

climate intelligence

Factsheet 18 · May 2024 · catavento.biz

clarissa.lins@catavento.biz · pedro.guedes@catavento.biz · guilherme.ferreira@catavento.biz · bernardo.correa@catavento.biz

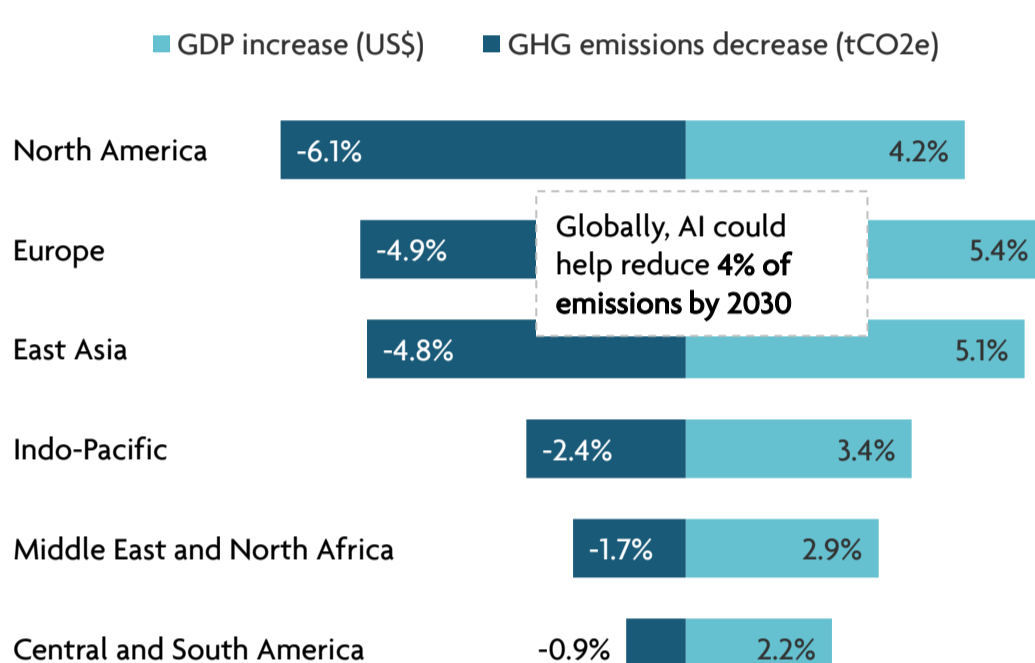
THE IMPACT OF AI AND DATA ON CLIMATE AND ENERGY TRANSITIONS



Artificial Intelligence (AI) is primarily associated with machine learning algorithms, which identify patterns in large volumes of data¹. By assimilating these patterns, AI algorithms can make forecasts and recommendations based on defined goals, potentially assisting in solving complex problems and increasing productivity across various sectors of the economy²

AI can optimize decision-making processes related to climate issues across various sectors...

AI's potential impact on GDP and emissions in selected sectors³ — energy, transport, and agriculture (2030 vs. BaU^a)



..by delivering efficiency gains, consolidating data...



Power – Renewable intermittence may be addressed through AI-based demand forecast⁴ and weather predictions to heighten energy security⁵ (e.g., The U.S. Department of Energy launched a report showcasing the opportunity to incorporate AI in load and supply matching)



Mobility - Freight routing, public transportation and EV infrastructure could all be optimized by the usage of AI models⁶ (e.g., Google's EIE model transport flows' emissions in cities to suggest mobility interventions by governments)



Land management – Nature-based solutions can be monitored by AI-based systems that measure carbon stocks⁷, calculate removals⁸ and identify land invasions⁹ (e.g., PrevisIA is a platform that utilizes AI to identify areas at risk of deforestation in the Amazon)

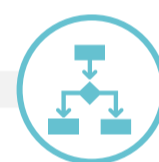
..and improving actions related to climate adaptation and resilience¹⁰



Hazard prediction
Anticipating extreme weather events such as flooding and drought, while also projecting long-term trends (e.g.: temperature and sea-level rise)



Smart infrastructure
Supporting management and investment decisions by identifying vulnerable sites and signaling hotspots for preventive maintenance



Crisis response
Optimizing the allocation of resources and assignment of tasks through the combination of data from scattered sources

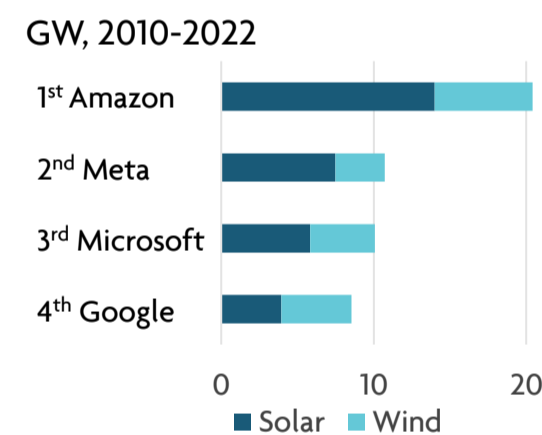
Examples from companies

- [Google's Wildfire Boundaries](#) uses satellite imagery and AI to detect wildfires and aid responders and residents¹¹
- [Sipremo](#) uses AI to predict extreme climate events and deliver operational insights for business resilience¹²

Nevertheless, AI requires data centers, which already generate a significant demand for steady clean power...

- Globally, data centers account for 2% of electricity demand (460 TWh in 2022)¹³ and -1% of energy-related GHG emissions (330 MtCO₂)¹⁴
- **Big techs^b power consumption** was at 90 TWh in 2022 (same as Colombia's) and tends to grow further due to AI¹⁵
- By the same year, ~25% of data center workloads were related to machine learning, a share expected to increase¹⁶

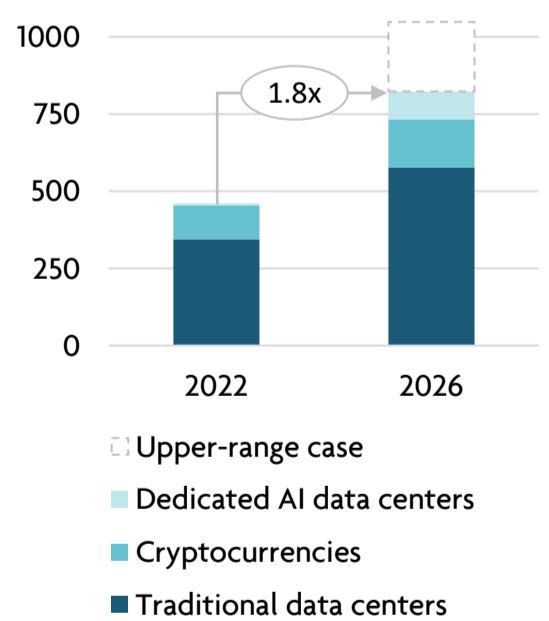
Mainly due to data center operations, big techs are top corporate off-takers⁷ of renewable PPAs^c



Amazon, Microsoft and Google are also moving towards nuclear, geothermal and batteries to steadily power their operations¹⁸

....poised to increase in the coming years with the expansion of artificial intelligence solutions

Global electricity demand for data centers¹⁹
TWh



- By 2026, global dedicated AI centers' power use could reach 90 TWh²⁰, equivalent to 13% of Brazil's current power demand²¹
- In Brazil, the expected load for data centers could reach 2.5 GW by 2037²², considering only new projects in three states^d
- Additionally, AI's water footprint may get to 6.6 bn m³ by 2027²³, equivalent to 9% of Brazil's current freshwater demand²⁴

In this context, public policy can shape national strategies to harness the potential of the technology^{25 26 27 28 29 30}



AI and climate change – promote the use of AI to address climate risks and opportunities, fostering collaboration among governments, academia and private sector



Energy and infrastructure - develop the necessary setup to support AI adoption, which encompasses renewable energy generation, safe transmissions grids and water availability



Safety and standards - establish guidelines and standards to mitigate cyber threats, promote ethical use of technology, and prevent social biases



Data management - enhance AI data management practices to optimize its utilization and integration with other digital technologies (e.g., digital twins and internet of things)



Integration of AI into climate and energy solutions can upscale emission reduction efforts and facilitate adaptation and resilience measures. However, the increased power demand of AI applications should be met by low-carbon sources to deliver climate benefits. This is incorporated into tech companies' plans, which are committed to low-emitting energy coupled with measures to ensure its steady supply. In a nutshell, AI's opportunities and challenges must be transparently weighed to effectively maximize positive climate impacts

^a Business-as-Usual; ^b Amazon, Meta (Facebook), Alphabet (Google) and Microsoft; ^c Power Purchase Agreements; ^d São Paulo, Rio Grande do Sul e Ceará

¹ / Global Partnership on AI. Climate Change and AI - Recommendations for Government Action. 2021; ² / Innovation for Cool Earth Forum. Artificial Intelligence for Climate Change Mitigation Roadmap. 2023; ³ / pwc. How AI can enable a Sustainable Future. 2019; ⁴ / IEA. Why AI and energy are the new power couple. 2023; ⁵ / Global Partnership on AI. Climate Change and AI - Recommendations for Government Action. 2021; ⁶ / Global Partnership on AI. Climate Change and AI - Recommendations for Government Action. 2021; ⁷ / Global Partnership on AI. Climate Change and AI - Recommendations for Government Action. 2021; ⁸ / BCG. Accelerating Climate Action with AI. 2023; ⁹ / AI for the Planet. How AI Can Be a Powerful Tool in the Fight Against Climate Change. 2022; ¹⁰ / BCG. Accelerating Climate Action with AI. 2023; ¹¹ / Google Research. Real-time tracking of wildfire boundaries using satellite imagery. 2023; ¹² / World Economic Forum. 9 ways AI is helping tackle climate change. 2024; ¹³ / IEA. Electricity 2024. 2024; ¹⁴ / IEA. Data Centres and Data Transmission Networks. 2023; ¹⁵ / The Economist. Big tech's great AI power grab. 2024; ¹⁶ / Lynn Kaack et al. Aligning artificial intelligence with climate change mitigation. 2022; ¹⁷ / IEA. Data Centres and Data Transmission Networks. 2023; ¹⁸ / The Economist. Big tech's great AI power grab. 2024; ¹⁹ / IEA. Electricity 2024. 2024; ²⁰ / IEA. Electricity 2024. 2024; ²¹ / EPE. Brazilian Energy Balance 2023. 2023; ²² / Brazilian Ministry of Mines and Energy. MME e EPE mapeiam soluções para atender crescente demanda dos Data Centers no Brasil. 2024; ²³ / Li et al. Making AI Less "Thirsty": Uncovering and Addressing the Secret Water Footprint of AI Models. 2023; ²⁴ / World Bank. Annual Freshwater Withdrawals. 2024; ²⁵ / BCG. Accelerating Climate Action with AI. 2023; ²⁶ / Global Partnership on AI. Climate Change and AI - Recommendations for Government Action. 2021; ²⁷ / Innovation for Cool Earth Forum. Artificial Intelligence for Climate Change Mitigation Roadmap. 2023; ²⁸ / pwc. How AI can enable a Sustainable Future. 2019; ²⁹ / Heinrich-Böll-Stiftung. Artificial Intelligence and Climate Change: Opportunities, considerations, and policy levers to align AI with climate change goals. 2020; ³⁰ / Friends of the Earth. Artificial Intelligence Threats to Climate Change. 2024