MINISTÈRE
DE LA TRANSITION
ÉCOLOGIQUE,
DE L'ÉNERGIE, DU CLIMAT
ET DE LA PRÉVENTION
DES RISQUES

Liberté
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Commissariat général au développement durable
Service de la recherche et de l'innovation

ECO LAB
Innovation - Écologie - Territoires

BALANCING AI OPPORTUNITIES AND RISKS FOR THE ENVIRONMENT
French Government strategy

May 21st, 2025

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1. AI FOR OUR PUBLIC POLICIES

For the ecological transition

Text	Image	Sound
To realize, yes, climate change is a real problem, but it's not this catastrophic end of the world. There is nothing in the UN climate panel, the new report that came out from 2021–2022, these 1600 pages. No apocalypse in there. → Not Bad		
Hottest day in Atlanta in last 100 years, July 17, 1980. So much for global warming? → Not Happening		

Source: Frugal AI Challenge, Hugging Face & Data for Good, with datasets from QuotaClimat, GainForest and Pyronear

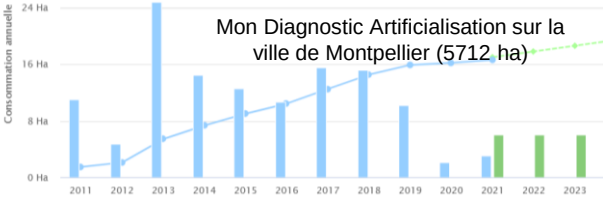
For our public policies

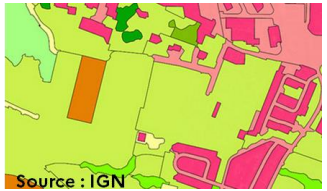
At the national level

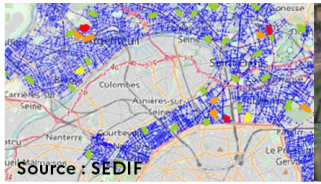
- Monitoring of land artificialization (IGN)
- Monitoring of underground water reserves (BRGM)
- Improving previsions (Météo –France)
- Ask questions on documents from public organizations on ecological transition (ADEME-Cerema-Ministry)

At the local level

- Reducing the energy consumption of public buildings (Bordeaux Métropole, Métropole Grand Paris)
- Renaturation of cities (Lyon Métropole)
- Predictive maintenance of water networks (SEDIF, Syndicat des eaux du Brivadois)







→ AI: a tool to better understand present and future dynamics and inform decisions

2. ENVIRONMENTAL IMPACT OF AI

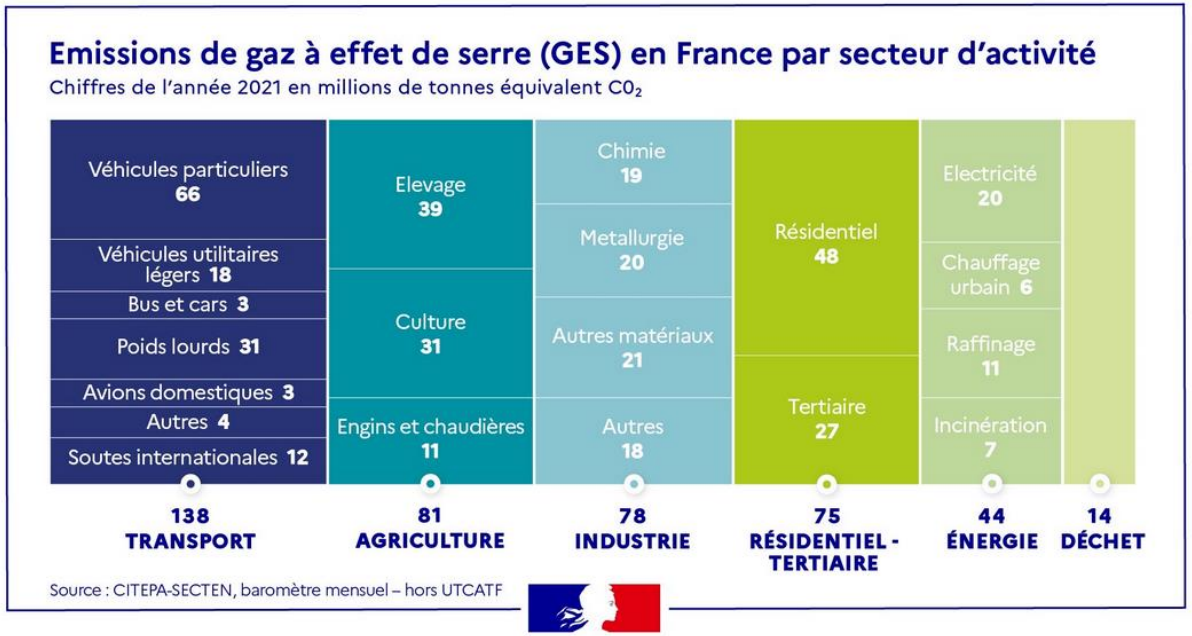
Carbon footprint of ICT sector in France

4,4 %

of France carbon footprint in 2022

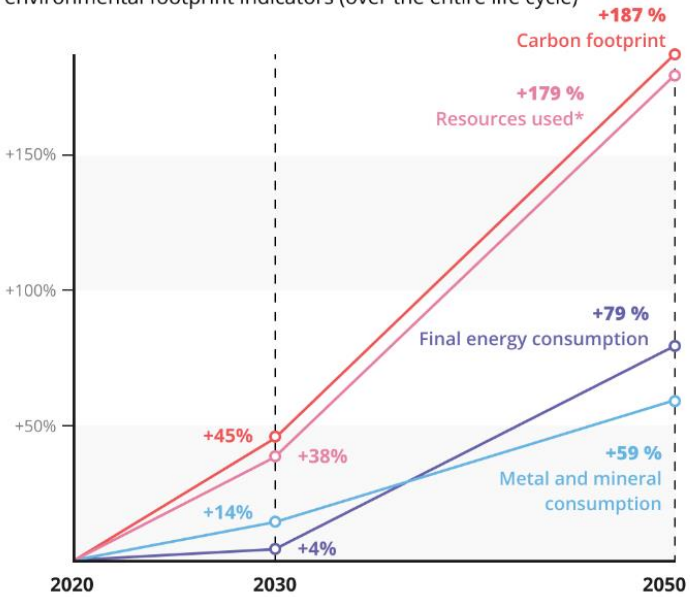
Around 29,5 Mt of CO2eq

Source : Mise à jour de l'étude ADEME-ARCEP Janvier 2025



What is the current trend?

Progression of the business-as-usual scenario for the four digital environmental footprint indicators (over the entire life cycle)



* MIPS definition factoring in materials used, biomass, soil movement, either mechanical or due to erosion, water and air.

French Digital sector

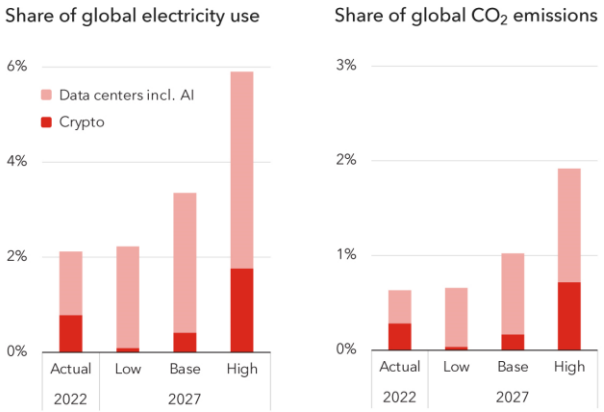
Increase of impact across environmental indicators:

- Energy consumption
- Resources used (materiel, biomass, soil)
- Carbon footprint
- Metal and mineral consumption

From ADEME/ARCEP study: assessment of the digital environmental footprint in France in 2020, 2030 and 2050

What is the current trend?

Crypto and data centers account for a growing amount of emissions



Source: Hebous and Vernon (2023); Carbon Pricing Assessment Tool; IEA 2024.
Note: All projection scenarios use the average BTC price for 2021-2023. "Base" refers to the average energy-intensity of mining equipment; "Low" and "High" refer to the lowest and highest available energy-intensity, respectively. Crypto emissions decline from 2022 to 2027 under the baseline scenario is mainly driven by the reduction in mining block rewards while assuming no offsetting increase in crypto prices or transaction fees.

IMF

Datacenters at a global scale:

- Electricity demand from data centres worldwide set to **more than double by 2030 to around 945 terawatt-hours (TWh)**, slightly more than the entire electricity consumption of Japan today.
- AI will be the **most significant driver of this increase**, with electricity demand from AI-optimised data centres projected to more than **quadruple by 2030**.

(Source : IEA, April 2025)

AI models – Few data about energy consumption and carbon impact of training and inferences:

- GPT-3 (december 2022) : 552 tons of CO2 for training (Patterson et al, 2021)
- Llama-3 70B (april 2024) : 1900 tons of CO2 for training (model card)
- Llama-4 Scout 17Bx128e (april 2025) : 1354 tons of CO2 for training
- Generation of 1 image: 2,9 Wh on average (up to 11 Wh / half a phone charge) (Luccioni et al, 2024)

Trends we do not know (or envision) yet

Future sizes of models

Number of users (private & professional)

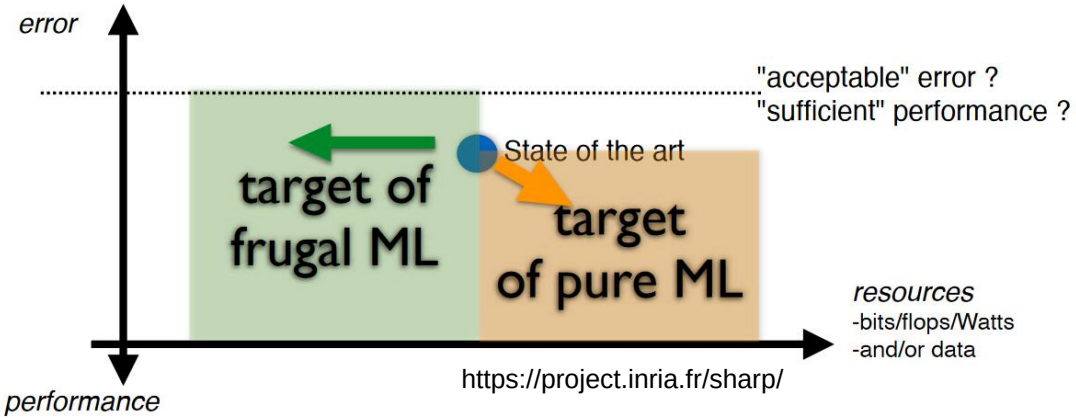
Time spent by users with Gen AI (number of applications throughout our equipment, etc.)

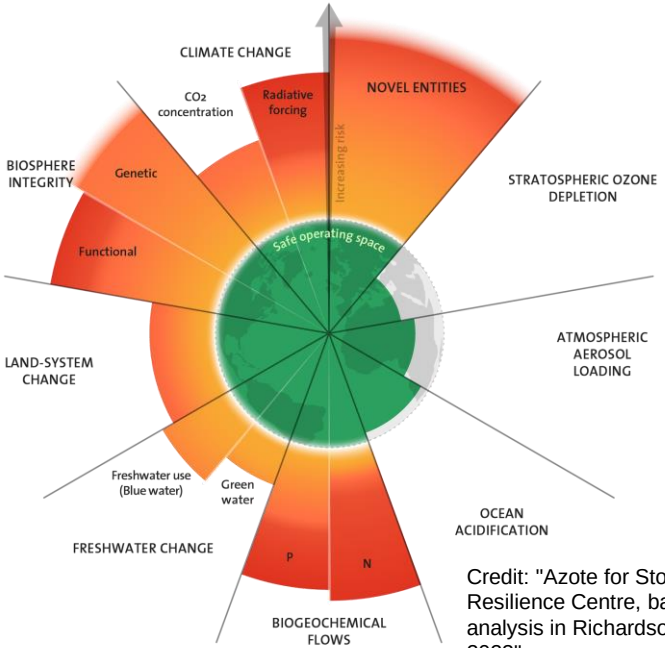
Number of re-trainings

Secondary effects from IA (accelerated obsolescence of our equipment, consumer influence for more consumption, etc.)

...

Sufficient/Frugal AI





Credit: "Azote for Stockholm Resilience Centre, based on analysis in Richardson et al 2023".

Assessment of relevance of AI compared to other solutions	Environmental assessment and implementation of best practices	Use case respecting planetary boundaries, with resource constraints prioritized

Source: AFNOR-Spec 2314, General Framework for Frugal AI, June 2024

Already available tools

1. Comparison on AI models

2. Environmental impact estimation

3. Assessment of environmental impact

AI Energy Score

Green Algorithms

EcoLogits

Code Carbon

Our action plan

- Continue setting environmental criteria in project fundings
- Encourage the use of environmental criteria in public procurement
- Encourage companies to adopt Frugal AI best practices
- Encourage local authorities to use AI in the national plan for adaptation to climate change (floods, heat islands, coastline retreat, forest fires, etc.)
- Adopt standardized methodologies for the environmental assessment of AI at the European level
- Make sure AI x environment is at the center of international discussions

How to include environmental sustainability criteria in national AI funding schemes? Reflecting on the example of France and the Green Algorithms tool.

Lannelongue, Loic[1] ; Fropier, Juliette[2] ; Matencio, Even[2]

Show affiliations

Artificial intelligence (AI) is in the media spotlight for its potential to transform the economic and research sectors, among others. This drives funding bodies to support AI-based innovation, with for example the Horizon Europe and Digital Europe programmes run by the European Union, or France's investment strategy France 2030 (national strategy for AI). On the other hand, the environmental impacts of AI are now better understood, and we cannot ignore the role of AI on electricity and water usage, mineral resource depletion, and greenhouse gas emissions[1,2]. **To bring together innovation and sustainability, the French Department for the Environment (*Ministère en charge de la Transition Écologique*) has decided to require the use of the Green Algorithms tool for funding applications on the topic of AI and climate change. Applicants now have to include estimates of the carbon footprint and energy usage of the different development phases of the proposed AI solution.** This was tested on a first funding call "Demonstrators of frugal AI for sustainable development of local communities". The first applications were received in December 2023, with positive feedback from the different stakeholders. Applicants in particular approved of this new criterion, as they understood its necessity, found the tool easy to use, and did not consider this to slow down innovation. Following this successful implementation in a first funding call, it was decided to include the Green Algorithms tool more systematically in the application guidelines of other AI-related funding calls run by the Department. The goal of this piece is to reflect on the inclusion of environmental criteria in AI funding calls and share the lessons learned with other funding bodies internationally to promote similar initiatives across the AI ecosystem.

COALITION FOR SUSTAINABLE AI