STUDY / Executive summary

Environmental and health impacts of AI worldwide

October 2025

ASSOCIATION green it

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Study: Environmental and health impacts of AI worldwide

Version: 1.0
Publication date: 21 october 2025

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Summary

Introduction

Artificial Intelligence (AI) has entered our personal and professional lives at breakneck speed. Until now, we lacked the data to assess its positive and negative impacts on the environment, the economy and public health.

That is why we are publishing today the results of the first multi-criteria Life Cycle Assessment (LCA) evaluating all the environmental and health impacts of artificial intelligence (AI) worldwide. It is based on NVIDIA H100 units, the most commonly-used GPUs in AI workloads today.

Scope of the study and methodology

In this study, we assessed **three functional units**:

1. Manufacturing an AI server
2. Using this server for one year
3. Using n servers for one year.

For each of these functional units, we quantified **16 environmental and health impacts** at each of the four stages of the life cycle: manufacturing, distribution, use and end of life.

In this article, we summarise the results of the assessment of the environmental and health impacts of artificial intelligence **on a global scale in 2025 and 2030**.

We considered n AI servers used at 67% of their maximum capacity for 365 days, with:

- *n2025* = 1,133,500 servers comprising 9,068,000 GPU equivalents
- *n2030* = 7,625,000 servers comprising 61,000,000 GPU equivalents

Finally, we estimate the impacts of the 'back office' aspect only, i.e. servers and other IT equipment housed in data centres.

These impacts are therefore partial, as they do not include those associated with networks and user terminals. These two other parts will be included in the updated study as soon as possible.

Results

Short lifespan and high power consumption

Regarding the specific characteristics of AI equipment and infrastructure that have an impact on the environment and health, we noted three key points:

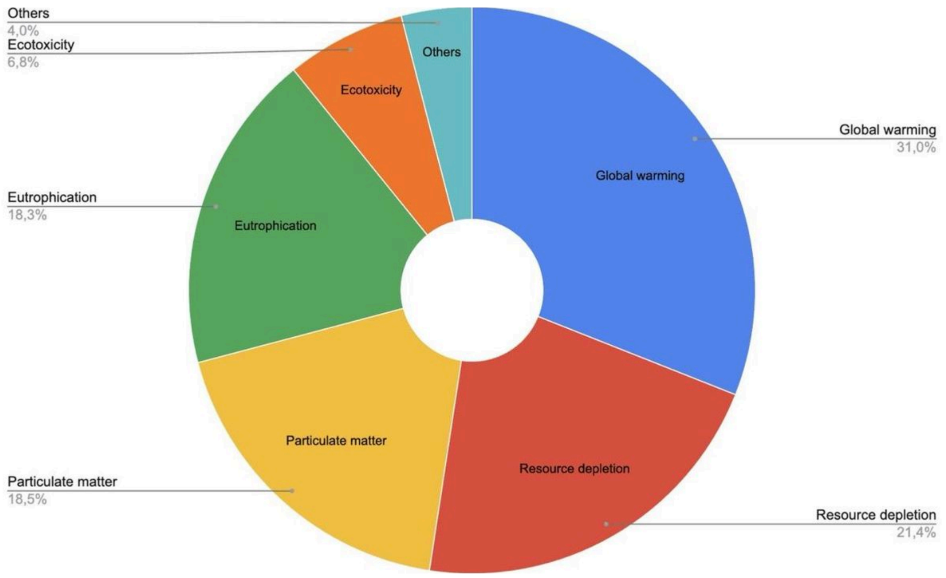
- The lifespan of AI servers is 3 to 5 times shorter than that of traditional servers.
- Their power consumption is 4 times higher (for equivalent server size).
- 80% of existing data centres are not capable of hosting AI servers. A large number of new data centres will therefore need to be built.

Impacts: 69% of impacts are not climate-related

Four environmental and health impacts account for more than 80% of AI's footprint:

- Global warming potential: 31%
- Mineral resource depletion (fossils, metals, minerals): 21.4%
- Particulate matter (air pollution): 18.5%
- Eutrophication: 18.3%

Figure 1 : Share of environmental impacts of AI (world, 2025)

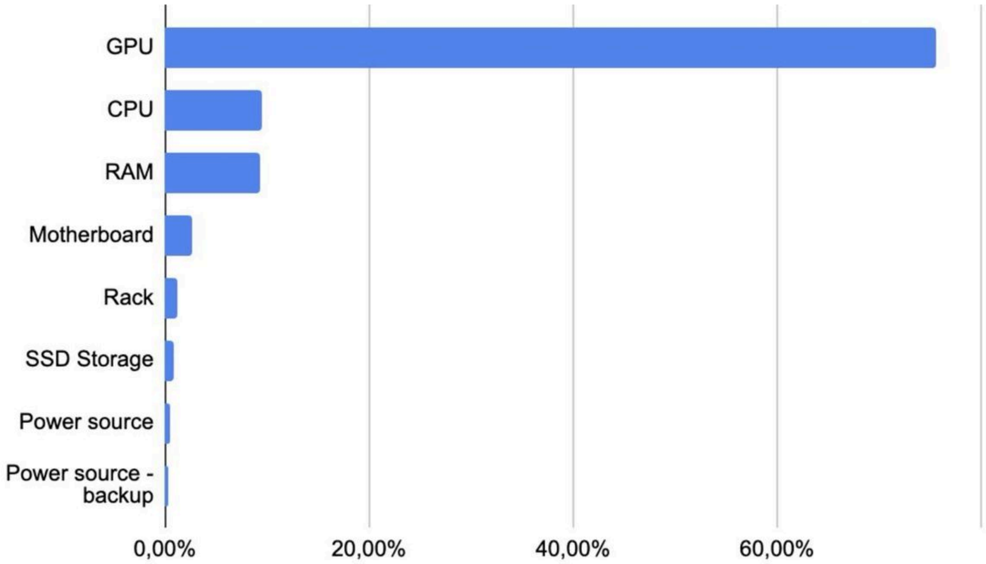


In other words, 69% of the environmental and health impacts of AI are not climate-related. To reduce the footprint of AI, it is therefore crucial to assess all impacts, not just greenhouse gas (GHG) emissions.

GPU power consumption, the main source of impacts

When calculating the unique environmental score of each component that makes up an AI server and the infrastructure that hosts it, microprocessors dedicated to AI – notably Graphical Processing Units (GPUs) – account for nearly 80% of the impact, followed far behind by other components such as CPUs, random access memory (RAM), etc.

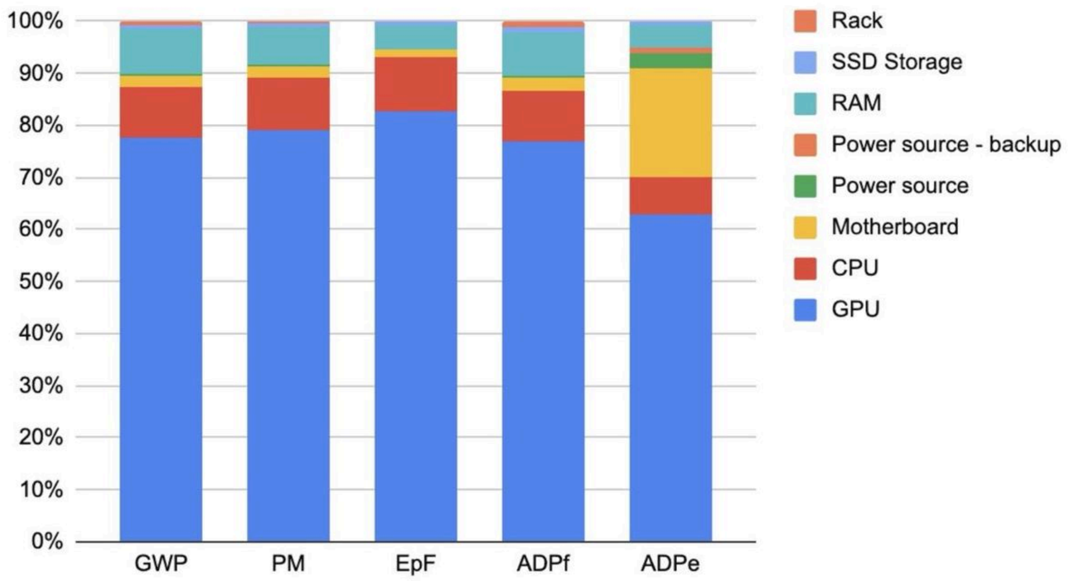
Figure 2 : Share of environmental impacts by component



The manufacture of random access memory (RAM) accounts for most of the impacts at this stage of the life cycle.

However, during use, it is the power consumption of GPUs that generates the bulk of the impact. This power consumption is such that the impact associated with electricity production dwarfs that of all other components and all other stages of the life cycle.

Figure 3: Share of environmental impacts by component



62% of the sustainable annual budget of a European citizen in 2030

In 2025, the environmental impacts of AI are as follows:

- Global warming: 41 million tonnes of CO2 equivalent;
- Resource depletion: 376 tonnes of antimony equivalent (SB);
- Particulate matter (air pollution): 5 deaths per day;
- Eutrophication: 19,123 tonnes of phosphorus equivalent (P)

Indicator	Description	Weighting	2025	2030	Unit
ADPe	Depletion of abiotic resources (metals and minerals)	**9%**	376	2 528	tonnes of antimony equivalent (SB)
ADPf	Depletion of abiotic resources (fossil)	**13%**	555	3 735	million GJ EP
EpF	Freshwater eutrophication	**17%**	19 123	128 637	tonnes phosphorus eq. (P)
GWP	Global warming potential	**31%**	41	277	million tonnes CO2 eq.
PM	Particulate matter (air pollution)	**18%**	1 870	12 579	deaths

IA represents up to 2% of digital impacts, and 10% of the European Union's annual sustainable budget.

By 2030, these impacts will have increased sevenfold, to reach up to 21% of the impacts of digital technology and 62% of the European Union's sustainable annual budget. This is, by definition, unsustainable.

Table 2: Environmental impacts of AI in terms of individual annual sustainable budgets

Indicator	Description	2025	2030
ADPe	Depletion of abiotic resources (metals and minerals)	11 742 802	78 993 261
ADPf	Depletion of abiotic resources (fossil)	17 136 573	115 276 904
CTUe	Toxicity to biodiversity (ecotoxicity)	9 190 614	61 824 821
EpF	Freshwater eutrophication	22 765 031	153 139 271
GWP	Global warming potential	41 824 781	281 353 292
PM	Particulate matter	24 933 084	167 723 660
WU	Freshwater use – water cycle	1 016 510	6 838 012
Population of the European Union		449 000 000	449 000 000

Conclusion

Major tensions on the horizon

Over the next five years, rampant growth in the use of AI will result in two major tensions:

1. Exacerbated tensions over access to resources (metals and minerals) and electricity (with AI competing with heavy industry for access to electricity).
2. The impossibility for developed countries to meet their environmental commitments. They will have to choose between the climate and AI.

Three recommendations

In an attempt to reconcile AI and the environment, we recommend three key actions:

1. **Create an 'AI sobriety' plan, to contain supply and control demand.**
   As it is currently supply that is creating the impacts, there is an urgent need to regulate AI players and raise awareness among users. This involves identifying 'useful' AI systems with proven positive net impact. This step would enable the implementation of incentive and dissuasive mechanisms, such as a bonus-malus system. Technically, everything is ready. Eco-design could also be made mandatory for AI systems hosted in France. All that is lacking is the political will.
2. **Create a centre of excellence for frugal AI.**
   Improving the environmental performance of 'useful' AI can only become widespread with the widespread adoption of eco-design practices. We therefore believe it is urgent to make training in AI eco-design compulsory in initial training (engineering schools, etc.), for example by extending the scope of Article 3 of France's REEN law (for digital sobriety) to artificial intelligence.
3. **Host AI in countries where electricity has the least impacts.**
   In the short to medium term, this is an effective solution for reducing impacts. However, it is only a quick win that does not solve the underlying problem.