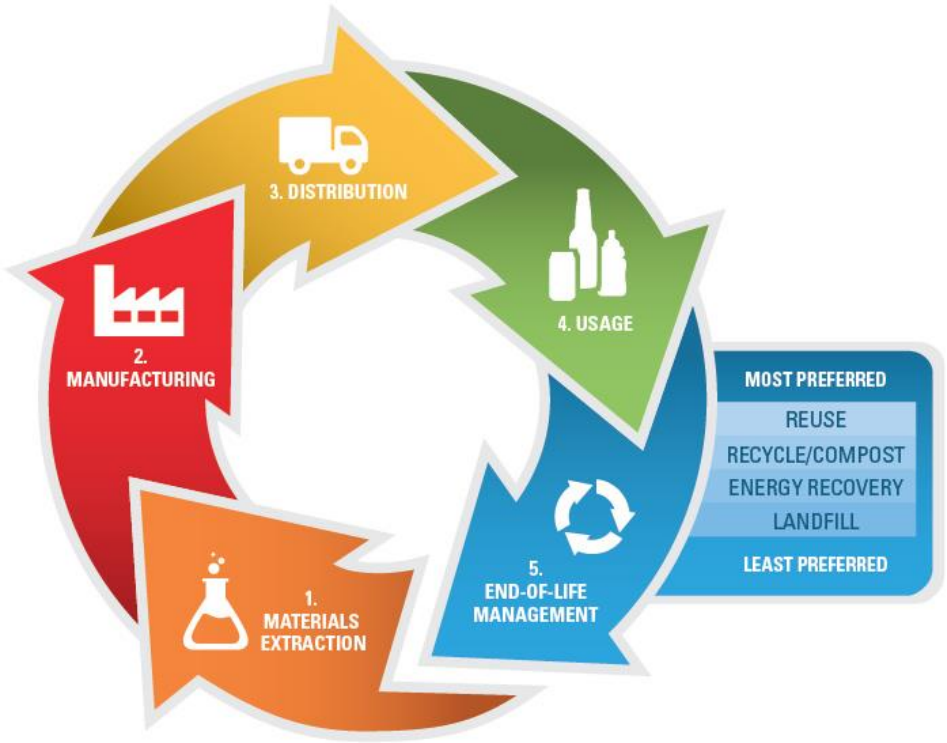
HINKLEY CENTER FOR SOLID AND HAZARDOUS WASTE MANAGEMENT

# Life Cycle Thinking

***Let's consider the life cycle of an aluminum can***



# Sustainable Materials Management




"Sustainable materials management (**SMM**) is a systemic approach to using and reusing materials more productively over their entire **life cycles**. It seeks to **use materials in the most productive way** with an emphasis on using less. "

https://www.epa.gov/smm/sustainable-materials-management-basics

# Life Cycle Thinking Application

**Answer Questions Like…**

## Prioritize and Strategically Plan

- Which materials should we prioritize recycling?
- Which disposal method is best for our waste stream?
- Which policies or technologies should we prioritize?
- Which stakeholders should we prioritize?

**AND**

## Performance Metrics

- What should our targets metrics be based on?
- What are the units of measure our metrics should be?
- How can we measure our solid waste system performance?

# Life Cycle Assessment (LCA)

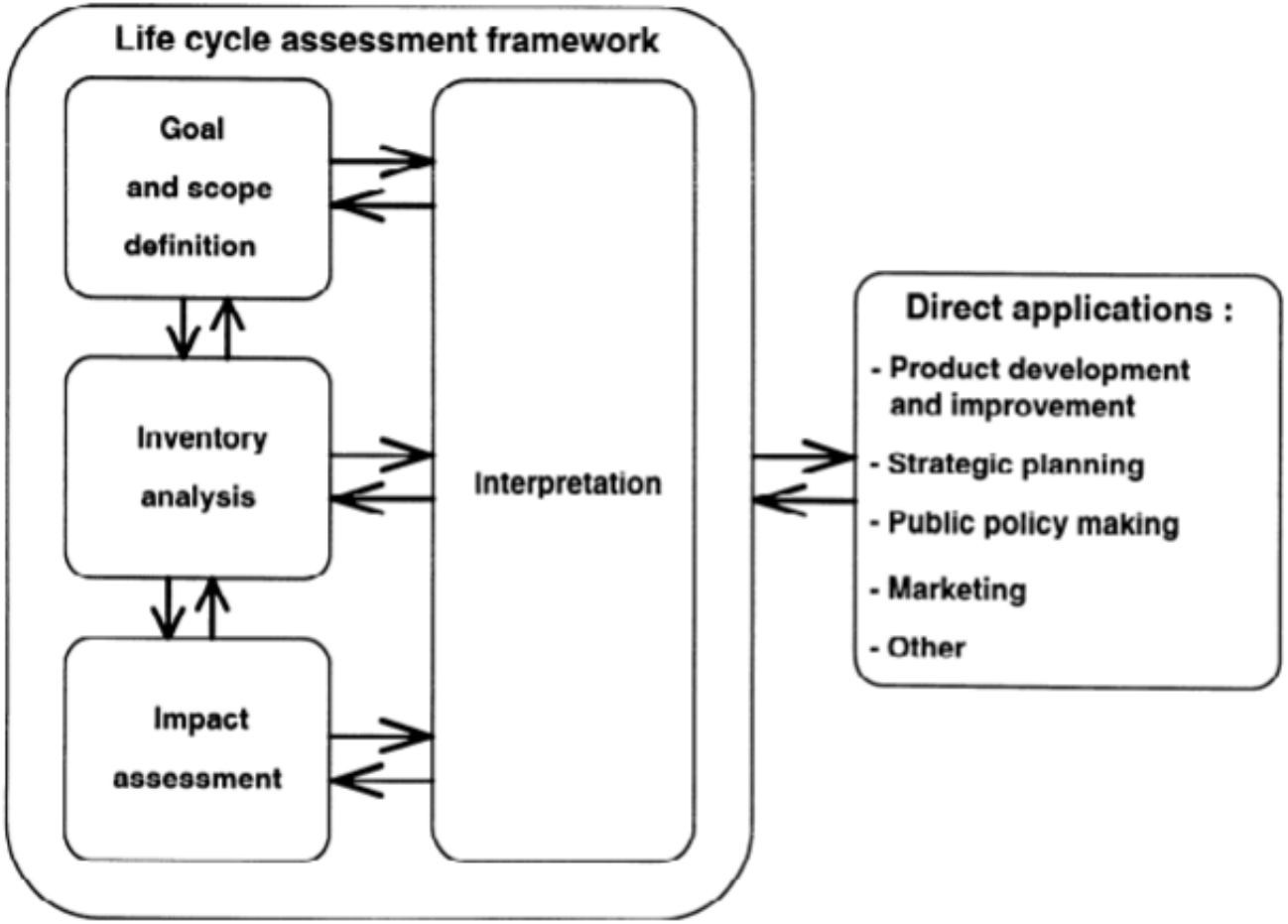
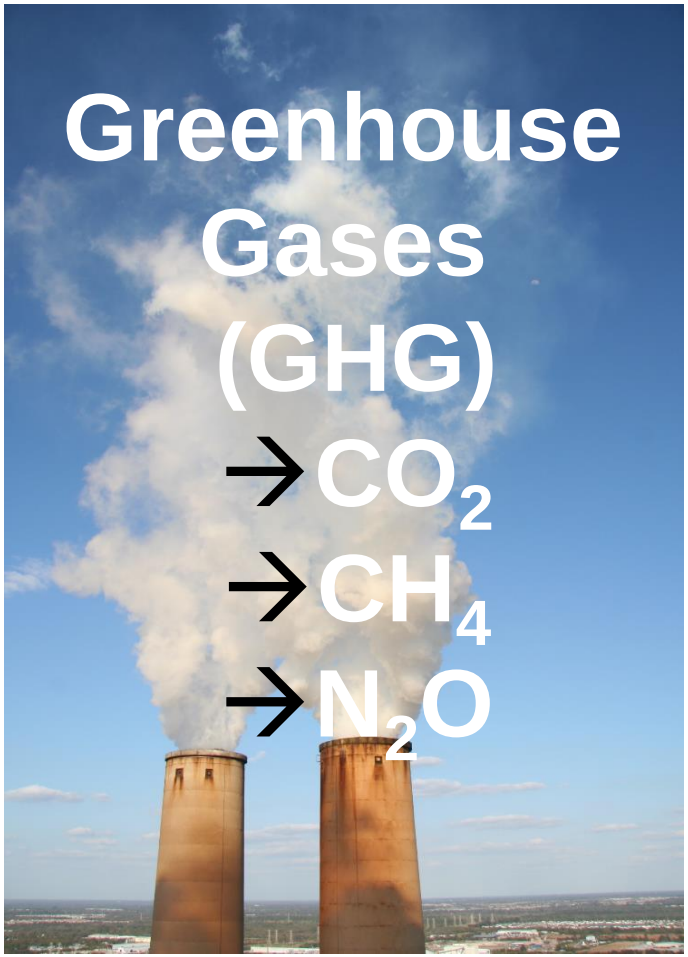



Figure 1 : Phases of an LCA

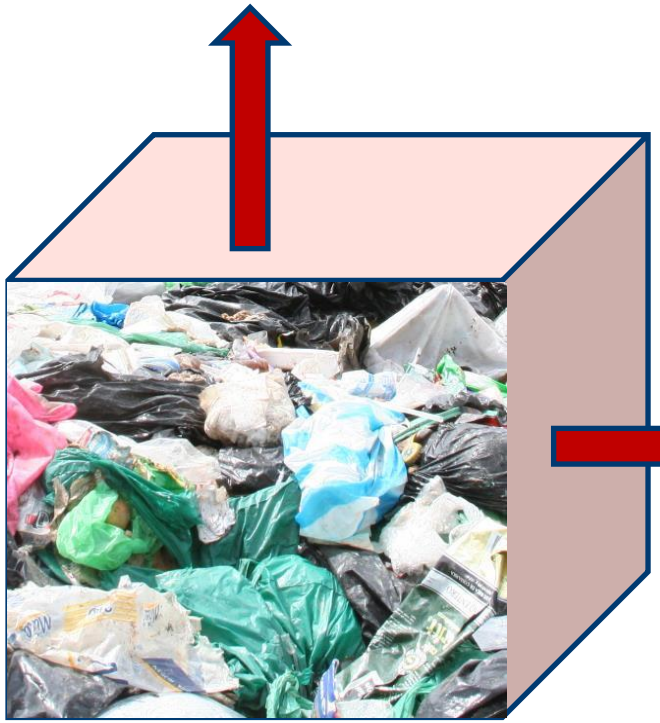
https://web.stanford.edu/class/cee214/Readings/ISOLCA.pdf

# LCA Indicators

# Impact Factors

Net $CO_2$, $CH_4$, $N_2O$, … → Metric Tons of $CO_2$ Equivalents ($tCO_2eq.$)



Mass of Waste

$$\frac{tCO_2eq.}{Ton\ Waste\ Managed}$$

# Impact Factors Calculations

$$\text{Net GHG Emissions (per ton)} = [\text{GHG Emissions}] - \begin{bmatrix}\text{GHG Emissions} \\ \text{Offsets}\end{bmatrix}$$

Degradation of biogenic carbon containing waste fractions

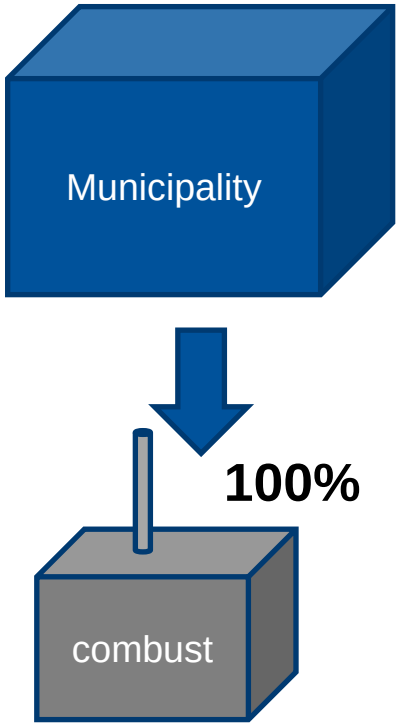
- Electrical power offset
- Remanufacturing
- Carbon sequestration and storage

# 2021 SMM Tool Introduction

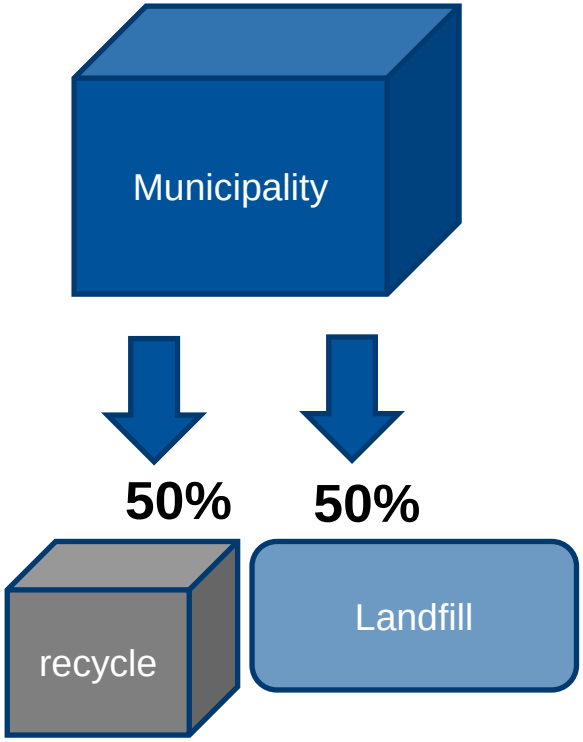
# Example Problem

A municipality is evaluating two option for managing cardboard in their waste stream. If they collect 20 tons per day of cardboard. Which option results in the lowest GHG emissions ($tCO_2eq.$) per day?

**Option 1**




**Option 2**



# Example Problem

## Option 1- 100% combust

$$20\frac{tons}{day} * 100\% * -1.08\ \frac{tCO_2eq.}{ton\ cardboard\ combusted} =$$

## Option 2- 50% recycle & 50% landfill

$$20\frac{tons}{day} * 50\% * 0.19\ \frac{tCO_2eq.}{ton\ cardboard\ recycled} =$$

$$20\frac{tons}{day} * 50\% * -0.77\ \frac{tCO_2eq.}{ton\ cardboard\ landfilled} =$$

# Example Problem

**From "4 SMM Input": Selected MSWDST (FL)**

**All Units ($tCO_2eq./$ Short Ton)**

| Material Category | Item No. | Material Type | Recycling | Landfill | Combustion |
|---|---|---|---|---|---|
| MSW | 1 | Mixed MSW | NA | (0.18) | (0.27) |
| | 2 | Newspaper | (0.83) | (1.35) | (1.18) |
| | 3 | Corrugated Cardboard (OCC) | 0.19 | (0.77) | (1.08) |

# Example Problem

## Option 1

$$20\frac{tons}{day} * 100\% * -1.08\ \frac{tCO_2eq.}{ton\ cardboard\ combusted} = \mathbf{-22\frac{tCO_2eq.}{day}}$$

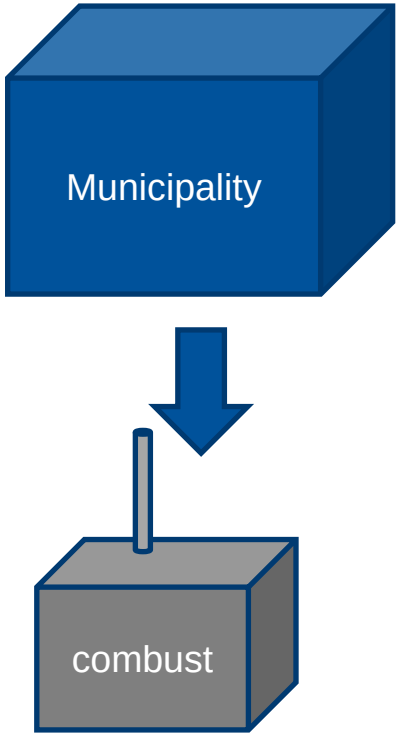
## Option 2

$$20\frac{tons}{day} * 50\% * 0.19\ \frac{tCO_2eq.}{ton\ cardboard\ recycled} = \mathbf{2\frac{tCO_2eq.}{day}}$$

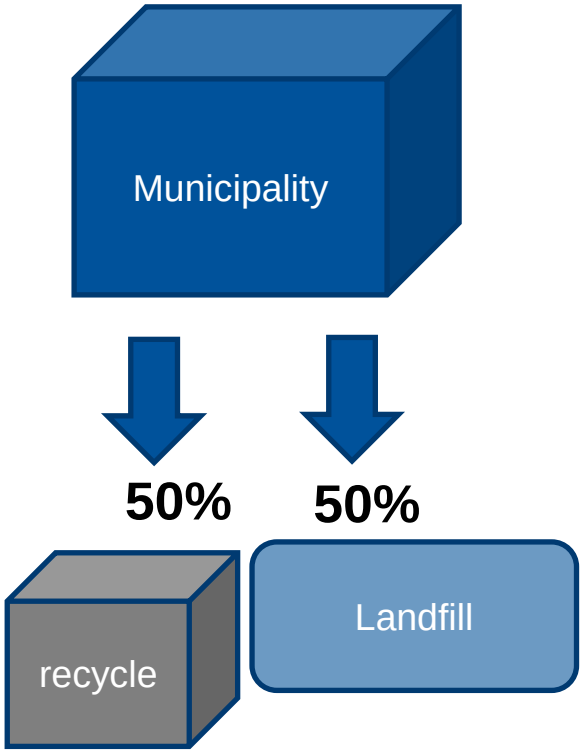
$$20\frac{tons}{day} * 50\% * -0.77\ \frac{tCO_2eq.}{ton\ cardboard\ landfilled} = \mathbf{-8\frac{tCO_2eq.}{day}}$$

$$\mathbf{2 + (-8) = -6\frac{tCO_2eq.}{day}}$$

Option 1 = $-22 \frac{tCO_2eq.}{day}$




Option 2 = $-6 \frac{tCO_2eq.}{day}$




Option 2 is the recommend approach because it has a greater GHG emissions offset footprint.

# 2021 SMM Tool Example Problem

# Example Problem

What is the waste management environmental footprint of our county?

# Thank You for Your Time!

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