MANUFACTURE 2030

How to: Calculate product carbon footprints

The overarching steps of PCF calculation are:

1. **Identify the system boundary**. The system boundary defines what emission sources get included in a PCF. Typically for an intermediate product, where the final use of the product is unknown, PCFs will be 'cradle-to-gate' and include all emission sources from raw material extraction to end of the manufacturing process. For finished products, the PCF will typically be 'cradle-to-grave' and account for all emissions across the product life cycle, including its use and end-of-life disposal. Listing the sources that you want to collect data for and drawing a diagram showing what is included and excluded from the scope of your PCF can be helpful in communicating the system boundary to others.

2. **Collecting the data.** Data collection is the exercise in building a repository of measured or approximated data points for each emission source within your system boundary. Activity data refers to the data about the individual processes, which may be the amount of fuel used or amount of material purchased. It could also include information on location of each source and any other important technological or operational information.

3. **Select appropriate emission factors.** Emission factor data or emissions data is information that represents the emissions per unit of activity data for each emission source. These can be sourced from life cycle databases, other emission factor databases, or through primary data collection from suppliers who have existing PCFs themselves.

4. **Calculate the emissions.** The general approach is identical to the approaches in other forms of carbon accounting where the emissions are calculated by multiplying activity data by emission factors for a given source. By adding up the emissions contributions per reference unit for each emission source, a total PCF can be estimated. PCF results are usually expressed in terms of kg CO2e / reference unit, where the reference unit can be anything that makes sense in terms of the product. Examples can include kg, kWh, litres, m3, tonne-km, sold unit.

5. **Interpret the results and plan decarbonization.** Analysis of the PCF results, split by emission source, can be insightful and help understand emission hotspots, decarbonization opportunities and risks, and develop credible and achievable targets.

MANUFACTURE 2030

How to: Calculate product carbon footprints

What methodology standard, guideline, or framework should I follow?
The exact methodologies to be used can differ. Whilst the calculation concepts remain the same between different sets of standard, guidances, and frameworks, there can be differences that affect what activity data gets collected and which emission factors to apply.

Picking the most appropriate methodology for your product is essential for building a PCF that can be compared against other products to understand how your product performs. Sector-specific methodologies should be used where available, including the use of Product Category Rules (PCRs) or Product Environmental Footprint Category Rules (PEFCRs). Other sector-specific rules include Catena-X, Together for Sustainability, and CEPI Ten Toes.

By default, the M2030 Dynamic PCF solution will calculate emissions to align with the WBCSD PACT Pathfinder Framework which is designed for manufacturers across all sectors. It provides a generic ruleset that is based on the GHG Protocol Product Standard for calculating PCFs on a cradle-to-gate basis.

What is allocation?
Allocation refers to the process of assigning environmental impacts of a system to its co-products. For example, if multiple products are produced on a single production line and it is not possible to separate the amount of energy consumed on this production line to each individual product, then allocation methods allow for the assigning of the energy consumed to individual products. Methods include:

- Mass allocation – allocation of emissions based on the mass of each co-product
- Economic allocation – allocation of emissions based on the economic value of co-products

Different standards often have different rules for what allocation methods are allowable and should be reviewed whilst calculating a PCF

What are exempted emissions?
In PCFs, minor emissions that contribute insignificantly to the overall PCF value (as quantified by a screening assessment) can be excluded from the final analysis to focus on the most significant emission sources. This is done to simplify the assessment and focus on the most significant contributors. Different standards have different rules on the amount of emissions that can be excluded.