



Basic Information about the Waste Reduction Model (WARM)

EPA created the Waste Reduction Model (WARM) to provide high-level estimates of potential greenhouse gas (GHG) emissions reductions, energy savings and economic impacts from several different waste management practices.

On this page:

- [What is WARM?](#)
 - [Who Should Use WARM?](#)
 - [What Materials Are in WARM?](#)
-

What is WARM?

WARM Resources

- [Documentation](#)
- [Frequent Questions](#)
- [Versions](#)

WARM is a tool that estimates the potential GHG emissions, energy savings and economic impacts of baseline and alternative waste management practices, including source reduction, recycling, combustion, composting, anaerobic digestion, and landfilling. The model calculates emissions, energy units and economic factors across a wide range of material types commonly found in municipal solid waste in the following categories:

- Metric tons of carbon dioxide equivalent (MTCO₂E),
- Energy units (million British Thermal Unit - BTU),
- Labor hours,
- Wages (\$), and
- Taxes (\$).

WARM is currently available as a tool based on a database developed in open life cycle assessment (openLCA) software, with versions available for both [Windows and Macintosh users](#). WARM is also available as [a downloadable Microsoft Excel spreadsheet](#).

GHG savings are calculated by comparing the emissions associated with managing materials under an alternative scenario with the emissions associated with the user's baseline scenario (i.e., current practices), as opposed to simply multiplying the quantity of materials managed by an emission factor. For example, the GHG savings of recycling one (1) short ton (standard U.S. ton) of aluminum cans instead of landfilling them would be calculated as follows:

$$(1 \text{ short ton} \times -9.13 \text{ MTCO}_2\text{E/short ton}) - (1 \text{ short ton} \times 0.02 \text{ MTCO}_2\text{E/short ton}) = -9.15 \text{ MTCO}_2\text{E}$$

WARM is periodically updated as new information becomes available and new material types are added. Users may refer to the model history to better understand the differences among various [versions of WARM](#). WARM was last updated in November 2020.

Who Should Use WARM?

WARM provides high-level estimates of potential greenhouse gas (GHG) emissions reductions, energy savings and economic impacts from six different waste management practices including source reduction, recycling, composting, anaerobic digestion, combustion, and landfilling. WARM can be used by individuals and organizations ranging from state and local governments, students, small businesses, and other organizations interested in the GHG, energy and economic impacts from materials management decisions.

What Materials Are in WARM?

Related Information

[WARM Background Documents](#) - provide information on using WARM emission, energy and economic factors for materials and pathways that are not in the model.

WARM now recognizes 60 material types, which are presented in the table below. Their emission, energy and economic factors are available for viewing in units of metric tons of carbon dioxide equivalent (MTCO₂E), million BTU, labor hours, wage dollars and tax dollars.

Material Types Recognized by WARM		
Aluminum Cans	Fly Ash	Mixed Paper (primarily from offices)
Aluminum Ingot	Food Waste	Mixed Paper (primarily residential)
Asphalt Concrete	Food Waste (meat only)	Mixed Plastics
Asphalt Shingles	Food Waste (non-meat)	Mixed Recyclables
Beef	Fruits and Vegetables	Newspaper
Branches	Glass	Office paper
Bread	Grains	PET (polyethylene terephthalate)
Carpet	Grass	Phonebooks
Clay Bricks	Hard-copy Devices	PLA (polylactic acid)
Concrete	HDPE (high-density polyethylene)	Portable Electronic Devices
Copper Wire	LDPE (low-density polyethylene)	Poultry
Corrugated Cardboard	Leaves	PP (polypropylene)
Cathode Ray Tube (CRT) Displays	LLDPE (linear low-density polyethylene)	PS (polystyrene)
Dairy Products	Magazines/Third-Class Mail	PVC (polyvinyl chloride)
Desktop Central Processing Units (CPU)s	Medium Density Fiberboard	Steel Cans
Dimensional Lumber	Mixed Electronics	Textbooks
Drywall	Mixed Metals	Tires
Electronic Peripherals	Mixed MSW (municipal solid waste)	Vinyl Flooring
Fiberglass Insulation	Mixed Organics	Wood Flooring
Flat-Panel Displays	Mixed Paper (general)	Yard Trimmings