

Waste Reduction Model (WARM) Excel User's Guide – Version 14

Calculating Greenhouse Gas Emissions with the Excel Version of the Waste Reduction Model

What is the Waste Reduction Model?

The Waste Reduction Model (WARM) was created by the U.S. Environmental Protection Agency (EPA) to help solid waste planners and organizations estimate greenhouse gas (GHG) emission reductions from several different waste management practices.

WARM calculates GHG emissions for baseline and alternative waste management practices, including source reduction, recycling, combustion, composting, and landfilling. The model calculates emissions in metric tons of carbon dioxide equivalent (MTCO₂E) and metric tons of carbon equivalent (MTCE) across a wide range of material types commonly found in municipal solid waste (MSW).

The user can construct various scenarios by simply entering data on the amount of waste handled by material type and by management practice. WARM then automatically applies material-specific emission factors for each management practice to calculate the GHG emissions and energy savings of each scenario. Several key inputs, such as landfill gas recovery practices and transportation distances to MSW facilities, can be modified by the user.

The GHG emission factors were developed following a life-cycle assessment methodology using estimation techniques developed for national inventories of GHG emissions. The methodologies used to develop these emission factors are described in detail in the background reports available for download at the WARM website. This version also reflects revised data on the average recycled content values for materials available in the marketplace, and the EPA's latest MSW characterization report *Advancing Sustainable Materials Management: Facts and Figures*.

Who should use WARM?

WARM was developed for solid waste managers (from state and local governments and other organizations) who want to calculate the GHG emissions associated with different waste management options. Emissions estimates provided by WARM are intended to support voluntary GHG measurement and reporting initiatives. These initiatives include waste management components of state and local climate change action plans, and other waste management projects for which an understanding of GHG emissions is desired.

Using the Excel Version of WARM

Before using WARM, you first need to gather data on your baseline waste management practices and an alternative scenario. In order to effectively use the tool, users should know how many tons of waste you manage (or would manage) for a given time period under each scenario by material type and by management practice. The model allows you to customize your results based on project-specific landfill gas recovery practices, anaerobic digestion practices and transportation distances. Note that you may

use default values if you are unsure of landfill gas recovery practices, anaerobic digestion practices and/or transportation distances.

Instructions:

- Click on the “Analysis Inputs” tab at the bottom center of the screen to open the input sheet. Follow the instructions for Steps 1 and 2. This involves filling in the tables describing your baseline and proposed alternative waste management scenarios. The "mixed" material types are defined as the following:
 - Mixed Metals: Aluminum Cans 35%, Steel Cans 65%
 - Mixed Plastics: HDPE 38%, PET 62%.
 - Mixed Paper (general): Corrugated Containers 48%, Magazines/Third-class Mail 8%, Newspaper 24%, Office Paper 20%
 - Mixed Paper (primarily residential): Corrugated Containers 53%, Magazines/Third-class Mail 10%, Newspaper 23%, Office Paper 14%
 - Mixed Paper (primarily from offices): Corrugated Containers 5%, Magazines/Third-class Mail 36%, Newspaper 21%, Office Paper 38%
 - Mixed Recyclables: Aluminum Cans 1.4%, Steel Cans 2.7%, Glass 6.4%, HDPE 1.2%, PET 1.9%, Corrugated Containers 54.1%, Magazines/Third-class Mail 7.6%, Newspaper 10.6%, Office Paper 8.1%, Phonebooks 0.4%, Textbooks 0.7%, Dimensional Lumber 5.0%
 - Food Waste: Beef 9%, Poultry 11%, Grains 13%, Fruits and Vegetables 49%, Dairy Products 18%
 - Food Waste (meat only): Beef 46%, Poultry 54%
 - Food Waste (non-meat): Grains 16%, Fruits and Vegetables 61%, Dairy Products 22%
 - Mixed Organics: Food Waste 52%, Yard Trimmings 48%.
 - Mixed MSW- represents the entire municipal solid waste stream as disposed.
- Fill in the data requested in Steps 3–9. WARM will use the answers to these questions to customize GHG estimates to reflect your waste management situation and location. For example, you are asked for data on transportation distances and on your landfill gas recovery systems, if applicable. If the requested data are not available, WARM will use the national average defaults.
- Step 10 allows you to customize your report, with your name, organization, and project period.

- Once you have completed Steps 1–9 on the “Analysis Inputs” sheet, WARM will calculate the GHG emissions and energy attributable to the baseline and alternative waste management scenarios you have specified. Emissions and energy calculations are presented on separate output sheets, as described below. From the “Analysis Inputs” sheet, click on a tab at the bottom of the screen for the results sheet you want to view first.
- The “Summary Report” sheet provides a concise report of GHG emissions or energy results from the baseline and alternative waste management scenarios, as well as an estimate of net emissions or energy.
- The “Analysis Results” sheet shows GHG emissions or energy results for each scenario in the units selected. You can compare the total impact of the baseline and alternative scenarios, or, if you want more detail, you can scroll down to view GHG emissions or energy results by material type and management practice. The bottom table shows the relative emissions or energy difference between the alternative and baseline scenarios for each material type and management pathway.

Assistance

If you need additional assistance with using WARM, please email orcrWARMquestions@epa.gov.