

IBM Power® S1012

Product Carbon Footprint

IBM is committed to environmental leadership in all its business activities, from operations to the design of its products and use of its technology. To help our clients better understand the environmental impacts associated with IBM products, we report the product carbon footprint for representative products using the Product Attributes to Impact Algorithm (PAIA) model.



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. LCA results are strongly influenced by the assumptions made by the analyst.

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 data is updated. More information on these limitations, as well as general guidance for interpreting this report, is available in the publication [“Assessment of lifecycle carbon footprints of products.”](#)

	Small	Medium	Large
Active cores	1	4	8
Processor type	Power10 eSCM	Power10 eSCM	Power10 eSCM
Clock speed	3.0 – 3.9 GHz	3.0 – 3.9 GHz	3.0 – 3.9 GHz
Configured memory	64 GB	128 GB	256 GB
Storage	2x 800 GB NVMe	4x 800 GB NVMe	4x 1.6 TB NVMe
4-port 1 GB Ethernet adapter	1	1	2
2-port PCIe Gen3 x8 Fibre Channel	1	1	2

Table 1: Typical product configurations of the IBM Power® S1012

This PCF estimate was produced using the Product Attributes to Impact Algorithm (PAIA) model, developed by the Massachusetts Institute of Technology's Materials Systems Laboratory and partners, Version 1.4.0, May 8, 2024, copyright by the ICT Benchmarking collaboration including the Massachusetts Institute of Technology's Materials Systems Laboratory and partners.

Table 2 provides the total estimated mean GHG emissions in carbon dioxide equivalent (kg CO₂e¹) associated with the manufacturing, assembly, electricity consumption², transportation and end-of-life handling of the IBM Power® S1012 configurations given in Table 1, over 5 years using hypothetical average GHG emissions factors. Figure 1 shows the estimated contribution of each lifecycle phase to the total estimated mean GHG emissions.

The data used in the PAIA server tool for each representative configuration is provided in Table 3. This PCF was generated using a distribution of emissions factors across the location, based on International Energy Agency (IEA) emissions factors³.

Impact by phases of the product's lifecycle

The PCF for server equipment is largely driven by the use phase which is highly variable based on the electricity generation source used to power the product, the expected use life of the product, and the power profile. This PCF was generated using a distribution of emissions factors across the respective location. Table 2 shows that 70% - 85% of the carbon footprint occurs in the Use phase. IBM recommends that you customize the Use Phase GHG emissions based on your specific data center conditions. IBM focuses on improving our product energy efficiency and on providing tools for our clients to estimate and measure the energy consumption of their product. The [IBM Systems Energy Estimator](#) can be used to estimate the power consumption of your specific product configuration.

Uncertainty in the product carbon footprint

All estimates of carbon footprint are uncertain. To provide transparency around this uncertainty, Table 2 also reports the Standard Deviation and the 95th percentile of the carbon footprint estimate. The 95th percentile means that 5% of the time the carbon footprint will exceed the value provided.

		Total Estimated Mean GHG Emissions in kg CO ₂ e ¹	% of Estimated Mean GHG Emissions in the Use Phase	Standard Deviation of the Estimated GHG Emissions in kg CO ₂ e ¹	95 th Percentile of the Estimated GHG Emissions in kg CO ₂ e ¹
Small	Europe	5,930	73%	3,100	14,000
	United States	3,930	81%	1,000	6,700
	Japan	5,830	70%	1,300	9,500
Medium	Europe	7,430	77%	4,100	17,800
	United States	5,130	84%	1,300	8,700
	Japan	7,130	74%	1,600	11,700
Large	Europe	9,030	80%	5,100	21,700
	United States	6,330	85%	1,600	10,800
	Japan	8,630	78%	2,100	14,200

Table 2: Summary of the estimated GHG emissions for the typical product configurations listed in Table 1 for the IBM Power® S1012.

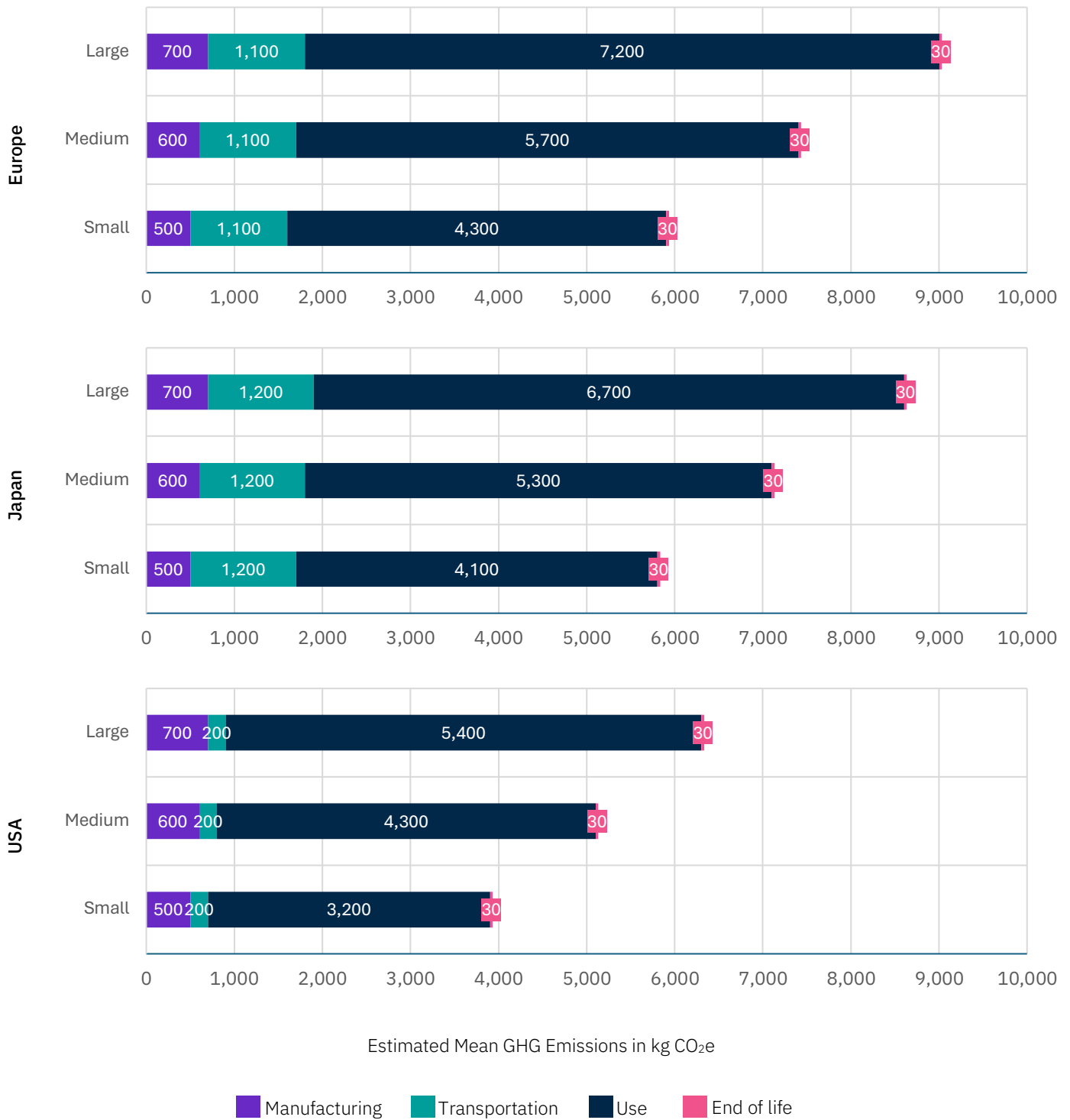


Figure 1: Carbon footprint impact by phase for the IBM® Power® S1012 product configurations listed in Table 1 using the PAIA model assuming a 5 year product lifetime.

PAIA input data	Small	Medium	Large
Server type	Rack	Rack	Rack
Server quantity	1	1	1
Number of PSU	2	2	2
Number of fans	2	2	2
Server weight	11.4 kg	11.4 kg	11.4 kg
Rack mount weight ⁴	7.0 kg	7.0 kg	7.0 kg
Packaging weight ⁴	16.6 kg	16.6 kg	16.6 kg
PWB area	1067.0 cm ²	1067.0 cm ²	1067.0 cm ²
CPU quantity	1	1	1
CPU package area	65.3 cm ²	65.3 cm ²	65.3 cm ²
DRAM total capacity	64 GB	128 GB	256 GB
Chipset & other ICs package area	Default	Default	Default
Chipset & other ICs quantity	Default	Default	Default
SSD quantity	2	4	4
SSD PWB area	Default	Default	Default
SSD IC area total	Default	Default	Default
SSD IC quantity	Default	Default	Default
Sub card total PWB area	184.3 cm ²	184.3 cm ²	262.8 cm ²
Sub card main chip package area	15.4 cm ²	15.4 cm ²	29.6 cm ²
Sub card chip count	46	46	89
PSU weight	0.91 kg	0.91 kg	0.91 kg
PSU dimensions	22.5 cm x 7.4 cm	22.5 cm x 7.4 cm	22.5 cm x 7.4 cm
Product lifetime	5 years	5 years	5 years
Yearly energy consumption ⁵	1,746 kWh	2,324 kWh	2,912 kWh
Assembly location	Mexico	Mexico	Mexico
Transportation		Mode: Air	Mode: Truck
	Europe	9,700 km	150 km
	Japan	10,900 km	150 km
	United States	0 km	3,200 km
Fraction recycled	0.97	0.97	0.97

Table 3: Data used in the PAIA server model for the IBM Power® S1012

Disclaimers

1. The results are reported using the units of kilograms of carbon dioxide equivalent (kg CO₂e). This represents the amount of global warming caused by a quantity of GHGs (CO₂, CH₄, N₂O, HFCs, PFCs and SF₆) at a specific point in time, expressed in terms of the amount of CO₂ which would have the same instantaneous warming effect. Recognizing the uncertainty in carbon footprint estimates, the results have been rounded.
2. The electricity consumption is incurred by clients using an IBM product. The estimate used is not specific to any client deployment of the IBM product or client workload.
3. The mean electricity emissions factor used in the PAIA analysis for each location is calculated based on the energy consumption and Use phase emissions. These values are 0.49 kg CO₂e/kWh for Europe, 0.46 kg CO₂e/kWh for Japan, and 0.37 kg CO₂e/kWh for the United States. The region definition for Europe follows the World Bank definition.
4. The estimated carbon footprint was computed including the rack mount enclosure and mounting hardware. The system rack is not included. The packaging weight includes the product packaging and shipping pallet.
5. Power consumption data is obtained using the [IBM Systems Energy Estimator](#), a web-based tool for estimating power requirements for IBM systems. This tool estimates the typical power requirements (watts) for the specific configuration under Normal operating conditions. The energy consumption used in these calculations assumes that the product operates at 30% utilization for 24 hours a day, 365 days a year for its product lifetime.

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