Life Cycle Assessment

Precision 5690

Report date: 2024 February

At Dell Technologies, we're working to reduce the impact of our business and products on the environment. Reducing the carbon footprint of our products is a critical consideration in our product designs and it also enables our customers to achieve their own sustainability goals.

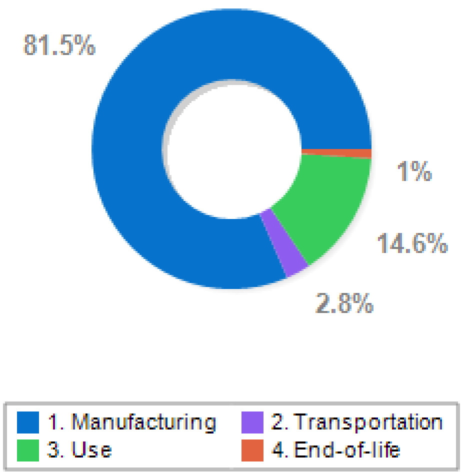
This document summarizes the Life Cycle Assessment (LCA) study of a Precision 5690. It was created using DELL's Product Carbon Footprint Calculator Version 1, an ISO14040 certified parametric LCA modeling tool powered by Sphera's LCA Calculator. The goal of this LCA is to quantify the product carbon footprint (aka global warming potential) of a single product system. Learn more about the calculation methodology please reference the report on our website.

The system's impacts were calculated across the products full life cycle (cradle-to-grave), including the extraction of raw materials, production of components, transportation, use of the product, and "end-of-life". Further assumptions and limitations to this approach are addressed in the greater methodology referenced above. The following assumptions were used to estimate the product impacts:

Assumptions for calculating PCF:

Product Weight	3.72 kg	Product Lifetime	4 yrs
Processor	INTEL ULTRA 9 185H	Energy Demand (Yearly TEC)	27.2 kWh/a
Memory	64 GB	Manufacturing Location	China
SSD	4096 GB	Assembly Location	China
Display	16 inch	Use Location	Europe

Total Carbon Footprint (EU Baseline): **246 kg CO_2-eq.** (excl. end of life credits)



Manufacturing breakdown

Manufacturing Total	100%
Mainboard	12%
SSD	42%
RAM	19%
Display (incl. camera)	9%
Battery	3%
Mechanicals (incl. enclosure and keyboard)	7%
Thermal solution	2%
Power Supply Unit	5%
Other (Speaker, LEDs, Logo)	-1%
Packaging	0%

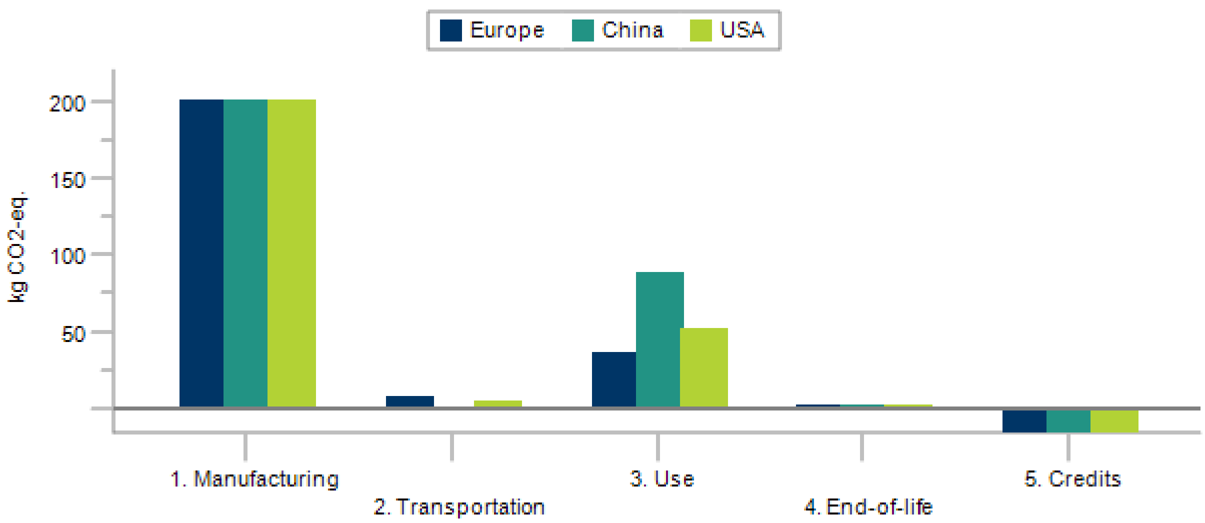
*Rounding can lead to deviations

The selected impact assessment methodology for the life cycle impact assessment (LCIA) is "EF 3.0 Climate Change - total" using the indicator global warming potential 100 (GWP100) measured in CO2-equivalents. Use stage conditions were calculated using Energy Star data. More information about the Energy Star can be found on the Energy Star website.

Depending on the end of life allocation approach used in a life cycle assessment, credits can be given to a product in its end-of-life stage if the environmental benefits from recycling the material are higher than the burdens of the recovery of the material. The Total Carbon Footprint above excludes end-of-life credits. Therefore, the end-of-life impacts only represent the transportation and disposal of the materials at the end of the product's useful life. An alternative end of life scenario which includes credits is presented below in addition to the assumptions made around material recovery.

Within the ICT industry, product carbon emissions are generally driven by the manufacturing and use lifecycle stages. Total product emissions will vary depending on the country/region of use due to the grid mix used (coal-based, nuclear-based, renewable-based, etc.) to produce the energy needed to operate the system over its lifetime. These location-based grid mixes will yield a different emission factor per kWh of consumption. To demonstrate this sensitivity, the following diagram and table shows different use location scenarios and how they would influence the total product carbon footprint.

Sensitivity Analysis on Use Location of Product (incl. end of life credits)



Note: 5. is negative based on the avoided environmental burdens due to the material recovery in the End-of-life scenario (see further information below).

All values are to be understood as kg CO_2-eq.

	1. Manufacturing	2. Transportation	3. Use	4. End-of-life	5. Credits
Europe	200	7	36	3	-14
China	200	1	89	3	-14
USA	200	5	52	3	-14

For the alternative end-of-life scenario resulting in credits, it is assumed that all components made of steel, aluminum, or ABS are sent for material recycling. This, combined with the collection rate and material composition, results in a 40.6% share of the total weight entering recycling processes. The remaining portion is incinerated to recover released energy.

For material recycling, the LCA model employs a substitution approach. Open scrap inputs from production are subtracted from end-of-life scrap, yielding the net scrap output. This net scrap undergoes material recycling. The burden of the primary material input is allocated between current and subsequent life cycles, using the mass of recovered secondary material to scale the substituted primary material. This credits the substitution, distributing burdens appropriately across different life cycles. This alternative approach was presented to demonstrate how different assumptions can influence the results of the analysis.

These steps, based on industry average inventories, are modeled using a parametric LCA calculator tool that references a range of products representing the majority of manufactured notebooks. The tool combines and modifies individual modules of these products. The analysis acknowledges uncertainties in manufacturing impacts due to technical deviations, such as variations in passive components on various PWBs. The LCA study focuses exclusively on the GWP of the products, noting that a more comprehensive environmental profile analysis requires considering additional impact categories. The LCA models were created using LCA for Experts (LCA FE) 10 software system for life cycle engineering, developed by Sphera®. The Sphera Managed LCA Content (MLC - formerly GaBi) database provides the life cycle inventory data for several of the raw and process materials obtained from the background system. Results shown here are subject to change as the model is updated.