HOW TO CALCULATE THE **CLIMATE BENEFITS OF REDUCING FOOD LOSS & WASTE**

The climate impact of food loss and waste (FLW) comes from:

GHG embedded in **producing the product discarded**

(e.g., growing, storage, processing, transportation etc.)

GHG produced from **food managed in different FLW destinations**

(e.g., animal feed, compost, landfill, etc.)

Greenhouse Gas Emissions (GHG) emissions from producing food typically are larger than those from end-of-life management. This means that the greatest opportunity to reduce GHG emissions often arises by preventing food from leaving the human food supply chain in the first place.

Source: WRI. 2021. Connecting Food Loss and Waste to Greenhouse Gas Emissions: Guidance for Companies

To calculate the associated GHG emissions, multiply the weight of FLW by the relevant emission factor.

A company's GHG inventory includes FLW-related emissions in categories like purchased goods and services, production, and waste.

Steps to Calculate the GHG Emissions
Associated with FLW

1

Gather data on the amount of FLW and important characteristics
- the type of food, in which stage the FLW has been generated (manufacturing, retail etc.), geographic region where the agricultural raw materials were produced (if known).

2

Select the relevant GHG emission factors
- see below a sampling of public and commercial data sets with emission factors for food production and FLW destinations.

3 **Formula**

GHG emissions associated with FLW* =
Food supply chain GHG
+ GHG emissions from FLW destination(s)

**Other climate impacts, which fall outside the GHG inventory scopes 1 – 3, should ideally also be calculated. For details refer to Connecting Food Loss and Waste to Greenhouse Gas Emissions: Guidance for Companies.*

Tips

Keep in mind that the GHG factor used should include all the stages of the value chain from the farm up until the stage at which the waste was generated.

Proxy emission factors may be sufficient for general communication but for a more specific claim, more accurate data specific to the food referenced should be used.

For Steps 2-3, a company may use a third-party calculation tool and/ or their own proprietary tool(s).

Example

2 kg of chicken	×	**2.4 kg CO2e / kg** of chicken production	**4.8 kg CO2e**
			+
2 kg of chicken	×	**0.6 kg CO2e / kg** of chicken sent to landfill	**1.2 kg CO2e**
2 kg of chicken sent by a producer to landfill			= **6.0 kg CO2e**

For products with multiple ingredients, apply the formula for each ingredient based on the proportion that each ingredient represents of the total unit, and then sum up the totals.

Data for this example comes from the Cool Food Calculator (Waite et al., 2019) for chicken production, and from the EPA GHG Emission Factors Hub for landfill.

What is a GHG Emission Factor?

Emission factors are expressed as the **weight** of **carbon dioxide equivalents (CO2e)*** **divided by a reference unit** over an annual basis.
E.g., kg CO2e / kg of production.

Primary data about emissions that is specific to an actual product is more accurate than using a **proxy** emission factor.

**CO2e is a standardised metric used to express emissions from different greenhouse gases based on their global warming potential (GWP). For example methane (generated when food decomposes) will trap over 20 years ~80 times as much heat as carbon dioxide.*

Where can I find data on food-specific emission factors?

Granular data may be gathered directly or sourced from commercial databases, e.g., **Ecoinvent, GaBi, Food Carbon Scope Data, World Food LCA Database (Quantis),** and **Agri-Footprint (Blonk Contsultants).**

Individual product life cycle assessment studies can complement data from other data sets and calculation tools.

Some LCAs are published online.

Online tools to estimate the GHG emissions associated with agricultural interventions include **Environmental Externalities Accounting Tool (EX-ACT).**

A review of other publicly available tools is in **Connecting Food Loss and Waste to Greenhouse Gas Emissions Guidance for Companies**.

Where can I find data on destination-specific emission factors?

Several countries have data on the emissions associated with different FLW management pathways, for example the US Environmental Protection Agency's (EPA) **Center for Corporate Climate Leadership GHG Emission Factors Hub.**

These factors do not include avoided emissions from energy recovery (for landfill) or carbon storage (for composting or landfill).

Relative Global Warming Potential
for some of U.S. EPA's Wasted Food Pathways

Median Impact/ metric ton FLW	Source Reduction	Donation	Upcycling	Animal Feed	AD	Compost	Controlled Combustion/ Incineration	Landfill
kg CO_2eq	-3,300	-570	-450	-210	-110	53	14	510

Colour scale based on trend not statistical differences and follow the diagram below:
Green = lower impact | Yellow to orange = moderate impact | Red = higher impact

Source:
From Field to Bin: The Environmental Impacts of U.S. Food Waste Management Pathways, Part 2 (Table 3.6).