**COMMITTEE :** Environment and Digital Technologies
**ISSUE :** How can the environmental impact of digital technologies, particularly artificial intelligence and data centres, be reduced while ensuring sustainable technological development?
**CHAIRS :** Valentin IFTENIE, Jade FONTAINE MORCELA and Jawad ABOU-CHEDID

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## CHAIR'S INTRODUCTION



My name is Valentin Iftenie, I am 15 years old, and I study at the Lycée International de Ferney-Voltaire in France, in the European English section.

A year ago, I was sitting at the back of the Artificial Intelligence committee as a Resolution Admin, watching delegates my age debate the future of technology as if the world were truly listening. Somewhere between the amendments and the applause, I made myself a quiet promise: one day, I would be the one opening the session. FerMUN 2027 is that day, and it is a real honour to serve as one of the Chairs of the Environment Committee.

I owe my first steps in MUN to my older sister, who came home from her conferences with stories that sounded bigger than school. She was right. MUN is much more than debating: it is meeting people from completely different backgrounds, defending ideas that are not your own, and discovering a voice you did not know you had.

Outside of MUN, I stay active through sports, I cook, and I love mathematics, though history is the subject that truly fascinates me.

This year, our committee tackles two environmental challenges born from our digital age: the carbon footprint of artificial intelligence and data centres, and the pollution caused by satellite constellations. This report focuses on the first. Here is what struck me while researching it: every message we send to an AI has a physical cost, somewhere, for someone. Behind every "intelligent" answer, there is electricity drawn from a grid, water pulled from a river to cool a machine, metal mined from the ground to build a chip and a planet quietly keeping the bill. This is not a distant, futuristic issue: it is happening right now, in data centres being built this year, in countries already fighting over the water they need. Understanding it is the first step toward debating it seriously.

This is the only research report I will ever write, and long after January it will remain on the FerMUN website, so I wrote it the way I hope you will debate: with honesty and ambition. Whether this is your first conference or your tenth, defend your country's position with confidence, listen harder than you speak, and enjoy every moment. I cannot wait to see the solutions you will bring. Make them worth remembering.

And never forget: the machines we build will never care about this planet, but you can. This is exactly why, this January, the intelligence that matters most in the room will not be artificial. It will be yours.

## KEY WORDS

**Artificial Intelligence (AI)**: UNESCO defines artificial intelligence as the capability of a device to perform functions normally associated with human intelligence, such as learning, reasoning, problem-solving and decision-making.

**Data Centre**: According to the UNESCO Thesaurus, a data centre is an organisation that stores, processes and manages digital information through interconnected computer systems and servers, providing the infrastructure required for digital services.

**Carbon Footprint**: The United Nations defines a carbon footprint as the total amount of greenhouse gas emissions generated directly and indirectly by an individual, organisation, product or activity, usually expressed in carbon dioxide equivalent ($CO_2e$).

**Greenhouse Gas (GHG) Emissions**: According to the United Nations Framework Convention on Climate Change (UNFCCC), greenhouse gases are gases in the atmosphere that absorb and re-emit infrared radiation, contributing to the greenhouse effect and climate change.

**Electricity Consumption**: According to the International Energy Agency (IEA), electricity consumption refers to the amount of electrical energy used by end users over a given period of time, usually measured in kilowatt-hours (kWh) or terawatt-hours (TWh). Data centres are among the fastest-growing consumers of electricity worldwide due to the increasing demand for cloud computing and artificial intelligence.

**Energy Efficiency**: The International Energy Agency (IEA) defines energy efficiency as using less energy to perform the same task or produce the same result, thereby reducing energy waste. In data centres, this efficiency is commonly measured using the Power Usage Effectiveness (PUE) indicator, which compares a facility's total energy consumption to the energy actually used by its IT equipment.

**Renewable Energy**: The United Nations describes renewable energy as energy derived from natural sources that are replenished faster than they are consumed, including solar, wind, hydropower, geothermal energy and biomass.

**Sustainable Development**: The United Nations defines sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This definition originates from the Brundtland Report (1987) and forms the basis of the 2030 Agenda for Sustainable Development.

**Water Consumption**: According to UN-Water, water consumption refers to the volume of freshwater that is withdrawn and not returned to its original source because it has been evaporated, incorporated into products, consumed by humans or livestock, or otherwise removed from the immediate water environment. Data centres often consume large amounts of water to cool servers and maintain safe operating temperatures.

**Life Cycle Assessment (LCA)**: According to the United Nations Environment Programme (UNEP), life cycle assessment is a method for evaluating the environmental impacts associated with all stages of a product's life cycle, from raw material extraction and manufacturing to use, recycling and final disposal.

# OVERVIEW

## Introduction

In the space of a few years, artificial intelligence has moved from research laboratories into the daily lives of billions of people. Every conversation with a chatbot, every AI-generated image and every automated recommendation relies on a vast physical infrastructure that most users never see: data centres filled with thousands of specialised processors, connected by submarine cables and powered around the clock. This infrastructure consumes electricity and water, requires enormous quantities of raw materials, and produces greenhouse gas emissions and electronic waste. The United Nations Environment Programme (UNEP) summarises the problem clearly[1]: data centres that house AI servers produce electronic waste, consume increasingly scarce water, rely on critical minerals that are often mined unsustainably, and use massive amounts of electricity that still largely comes from fossil fuels.

At the same time, artificial intelligence is one of the most promising tools available to fight environmental degradation: it is already used to detect methane leaks from space, forecast extreme weather, and optimise electricity grids. This dual character AI as both a driver of environmental pressure and an instrument of environmental protection is what makes this issue so complex, and so well suited to international negotiation. The question before this committee is therefore not whether artificial intelligence should exist, but under which conditions it can grow without undermining the climate goals and the sustainable development agenda that the international community has set for itself. This overview examines, first, the energy and climate footprint of AI and data centres; second, the material footprint that extends far beyond electricity, from mining to electronic waste, and its unequal geography; and third, the technological and political pathways that are currently emerging to reconcile digital innovation with environmental sustainability.

## I. The energy and climate footprint of artificial intelligence

### *A. A surging demand for electricity*

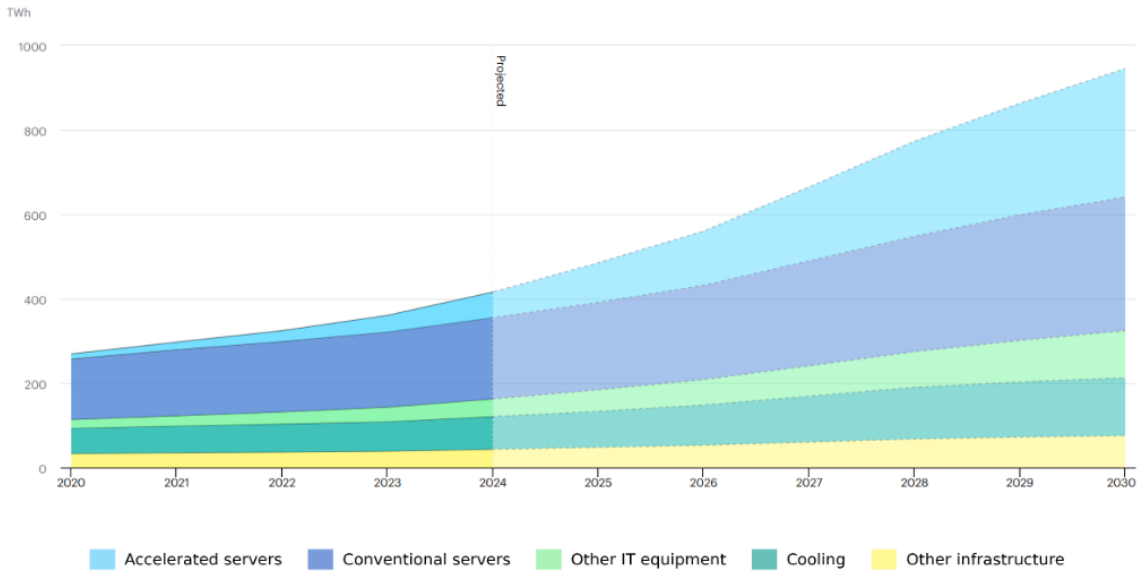
The most visible environmental impact of artificial intelligence is its electricity consumption. According to the International Energy Agency (IEA), whose special report *Energy and AI*[2] (April 2025) is the most comprehensive global analysis of the question to date, data centres consumed around 415 terawatt-hours (TWh) of electricity in 2024, about 1.5% of global electricity consumption. In the IEA's central scenario, this figure more than doubles to around

[1] UNEP, "AI has an environmental problem" (2024)
[2] IEA, Energy and AI – Executive summary (2025)

945 TWh by 2030 slightly more than the entire electricity consumption of Japan today[3] with AI as the single most important driver of this growth. Electricity demand from AI-optimised data centres alone is projected to more than quadruple over the same period.

This growth is highly concentrated geographically. The United States accounts for by far the largest share of the projected increase, followed by China; in the United States, data centres represent nearly half of all electricity demand growth between now and 2030, and by the end of the decade the country is expected to consume more electricity for data centres than for producing aluminium, steel, cement, chemicals and all other energy-intensive goods combined. The trend has since accelerated: in its 2026 update[4], the IEA reports that data centre electricity consumption rose by 17% in 2025 alone far outpacing the 3% growth of overall global electricity demand reaching around 485 TWh, and it now projects roughly 950 TWh by 2030, about 3% of global electricity demand, with consumption from AI-focused data centres tripling over the period. To grasp the scale at the level of an individual user: a single request to ChatGPT consumes about ten times as much electricity as a traditional Google search, according to IEA figures cited by UNEP[5].

**Share of electricity consumption by data centre and equipment type**




***Source: IEA, Energy and AI (2024)***

[3] IEA, "AI is set to drive surging electricity demand" (2025)
[4] IEA, Key Questions on Energy and AI (2026)
[5] UNEP, "AI has an environmental problem" (2024)

### *B. Greenhouse gas emissions and corporate climate commitments*

Because a large share of this electricity is still generated from coal and natural gas, the growth of AI translates directly into greenhouse gas emissions. The IEA estimates that emissions from the electricity used by data centres stand at around 180 million tonnes (Mt) of $CO_2$ today and could rise to 300 Mt by 2035 in its central scenario a small share of global emissions, but one of the fastest-growing. Renewables and natural gas[6] are expected to cover most of the additional demand, yet fossil fuels remain essential to meet the near-term surge up to 2030.

The consequences are already visible in the climate accounting of the world's largest technology companies. In its 2024 environmental report, Google disclosed that its greenhouse gas emissions had risen by 48% since 2019[7], reaching 14.3 million tonnes of $CO_2$ equivalent in 2023, a surge the company attributed to data centre energy consumption and supply-chain emissions linked to AI; Microsoft similarly reported emissions up 29% since 2020, driven by the construction of data centres "designed and optimised to support AI workloads". These figures illustrate a crucial point: a significant part of AI's carbon footprint is embodied carbon[8] emissions generated by manufacturing chips and servers and by constructing facilities which no amount of renewable electricity at the operation stage can eliminate. Most AI companies, moreover, still do not disclose their emissions at all.

### *C. Water consumption and pressure on local resources*

Data centres also consume large volumes of freshwater, mainly to cool servers that would otherwise overheat. According to World Economic Forum figures cited by UNEP[9], a one-megawatt data centre can use up to 25.5 million litres of water per year for cooling alone comparable to the daily water use of about 300,000 people. At the global scale, UNEP warns that AI-related infrastructure may soon consume six times more water than Denmark[10], at a time when a quarter of humanity already lacks access to clean water and sanitation. This creates acute tensions where data centres are built in regions already experiencing water stress[11].

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[6] IEA, Energy and AI – Energy supply for AI

[7] NPR, "Google and Microsoft report growing emissions" (2024)

[8] **Embodied carbon:** the greenhouse gas emissions generated by the manufacturing, transport and construction of equipment and buildings (here: chips, servers and data centre facilities), as opposed to emissions from their use. This life-cycle approach is described by UNEP.

[9] UNEP, Sustainable Procurement Guidelines for Data Centres and Servers (2025)

[10] UNEP, "AI has an environmental problem" (2024)

[11] **Water stress:** a situation in which the demand for water exceeds the available supply, or in which poor quality restricts its use; see the framing used by the United Nations University report on AI's water footprint UN University, Environmental Cost of Artificial Intelligence (2026).

Research published by UNESCO and University College London[12] helps locate where these impacts occur in the AI life cycle: the operation of data centres accounts for 85.5% of AI-related emissions and 91% of its water consumption. The same UNESCO report[13] highlights that the daily use of AI now weighs more than its initial training: generative AI tools receive around one billion prompts per day, each consuming roughly 0.34 watt-hours approximately 310 gigawatt-hours per year, equivalent to the annual electricity consumption of more than three million people in a low-income country. In other words, the environmental cost of AI is no longer dominated by the training of models, but by inference[14] the billions of everyday interactions with them.

## II. Materials, waste and the unequal geography of AI pollution

### *A. Raw materials and critical minerals*

The environmental footprint of artificial intelligence begins long before a data centre is switched on. The electronics it houses rely on a staggering amount of material: manufacturing a two-kilogram computer requires around 800 kilograms of raw materials[15], and the microchips that power AI depend on rare earth elements[16], which are often mined in environmentally destructive ways, as UNEP notes on the basis of its foresight report *Navigating New Horizons*. The IEA's *Energy and AI* report[17] provides the first global estimates of the critical mineral demand associated with data centre equipment, and warns of growing pressure on these supply chains. The circular economy that could relieve this pressure barely exists: according to the UN's Global E-waste Monitor[18], just 1% of the world's demand for rare earth elements is currently met by e-waste recycling.

### *B. A mounting wave of electronic waste*

At the other end of the life cycle, the constant renewal of servers, processors and devices feeds a global crisis of electronic waste, or e-waste[19]. The Global E-waste Monitor 2024, published

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[12] UNESCO, "Green AI takes centre stage at MWC Barcelona" (2025)

[13] UNESCO Courier, "Smarter, Smaller, Stronger" (2025)

[14] **Training / inference:** training is the initial phase in which an AI model learns from large datasets; inference is the phase in which the trained model responds to user requests. Definitions used in the UNESCO–UCL report *Smarter, Smaller, Stronger* (2025).

[15] UNEP, "AI has an environmental problem" (2024)

[16] **Rare earth elements:** a group of 17 metallic elements with unique properties, essential for electronics and clean-energy technologies; see the Global E-waste Monitor 2024 (ITU / UNITAR) Global E-waste Monitor 2024.

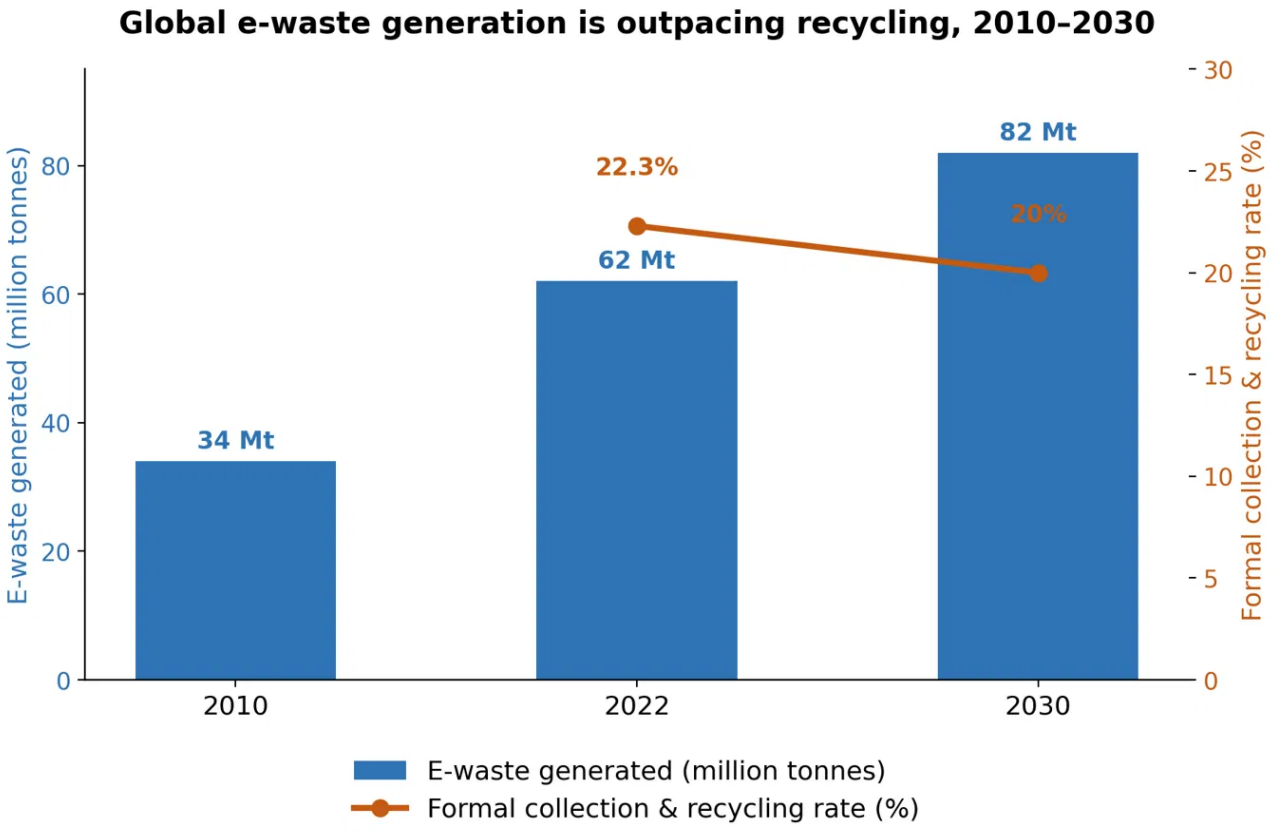
[17] IEA, Energy and AI (2025)

[18] Global E-waste Monitor 2024

[19] **E-waste (electronic waste):** any discarded product with a battery or a plug – computers, servers, phones, chips – that has reached the end of its useful life, as defined by the Global E-waste Monitor 2024 (ITU / UNITAR) ITU / UNITAR, Global E-waste Monitor 2024 – press release.

jointly by the International Telecommunication Union (ITU) and the United Nations Institute for Training and Research (UNITAR), reports that a record 62 million tonnes of electronic waste were generated in 2022 up 82% since 2010 while only 22.3% was documented as formally collected and recycled[20]. On current trends, e-waste will reach 82 million tonnes by 2030, while the recycling rate is actually expected to fall rather than rise. This leaves some 62 billion US dollars' worth of recoverable resources unaccounted for each year, and releases hazardous substances such as mercury and lead into soils and water.

Artificial intelligence is set to add a substantial new stream to this flow, as AI-specialised processors and servers are replaced at a rapid pace. A 2026 report by the United Nations University[21] warns that AI infrastructure could generate up to 2.5 million tonnes of e-waste annually by 2030, and that much of this burden is likely to fall on lower-income countries with limited capacity for safe disposal.




**Source: ITU / UNITAR, Global E-waste Monitor 2024.**

[20] ITU / UNITAR, Global E-waste Monitor 2024 – press release

[21] UN News, "AI's environmental costs threaten water, land and climate" (2026)

### *C. An unequal distribution of costs and benefits*

A defining feature of AI pollution and a central axis of debate for this committee is that its benefits and its burdens are not borne by the same people. The United Nations University[22] observes that while the benefits of AI flow across borders and sectors, the environmental burdens of data centre siting, electricity demand, water withdrawals, land use, mineral extraction and e-waste are concentrated in specific communities and regions. In small, highly connected economies, the pressure can become extreme: in Ireland, the IEA estimates that the rise of AI could see data centres account for nearly 35% of the country's energy use by 2026[23].

Meanwhile, the countries most exposed to mining impacts, e-waste dumping and water competition are often those that benefit least from the technology itself. UNESCO[24] points out that 2.6 billion people 32% of the world's population remain offline in 2025, and that in Africa only 5% of AI talent has access to the computing resources needed to develop local models. Any international response to AI pollution will therefore also have to address this double inequality: environmental costs concentrated in the Global South, and technological benefits concentrated in the Global North.

## III. Pathways towards sustainable technological development

### *A. Technical efficiency and cleaner energy supply*

The first family of solutions is technological. Modern hyperscale data centres[25] are considerably more energy-efficient than the small server rooms they replace, and operators measure this efficiency through indicators such as PUE[26]. On the supply side, the IEA projects that renewables will meet nearly half of the additional electricity demand from data centres to 2030[27], with nuclear playing a growing role towards the end of the decade making the decarbonisation of electricity grids[28] a decisive factor in AI's future footprint. Efficiency is also

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[22] UN University, Environmental Cost of Artificial Intelligence (2026)

[23] UNEP, "AI has an environmental problem" (2024)

[24] UNESCO, Green Digital Transformation

[25] **Hyperscale data centre:** a very large data centre (typically tens of megawatts or more) operated by major cloud and AI providers, offering much greater energy efficiency than small server rooms; category used by the IEA in *Energy and AI* (2025)IEA, Energy and AI (2025).

[26] **PUE (Power Usage Effectiveness):** the ratio of a data centre's total energy consumption to the energy consumed by its IT equipment alone (an ideal PUE is close to 1). Defined by the international standard ISO/IEC 30134, referenced in UNEP's Sustainable Procurement Guidelines for Data Centres and ServersUNEP, Sustainable Procurement Guidelines (2025).

[27] IEA, Energy and AI – Energy supply for AI

[28] **Grid decarbonisation:** the progressive replacement of fossil-fuel electricity generation by renewable and low-carbon sources in a power grid; see IEA, Energy and AI – Energy supply for AIIEA, Energy and AI – Energy supply for AI.

improving at the level of AI itself: the IEA's 2026 update finds that the electricity consumed per AI task is declining at an unprecedented rate[29].

Software design matters as much as hardware. The UNESCO–University College London report *Smarter, Smaller, Stronger* (2025)[30] demonstrates that small changes in how large language models are built and used smaller task-specific models, model compression, shorter prompts can cut AI energy consumption by up to 90% without compromising performance. This efficiency should nevertheless be treated with caution: researchers warn of a rebound effect known as the Jevons paradox[31], whereby efficiency gains lower costs, stimulate demand and can paradoxically increase total consumption.

### *B. An emerging international governance*

The second family of solutions is political, and it is still under construction. UNESCO's Recommendation on the Ethics of Artificial Intelligence (2021)[32], adopted by all member states, was the first global standard on AI and includes "environment and ecosystems" among its policy action areas. In March 2024, the UN General Assembly adopted by consensus its first resolution on artificial intelligence, A/RES/78/265[33], linking safe, secure and trustworthy AI to the achievement of the Sustainable Development Goals. The Global Digital Compact[34], adopted at the Summit of the Future in September 2024, commits states to "promote sustainability across the life cycle of digital technologies".

More operational initiatives followed. In February 2025, France, UNEP and the ITU launched the Coalition for Environmentally Sustainable Artificial Intelligence[35] at the Paris AI Action Summit, bringing together over 100 partners, including 37 technology companies, eleven countries and five international organisations. In June 2025, UNEP published Sustainable Procurement Guidelines for Data Centres and Servers[36] to help governments purchase energy- and water-efficient infrastructure, noting that very few countries currently have comprehensive frameworks for sustainable data centre operations. The governance gap remains wide, however: a World Bank review of 75 national AI strategies presented at

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[29] IEA, Key Questions on Energy and AI (2026)
[30] UNESCO Courier, "Smarter, Smaller, Stronger" (2025)
[31] **Jevons paradox (rebound effect):** the phenomenon whereby improvements in the efficiency of a resource's use lower its cost and end up increasing the total consumption of that resource; see Luccioni, Strubell & Crawford (2025) Luccioni, Strubell & Crawford, "From Efficiency Gains to Rebound Effects" (2025).
[32] UNESCO, Recommendation on the Ethics of AI (2021)
[33] UN General Assembly, resolution A/RES/78/265 (2024)
[34] United Nations, Global Digital Compact (2024)
[35] UNEP, "New Coalition aims to put AI on a more sustainable path" (2025)
[36] UNEP, Sustainable Procurement Guidelines (2025)

UNESCO's Green AI sessions[37] found that while many address inclusion, very few explicitly address AI's resource footprint.

### *C. The central tension: AI as both problem and solution*

Finally, one must grapple with the fact that artificial intelligence is simultaneously part of the problem and part of the solution. UNEP itself uses AI, through its International Methane Emissions Observatory[38], to detect methane emissions from oil and gas installations via satellite data. The IEA finds[39] that the widespread adoption of existing AI applications optimising power grids, industry, buildings and transport could enable emissions reductions that offset part of the growth in data centre emissions, while stressing that such an outcome is far from automatic and no substitute for climate policy. The task of this committee is precisely to define the conditions transparency requirements, efficiency standards, siting rules, financing and technology transfer under which the balance tips in the planet's favour.

[37] UNESCO, "Green AI takes centre stage at MWC Barcelona" (2025)
[38] UNEP, "How to make AI data centres more sustainable"
[39] IEA, Energy and AI – Executive summary (2025)

## RELEVANT UN TREATIES AND EVENTS

### 04/11/2016

Entry into force of the Paris Agreement[40], which aims to limit global warming to well below 2°C, preferably 1.5°C. It is the framework within which all national emissions including those of the digital sector and data centres – must ultimately be reduced.

### 23/11/2021

Adoption of the UNESCO Recommendation on the Ethics of Artificial Intelligence[41], the first global standard-setting instrument on AI, whose policy action areas explicitly include the protection of the environment and ecosystems throughout the AI life cycle.

### 20/03/2024

Publication of the Global E-waste Monitor 2024[42] by ITU and UNITAR, the UN's reference report on electronic waste, documenting 62 million tonnes of e-waste in 2022 and a recycling rate of only 22.3%.

### 21/03/2024

Adoption by consensus of UN General Assembly resolution A/RES/78/265[43], "Seizing the opportunities of safe, secure and trustworthy artificial intelligence systems for sustainable development" the first General Assembly resolution on AI, co-sponsored by more than 120 Member States.

### 22/09/2024

Adoption of the Global Digital Compact[44] at the UN Summit of the Future, the first comprehensive global framework for digital cooperation and AI governance, committing states to promote sustainability across the life cycle of digital technologies.

### 11/02/2025

Launch of the Coalition for Environmentally Sustainable Artificial Intelligence[45] at the Paris AI Action Summit, spearheaded by France, UNEP and ITU, with over 100 partners across the AI value chain.

### 10/04/2025

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[40] UNFCCC, The Paris Agreement
[41] UNESCO, Recommendation on the Ethics of AI (2021)
[42] ITU / UNITAR, Global E-waste Monitor 2024
[43] UN News, resolution A/RES/78/265 (2024)
[44] United Nations, Global Digital Compact (2024)
[45] UNEP, New Coalition press release (2025)

Publication of the IEA special report *Energy and AI*[46], the first comprehensive, data-driven global analysis of the links between artificial intelligence and the energy sector, updated in 2026 by *Key Questions on Energy and AI*[47].

### 12/06/2025

Release of UNEP's Sustainable Procurement Guidelines for Data Centres and Servers[48], helping governments procure energy- and water-efficient digital infrastructure based on international standards.

### 08/07/2025

Publication of the UNESCO–UCL report *Smarter, Smaller, Stronger: Resource-Efficient Generative AI*[49], showing that resource-efficient design can cut AI energy use by up to 90%.

### 06/2026

Publication of the United Nations University report *Environmental Cost of Artificial Intelligence: Carbon, Water and Land Footprints*[50], warning notably that AI infrastructure could generate up to 2.5 million tonnes of e-waste annually by 2030.

[46] IEA, Energy and AI (2025)
[47] IEA, Key Questions on Energy and AI (2026)
[48] UNEP, Sustainable Procurement Guidelines (2025)
[49] UNESCO Courier, "Smarter, Smaller, Stronger" (2025)
[50] UN University, Environmental Cost of AI (2026)

## POSSIBLE SOLUTIONS

Several concrete avenues already exist and could be strengthened, combined or scaled up in the committee's resolutions:

- **Mandatory transparency and reporting**: requiring data centre operators and AI developers to measure and publicly disclose their electricity and water consumption, greenhouse gas emissions and e-waste, using common international standards[51] (such as the EU Code of Conduct, Energy Star and ISO/IEC 30134).
- **Efficiency and siting standards**: setting minimum PUE and water-efficiency requirements for new data centres, and directing their construction towards regions with abundant clean electricity and low water stress.
- **Clean energy procurement**: accelerating the connection of data centres to renewable and low-carbon electricity, in line with the IEA's finding[52] that renewables can meet nearly half of additional demand to 2030.
- **Circular economy for hardware**: extending producer responsibility, raising e-waste collection and recycling targets (the Global E-waste Monitor[53] estimates that reaching a 60% collection and recycling rate by 2030 would generate net benefits exceeding 38 billion US dollars), and supporting safe recycling infrastructure in developing countries.
- **Right-sizing AI**: promoting smaller, task-specific models, model compression and AI literacy so that users and public administrations choose the least resource-intensive tool for each task, following the UNESCO–UCL recommendations[54].
- **International cooperation and technology transfer**: expanding initiatives such as the Coalition for Environmentally Sustainable AI[55], and financing access to clean compute in developing countries so that the environmental costs and the benefits of AI are shared more fairly.

[51] UNEP, New Coalition press release (2025)
[52] IEA, Energy and AI – Energy supply for AI
[53] ITU / UNITAR, Global E-waste Monitor 2024
[54] UNESCO Courier, "Smarter, Smaller, Stronger" (2025)
[55] Coalition for Sustainable AI – official website

## Questions to consider when preparing your position:

1. Does your country host data centres, or plan to attract them? What do they mean for its electricity grid and water resources?

2. Where does your country stand in the AI value chain: mineral producer, hardware manufacturer, AI developer, or mainly a user of imported technology?

3. Does your country have legislation on e-waste, and does it receive or export electronic waste?

4. What share of your country's electricity mix is renewable, and could data centre growth delay its energy transition?

5. Would your country support binding international standards on the transparency of AI's environmental footprint, or prefer voluntary industry commitments?

6. How can developing countries gain access to AI's benefits without becoming the dumping ground for its environmental costs?

7. Should the environmental cost of AI be integrated into existing climate frameworks (Paris Agreement, NDCs), or does it require a dedicated instrument?

## BIBLIOGRAPHY

*The sources below were the most useful in preparing this report, classified by type of document. All citations in the text above appear as footnotes at the bottom of the corresponding page.*


### *Reports of international organisations*

- IEA, Energy and AI (2025) – the reference analysis of data centre electricity demand, emissions and energy supply.
- IEA, Key Questions on Energy and AI (2026) – updated projections and efficiency trends.
- ITU / UNITAR, Global E-waste Monitor 2024 – the UN's reference data on electronic waste.
- UNESCO / UCL, Smarter, Smaller, Stronger: Resource-Efficient Generative AI (2025) – solutions to cut AI energy use by up to 90%.
- United Nations University (UNU-INWEH), Environmental Cost of Artificial Intelligence (2026) – carbon, water and land footprints of AI's energy use.

### *UN resolutions and frameworks*

- UN General Assembly, resolution A/RES/78/265 (2024) on safe, secure and trustworthy AI for sustainable development.
- United Nations, Global Digital Compact (2024).
- UNESCO, Recommendation on the Ethics of Artificial Intelligence (2021).
- UNFCCC, The Paris Agreement (2016).

### *Press releases and articles*

- UNEP, "AI has an environmental problem. Here's what the world can do about that." (2024) – accessible overview of AI's four environmental impacts.
- UNEP, "New Coalition aims to put Artificial Intelligence on a more sustainable path" (2025).
- UNEP, "UNEP releases guidelines to curb the environmental impact of data centres" (2025).
- UN News, "AI's environmental costs threaten water, land and climate" (2026).

- NPR, "Google and Microsoft report growing emissions as they double-down on AI" (2024) – corporate emissions figures.
- Luccioni, Strubell & Crawford, "From Efficiency Gains to Rebound Effects" (2025) – academic paper on rebound effects (Jevons paradox).

### *Sources used for the Key Words definitions*

*Listed here with the term each source was used to define, as requested by the board.*

- UNESCO – IA thesaurus / glossary → *Artificial Intelligence (AI)*
- UNESCO Thesaurus → *Data Centre*
- United Nations – Climate glossary → *Carbon Footprint*
- UNFCCC – Glossary of climate change acronyms and terms → *Greenhouse Gas (GHG) Emissions*
- IEA – Energy statistics glossary → *Electricity Consumption*
- IEA – Energy efficiency → *Energy Efficiency*
- United Nations – Renewable energy → *Renewable Energy*
- United Nations – Sustainable Development Goals / Brundtland Report (1987) → *Sustainable Development*
- UN-Water – Water Statistics glossary → *Water Consumption*
- UNEP – Life Cycle Initiative → *Life Cycle Assessment (LCA)*

### *To explore further*

- ITU, AI for Good Global Summit – talks and sessions on AI and sustainability.
- Coalition for Sustainable AI – official website with initiatives and members.

## LIST OF COUNTRIES AND ACTORS INVOLVED

*In order of priority for the debate.*

1. United States of America (largest data centre market; home to the leading AI companies)
2. China (second-largest data centre market; dominant in critical mineral refining)
3. European Union (regulatory pioneer: AI Act, energy-efficiency and e-waste legislation)
4. France (initiator of the Coalition for Environmentally Sustainable AI; AI Action Summit host)
5. Ireland (extreme case of data centre pressure on a national grid)
6. India (rapidly growing digital economy and data centre hub)
7. United Kingdom (major AI research hub; AI Safety Summit host)
8. Japan (advanced economy with high data centre density and energy constraints)
9. Republic of Korea (semiconductor manufacturing power)
10. Singapore (data centre hub that imposed a moratorium for sustainability reasons)
11. Netherlands (major European data centre hub; semiconductor equipment - ASML)
12. Germany (largest EU economy; energy-transition leader)
13. Chile (data centre growth in water-stressed regions; lithium producer)
14. Brazil (renewable-rich emerging data centre market)
15. Kenya (African digital hub; geothermal-powered data centres)
16. Nigeria (largest African population; growing digital economy)
17. Ghana (destination of e-waste flows - Agbogbloshie)
18. Democratic Republic of the Congo (cobalt and critical mineral extraction)
19. Australia (major producer of lithium and rare earth elements)
20. Canada (hydropower-based data centres; mineral producer)
21. Saudi Arabia (massive AI and data centre investments in a water-scarce region)
22. United Arab Emirates (AI national strategy; desert data centres)
23. Norway (renewable-powered data centres in cold climates)
24. Sweden (hyperscale data centres powered by renewables)
25. Rwanda (Least Developed Country building the Kigali Innovation City data hub as a deliberate leapfrog into the digital economy)
26. Denmark (benchmark country for AI water-consumption comparisons)
27. Switzerland (host of ITU and AI for Good)
28. Russia (energy exporter; growing domestic data centre sector)

29. Indonesia (nickel producer; emerging digital market)

30.Bangladesh (Least Developed Country with a rapidly growing digital population, highly exposed to imported electronic waste)

31. South Africa (main data centre hub of the African continent)

32. Mexico (nearshoring of data centres in water-stressed areas)

33. UNEP (United Nations Environment Programme)

34. ITU (International Telecommunication Union)

35. IEA (International Energy Agency)

36. UNESCO

37. Google / Alphabet (hyperscale operator; disclosed AI-driven emissions increase)

38. Microsoft (hyperscale operator; carbon-negative pledge under strain)

39. Amazon Web Services (largest cloud provider)

40. NVIDIA (dominant AI chip designer; member of the Coalition for Sustainable AI)