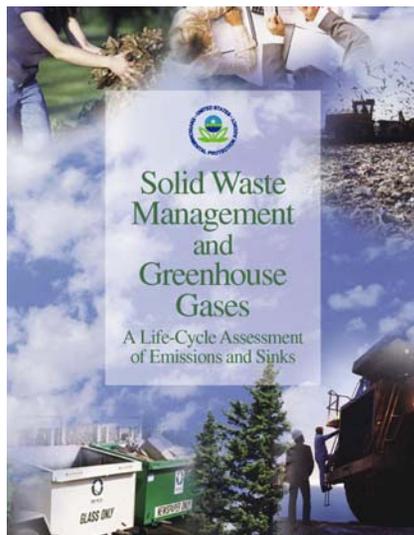


US EPA ARCHIVE DOCUMENT

# Background on WARM and EPA Emission Factors



EPA Organics Workshop  
May 13, 2008

Anne Choate, ICF International



# Background

- 1990s efforts to expand the portfolio of reasons for alternative waste management practices
- 1994 Climate Change Action Plan contained source reduction and recycling initiatives
  - WW, PAYT, and grant projects assumed to yield GHG reductions
- Streamlined life-cycle approach designed and peer reviewed
- 1998 First Edition EPA MSW GHG Report
- WAste Reduction Model (WARM) Released
- Updates to MSW GHG report and WARM
  - 2002 (including extensive revisions to compost chapter)
  - 2006

# Intended Audience and Scope

- Audience:
  - Solid waste managers, primarily from state and local governments who want to evaluate various waste management options
  - EPA source reduction and recycling program managers who are required to annually report GHG benefits of program activities
  - EPA source reduction and recycling program participants (e.g., WasteWise partners)
- Scope:
  - Source reduction, recycling, and composting are evaluated in comparison to combustion and landfilling
  - Emissions represent **baseline** versus **alternative** waste management scenarios (i.e., not absolute)
  - Currently covers 34 materials including 17 organic materials

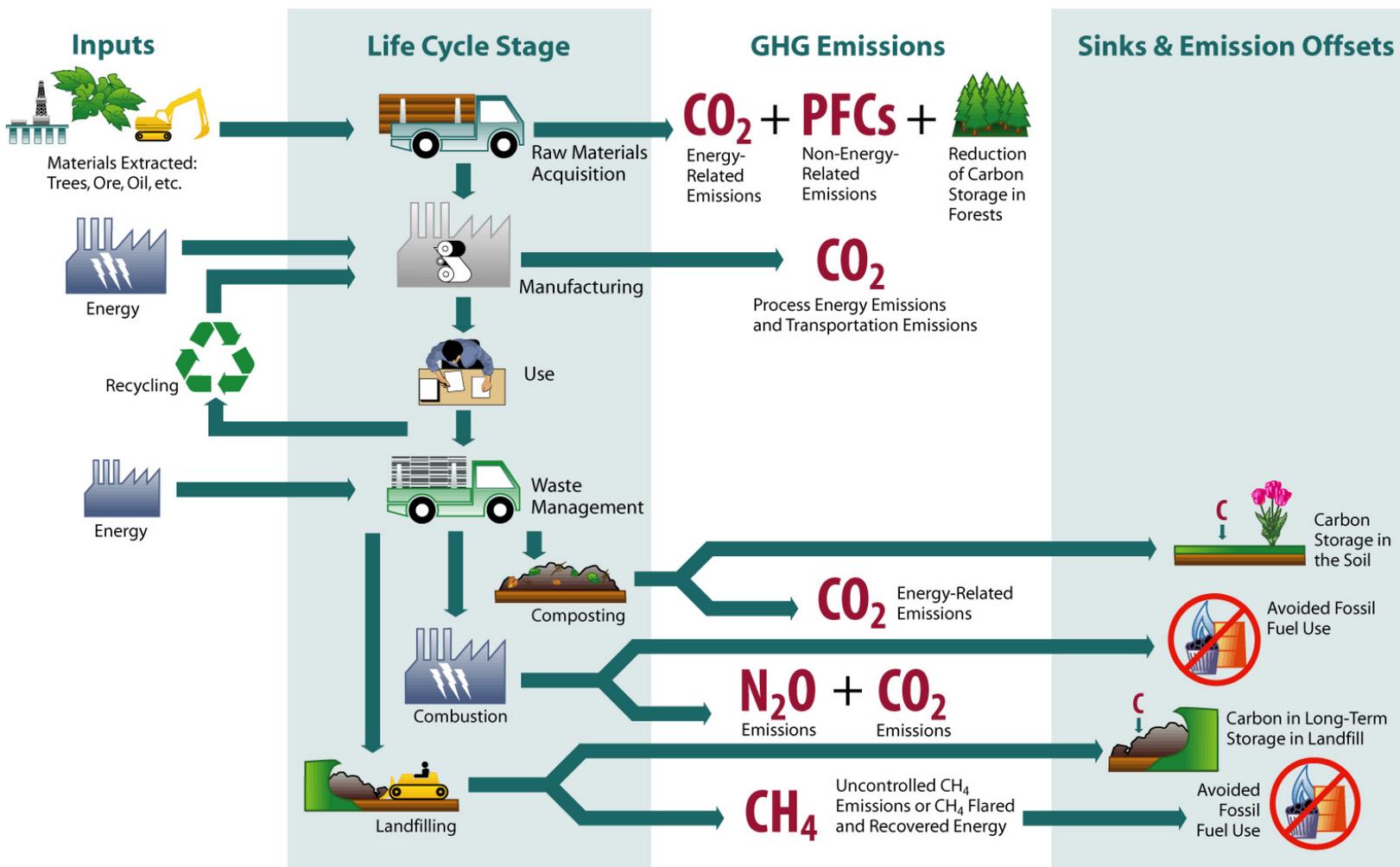
# Purpose

- **Understand** the link between waste management practices and climate change
- **Incorporate** GHG impacts into decision-making processes
- **Communicate** GHG emission reductions to the public
- **Improve** materials management through incorporation into climate action plans at the municipal and state level

# Streamlined Life-Cycle Methodology

- Life-cycle assessment limited to GHG and energy impacts
- Focus on GHGs emitted, carbon stored, or utility energy displaced at following stages:
  - Raw material acquisition
  - Manufacturing
  - Waste management
  - Transportation of raw material and waste

# GHG Sources & Sinks Associated with the Material Life Cycle

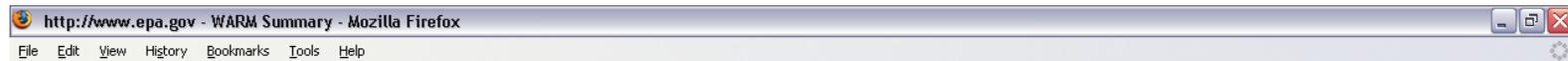


# WARM Scenarios

- WARM available at EPA's Climate Change – Waste  
Web site:  
[http://www.epa.gov/climatechange/wycd/waste/calculators/Warm\\_Form.html](http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_Form.html)
- Users input:
  - Tonnage by material type for two scenarios: baseline and alternative
  - Landfill characteristics
    - LFG recovery status
    - Collection system efficiency
  - Transportation distances

# Sample WARM run 1

- Baseline: landfilling 100 tons mixed organics **without** LFG recovery
- Alternative: composting 100 tons mixed organics



## GHG Emissions Analysis -- Summary Report

(Version 8, 8/06)

Analysis of GHG Emissions from Waste Management

### GHG Emissions from Baseline Waste Management (MTCE): 17

| Material       | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Total MTCE |
|----------------|---------------|-----------------|----------------|----------------|------------|
| Mixed Organics | N/A           | 100             | 0              | 0              | 17         |

### GHG Emissions from Alternative Waste Management Scenario (MTCE): -5

| Material       | Tons Reduced | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Total MTCE |
|----------------|--------------|---------------|-----------------|----------------|----------------|------------|
| Mixed Organics | N/A          | N/A           | 0               | 0              | 100            | -5         |

Total Change in GHG Emissions: -23 MTCE

Note: A negative value indicates an emission reduction; a positive value indicates an emission increase.

a) For an explanation of the methodology used to develop emission factors, see EPA report: Greenhouse Gas Emissions from Management of Selected Materials in Municipal Solid Waste (EPA530-R-98-013) -- available on the Internet at <http://www.epa.gov/epaoswer/non-hw/muncpl/ghg/greengas.pdf> (1.1 Mb PDF file). Please note that some of the emission factors used to generate these results do not match those presented in the report due to recent additions and/or revisions. A 3rd edition of the report will be available in early Fall of 2006, which will include the latest emission factors.

b) Emissions estimates provided by this model are intended to support voluntary GHG measurement and reporting initiatives.

c) Total emissions estimates provided by this model may not sum due to independent rounding.

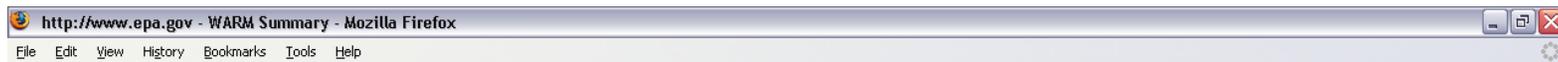
→ Switch to compost significantly **decreases** emissions

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[View Emission Factors](#)

# Sample WARM run 2

- Baseline: landfilling 100 tons mixed organics **with** LFG recovery (for energy)
- Alternative: composting 100 tons mixed organics



## GHG Emissions Analysis -- Summary Report

(Version 8, 8/06)

Analysis of GHG Emissions from Waste Management

### GHG Emissions from Baseline Waste Management (MTCE): -10

| Material       | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Total MTCE |
|----------------|---------------|-----------------|----------------|----------------|------------|
| Mixed Organics | N/A           | 100             | 0              | 0              | -10        |

### GHG Emissions from Alternative Waste Management Scenario (MTCE): -5

| Material       | Tons Reduced | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Total MTCE |
|----------------|--------------|---------------|-----------------|----------------|----------------|------------|
| Mixed Organics | N/A          | N/A           | 0               | 0              | 100            | -5         |

Total Change in GHG Emissions: 5 MTCE

Note: A negative value indicates an emission reduction; a positive value indicates an emission increase.

- For an explanation of the methodology used to develop emission factors, see EPA report: Greenhouse Gas Emissions from Management of Selected Materials in Municipal Solid Waste (EPA530-R-98-013) -- available on the Internet at <http://www.epa.gov/epaoswer/non-hw/muncpl/ghg/greenqas.pdf> (1.1 Mb PDF file). Please note that some of the emission factors used to generate these results do not match those presented in the report due to recent additions and/or revisions. A 3rd edition of the report will be available in early Fall of 2006, which will include the latest emission factors.
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- Total emissions estimates provided by this model may not sum due to independent rounding.

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→ Switch to compost  
moderately  
***increases*** emissions

## WARM Caveats

- Emission estimates are intended to support *voluntary* GHG measurement and reporting initiatives
- Emission results are *relative* to alternative scenarios
- Factors do not reflect use phase emissions
- Not all waste management practices are included (e.g., anaerobic digestion)