

IBM FlashSystem 9500



Product carbon footprint



IBM is committed to environmental leadership in all its business activities, from operations to product design and the use of its technology. As an expression of that commitment, we provide a product's carbon footprint (PCF) for representative products. A product carbon footprint can be used to estimate the complete life cycle emissions of a product and identify areas for the greatest greenhouse gas reduction opportunity.¹

IBM FlashSystem 9500 Configuration	
Model	4666-AH8
System Memory	2048 GiB
I/O Adapter Cards	4x Quad 32Gb Fibre Channel HBA pair
Flash Drives	36x 19.2TB FCM3

Table 1: Typical product configuration

1. Greenhouse Gas Protocol. Product Life Cycle Accounting and Reporting Standard.
https://ghgprotocol.org/sites/default/files/standards/Product-Life-Cycle-Accounting-Reporting-Standard_041613.pdf

The estimate

274,000 kg CO₂ eq

Will be used over the course of the IBM FlashSystem 9500 lifecycle when used in the EU for 4 years.

This PCF estimate was produced using the Product Attributes to Impact Algorithm (PAIA) model (Storage Tool), developed by the Massachusetts Institute of Technology's Materials Systems Laboratory and partners, Version 1.3.1, March 30, 2022, and copyrighted by the ICT Benchmarking collaboration including the Massachusetts Institute of Technology's Materials Systems Laboratory and partners.

All estimates of carbon footprints are uncertain. IBM reports the 95th percentile of the carbon footprint estimate to reflect that uncertainty. For this product, that estimate has a mean of 40,100 ± 44,500 kg CO₂ eq over a use period of 4 years.



Impact by phases of the product's lifecycle

The PCF for storage equipment is driven almost entirely by the use phase, which is highly variable based on the electricity generation source used to power the product, the product's expected use life, and the power profile. The analysis for this product shows that **93.4%** of its carbon footprint occurs in the use phase. IBM focuses on improving our product energy efficiency and on providing mechanisms for our clients to measure, in real-time, the actual energy consumption of the product.

Figure 1 shows the estimated contribution for the individual phases of the product's lifecycle over a use period of 4 years, reported as the 95th percentile for each phase.

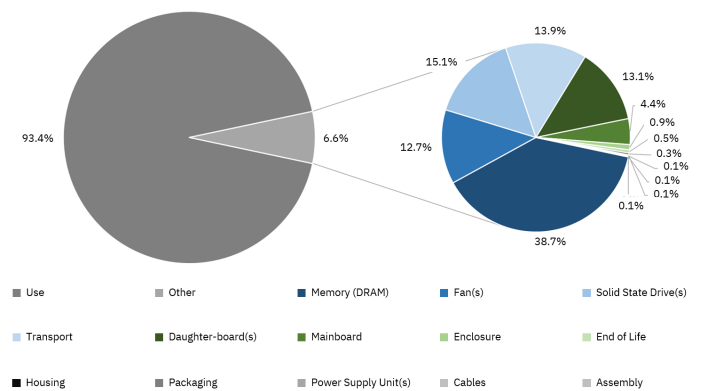


Figure 1: Carbon footprint impact by phases of the lifecycle for IBM FlashSystem 9500 typical product configuration using the PAIA model; 93.4% occurs in the use phase and the remaining 6.6% is broken out by component contribution.

Figure 2 shows the uncertainty in the most significant aspects of the product's carbon footprint. Only calculated categories that contribute more than 2% to the total product carbon footprint are shown for clarity.

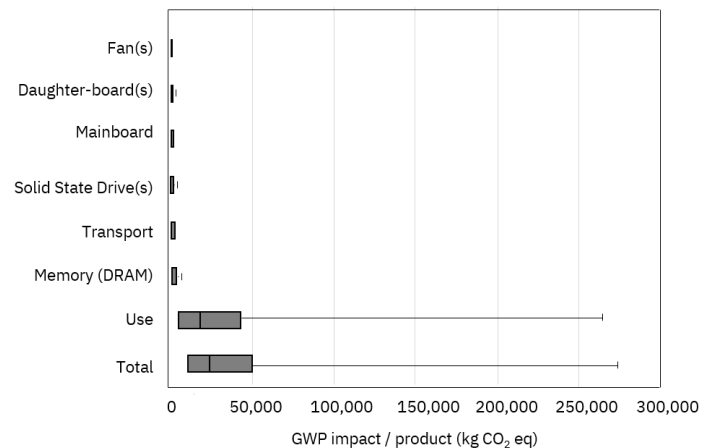


Figure 2: Uncertainty in the PCF estimate for IBM FlashSystem 9500 typical product configuration; that estimate has a mean of 40,100 ± 44,500 kg CO₂ eq over a use period of 4 years.

PAIA input assumptions

The PCF assumes a typical configuration of the IBM FlashSystem 9500 as described in Table 1. The numbers for your specific configuration might be different. The data used in the PAIA server tool is provided in Table 2.

Limitations of PAIA

PAIA results represent a streamlined Life Cycle Assessment (LCA). While the product carbon footprint provides a high-level estimate of the emissions associated with the product, it should not be used for emissions inventory, formal carbon footprinting exercises, or comparing products. The assumptions made by the analyst strongly influence LCA results; if those assumptions are inconsistent, comparisons are not likely meaningful. Furthermore, PAIA may not be compliant with the primary data requirements of some LCA standards. The results from the PAIA tools are liable to change over time as the methodology is improved and the data is updated. More information on these limitations and general guidance for interpreting this report, is available in the publication "[Assessment of lifecycle carbon footprints of products](#)".

IBM FlashSystem: sustainable storage

13% ↑

Higher IOPS/Watt performance compared to FlashSystem 9200.²

30% ↑

More effective storage capacity per U with Flashcore Module generation 3.³

99% ↑

Of paper and wood-based packaging used are from sustainably-managed forests.⁴

2. IBM development performance measurements, 70/30 Read/Write, 50% cache hit, 16k blocksize: FS9500 with 8.5.0 code measured at 1,604KIOPS@2487W; FS9200 with 8.3.1 code measured at 641KIOPS@1119W.

3. Enhanced Effective Capacity of FlashCore Module generation3 48.4TB drive, compared to earlier FlashCore technology.

4. https://www.ibm.com/ibm/environment/annual/IBMEnvReport_2020.pdf

Product configuration and PAIA input information	
Storage enclosure/chassis type	Rack
Storage array weight	44.312 kg (excl. PSUs & chassis)
Number of storage arrays	1
Packaging cardboard mass	4.53 kg
Packaging plastic foam mass	1.47 kg
Chassis/Enclosure	
Chassis Weight	18.6 kg
Chassis IC package area	11.06 cm ²
Chassis PWB area	0.086 m ²
Power Supply Unit & Fans	
Number of PSUs in the system	4
PSU length, width	32.15 cm, 5.45 cm
PSU mass	1.25 kg
Number of Fans per storage array	20
HDD and SSD	
Number of HDDs per storage array	0
Number of SSDs per storage array	36
Mass of each SSD	0.176 kg
SSD IC packaging area	125.8 cm ²
SSD non-ferrous metal mass	0.074 kg
SSD PWB area	239 cm ²
SSD PWB substrate # of layers	15 (PAIA model accepts max 12)
Mainboard, DIMM/memory and sub-boards	
Number of mainboards	2
Area of PWB used for mainboard	2,501.5 cm ²
Mainboard PWB substrate layer#	18 (PAIA model accepts max 12)
Mainboard IC count	256
Mainboard total IC package area	307.49 cm ²
Mainboard IC fabrication location	Asia
DRAM IC count	1152
DRAM IC package area	1,258.56 cm ²
Number of sub-boards	20
Location	
Assembly Location	Mexico
Use Location	EU

Table 2: Product configuration and PAIA input information

Table 2 Continued: Product configuration and PAIA input information



Transportation	
To country of use: by air	9700 km
Within country of use: by truck	150 km
Use	
Product lifetime	4 years
Annual energy consumption	16662 kWh
End of life	
Fraction recycled	0.97
Fraction shredded recycling	0.00

Note: Power consumption data is obtained using the IBM Storage Modeller, a web-based tool for estimating performance for IBM storage systems. This tool estimates typical power requirements for a specific system configuration under normal operating conditions. The power consumption assumes that the product operates at maximum throughput across a range of I/O workloads, 24 hours a day, 365 days a year, for its product lifetime.

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