POLICY BRIEF

Managing the AI–Energy Nexus: G20 Policy Priorities for the Twin Transition

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Accelerating Climate Action and the Just Energy Transition

Abstract

The rapid advancement of artificial intelligence (AI) presents both transformative opportunities and significant environmental challenges, particularly concerning energy consumption and carbon emissions. This policy brief proposes that the G20 play a leading role in managing the AI–energy nexus through a strategic twin transition agenda that aligns digital transformation with sustainability.

It recommends three targeted actions: (1) establish a G20 Task Force on AI–Energy Synergies to coordinate global policies, empower clean energy integration in AI development, and redefine AI success metrics to include sustainability and energy efficiency; (2) launch an AI–Energy Twin Transition Fund to support energy-efficient AI innovation and equitable green infrastructure; and (3) develop common global metrics for AI energy use and carbon emissions, modelled on the Task Force on Climate-related Financial Disclosures. By combining coordinated governance, targeted financing, and transparent reporting, this framework aims to support better coordination between AI growth and concerns over rising fossil fuel emissions – ensuring technological progress aligns with planetary boundaries.

Keywords: Twin Transition, Artificial Intelligence (AI), AI–Energy Nexus, Energy-efficient AI, Sustainable AI Infrastructure, Carbon Emission, Low- and Middle-Income Countries, Blended Financing Model, Disclosure.

Introduction

The rapid global expansion of artificial intelligence (AI) presents a paradox. AI is a powerful driver of economic transformation, with the potential to accelerate climate modelling, advance renewable energy technologies, and boost energy efficiency. However, its rapidly expanding environmental footprint poses a critical challenge to long-term sustainability. The challenge is twofold. First, current AI training relies on brute-force scaling, which depends on highly energy-intensive data centres. In 2024, data centres consumed approximately 415 terawatt-hours (TWh) of electricity globally – around 1.5% of total global electricity use.[1] This demand has been increasing at a rate of roughly 12% per year, compared to about 3% for overall electricity consumption.[2] The International Energy Agency projects that data centre electricity use will more than double to approximately 945TWh by 2030.[3] Even nations with advanced renewable energy infrastructure cannot take AI's growing power demands lightly. For industrialised economies, meeting this challenge requires deliberate investments in grid modernisation and storage solutions. This already difficult equation becomes exponentially harder for regions still grappling with energy poverty or entrenched fossil fuel dependence. Underdeveloped grids and fossil fuel dependence mean scaling AI could deepen emissions and delay clean transitions. Replicated across under-resourced countries, this rise of 'dirty' AI could erode global climate progress and entrench carbon-intensive development paths.

Second, AI is increasingly framed as a tool of strategic competition, where global powers prioritise model performance over energy efficiency. This high-resource 'arms race' widens the divide between countries with vast computational

[1] International Energy Agency IEA). *Energy and AI.* Accessed February 14, 2025. https://www.iea.org/reports/energy-and-ai/executive-summary
[2] Ibid.
[3] Ibid.

capacity and those with fragile infrastructure – deepening energy inequities and excluding developing economies from AI-driven growth.

Relevance to the G20

As a bloc responsible for 80% of global CO_2 output and most data centres, the G20 is well positioned to help reconcile these competing priorities.[4] At the 2024 Brazil G20/S20, science academies stressed the urgency of integrating sustainability into AI development.[5] Yet progress is limited, underscoring the need for stronger coordination and comprehensive environmental guidelines for AI.[6] Nations like South Africa – where coal provides 85% of electricity while AI adoption grows – embody the tension between technological progress and environmental constraints.[7] By championing energy-efficient, climate-aligned AI development, South Africa can help model a just, climate-conscious digital transition – offering a governance template for other emerging economies facing similar trade-offs.

Recommendations

1. Establish an Interdisciplinary AI-Energy Synergies Task Force at the G20

G20 leaders have recognised that growth in the digital economy must be inclusive and sustainable.[8] In fact, the G20-adopted AI Principles explicitly state that "AI should pursue inclusive growth, sustainable development and

[4] International Renewable Energy Agency (IRENA). "G20+ Countries Hold the Key to the Global Renewable Target by 2030." March 17, 2025. https://www.irena.org/News/pressreleases/2025/Mar/G20-plus-Countries-Hold-the-Key-to-the-Global-Renewable-Target-by-2030.And Statista. 2025. "Leading Countries by Number of Data Centers 2025." March 2025. Accessed April 2, 2025. https://www.statista.com/statistics/1228433/data-centers-worldwide-by-country/.
[5] S20 Brasil. "G20 Science Summit Recommends More 'Green AI' and Attention to Diseases in Climate Crisis." July 1, 2024. https://s20brasil.org/en/g20-science-summit-recommends-more-green-ai-and-attention-to-diseases-in-climate-crisis/
[6] Ibid.
[7] International Trade Administration. "South Africa Country Commercial Guide: Energy." Accessed March 1, 2025. https://www.trade.gov/country-commercial-guides/south-africa-energy.
[8] The White House. 2023. "Fact Sheet: Delivering an Ambitious Agenda for the G20." Statements and Releases, September 9, 2023. Accessed 4 Feb 2025. https://bidenwhitehouse.archives.gov/briefing-room/statements-releases/2023/09/09/fact-sheet-delivering-an-ambitious-agenda-for-the-g20/#:~:text=Leading%20by%20example%20and%20working,to%20our%20most%20pressing%20issues.

wellbeing".[9] Yet historically, the G20 and the G20 Think Tank Engagement Group (T20) have treated the digital economy and climate transition as separate priorities. Today, as AI's role in global development expands, its soaring energy footprint increasingly clashes with decarbonisation goals. This is not merely a policy misalignment – it is a missed opportunity. AI can accelerate clean energy through smart grids, forecasting, and climate modelling, while clean energy is essential to support AI's growth. Aligning these agendas could unlock a self-reinforcing cycle of innovation and sustainability.[10]

The G20 and T20 should establish an Interdisciplinary Task Force on AI–Energy Synergies to integrate climate scientists, AI engineers, and economists under a unified mandate, serving as both a knowledge hub and a coordination platform.

- **Priority intervention mapping:** Systematically identify the most critical technological innovations, regulatory frameworks, and policy measures required to align AI growth trajectories with climate mitigation and adaptation goals.
- **Incentive realignment:** Develop and promote industry transition pathways that replace narrow performance-centric metrics (eg, model accuracy) with comprehensive sustainability benchmarks, establishing energy efficiency as a fundamental governance parameter for AI systems.
- **Implementation pilots:** Select and support pioneering G20 member states to design and execute real-world pilot programmes, creating scalable models for sustainable AI deployment that balance computational needs with environmental constraints.

[9] Ministry of Foreign Affairs of Japan (MOFA). 2019. "G20 Ministerial Statement on Trade and Digital Economy (Annex 8): G20 AI Principles." https://www.mofa.go.jp/policy/economy/g20_summit/osaka19/pdf/documents/en/annex_08.pdf.
[10] Chan, Kenddrick, et al. *Greening AI: A Policy Agenda for the Artificial Intelligence and Energy Revolutions.* Tony Blair Institute for Global Change, May 29, 2024. https://institute.global/insights/climate-and-energy/greening-ai-a-policy-agenda-for-the-artificial-intelligence-and-energy-revolutions.

2. Incentivise energy-efficient AI through global investment

The G20 should establish an AI–Energy Twin Transition Fund – a dedicated source of patient, mission-driven capital to accelerate innovation in energy-efficient AI and equitable green infrastructure. While global initiatives such as the Green Climate Fund[11] and Clean Technology Fund,[12] and national programmes like Singapore's Green Computing Funding Initiative[13] have made significant strides in climate and technology financing, none is explicitly focused on reducing the carbon footprint of AI systems themselves.

This fund should operate through two complementary financing streams:

- **Innovation & efficiency stream:** This stream would accelerate the R&D, commercialisation, and scaling of transformative low-carbon AI technologies. The latter include next-generation energy-efficient AI chips, optical neural networks, photonic computing, green data centre designs, and advanced cooling systems. To ensure investments are well targeted, innovations could be categorised along three dimensions: (1) training efficiency (eg, reducing the energy needed to train frontier models); (2) data processing efficiency (eg, reducing the energy required to run algorithms and process data, including sourcing and energy source concerns); and (3) algorithmic efficiency (eg, reducing the compute required per user query or task). To drive progress, this initiative could deploy a mix of financial instruments including early-stage grants, venture-style equity investments,

[11] Green Climate Fund. "GCF Approves USD 686 Million for Climate Action, Decides to Establish Regional Presence." *Green Climate Fund*, accessed February 21, 2025. https://www.greenclimate.fund/news/gcf-approves-usd-686-million-climate-action-and-decides-establish-regional-presence.
[12] World Bank Group. "Clean Technology Fund (CTF)." Accessed January 13, 2025. https://fiftrustee.worldbank.org/en/about/unit/dfi/fiftrustee/fund-detail/ctf.
[13] Infocomm Media Development Authority (IMDA) and Government Technology Agency of Singapore (GovTech). "New Initiatives to Drive Digital Sustainability." Accessed January 24, 2025. https://www.imda.gov.sg/resources/press-releases-factsheets-and-speeches/press-releases/2024/new-initiatives-to-drive-digital-sustainability.

challenge prizes, and de-risking mechanisms like contracts-for-difference or first-loss guarantees.[14]

- **Infrastructure & access stream:** This stream should prioritise overcoming both supply- and demand-side barriers to sustainable AI adoption in emerging and low-income economies. On the demand side, many countries lack the reliable, affordable energy needed to support AI infrastructure. The fund should back practical solutions such as co-locating green data centres with renewables, upgrading grid reliability in digital zones, and deploying storage to stabilise supply. On the supply side, many regions lack the capital and capacity to build energy-efficient AI infrastructure. This effort would be underpinned by partnerships with international financial institutions – such as the IMF's Resilience and Sustainability Trust[15] – to establish a blended finance model combining grants from high-income countries with concessional loans for developing economies. This dual approach would help close the digital–carbon divide and support an inclusive, climate-aligned AI transition.

3. Introduce revenue sources and behavioural incentives

This proposal avoids one-size-fits-all mechanisms by introducing a voluntary Global AI Sustainability Contribution, where major AI firms contribute based on computer-related emissions. The rationale is twofold: first, many countries facing development and energy access challenges are wary of externally imposed pricing or monitoring regimes; second, voluntary, incentive-aligned contributions are more likely to build broad consensus. Funds would support green AI infrastructure in energy-constrained economies, while innovators of

[14] Chan, Kenddrick, et al. *Greening AI: A Policy Agenda for the Artificial Intelligence and Energy Revolutions.* Tony Blair Institute for Global Change, May 29, 2024. https://institute.global/insights/climate-and-energy/greening-ai-a-policy-agenda-for-the-artificial-intelligence-and-energy-revolutions.
[15] International Monetary Fund. "Resilience and Sustainability Trust." https://www.imf.org/en/Topics/Resilience-and-Sustainability-Trust. Accessed March 10, 2025.

energy-efficient AI systems could access rewards such as tax incentives, green bonds, and preferential procurement. Further, a Global AI Sustainability Certification, co-developed with Global South partners, would provide benefits like regulatory fast-tracking and lower capital costs – reinforcing behavioural change without undermining national agency or developmental priorities.

4. Establish a global baseline for AI's environmental impact

Despite growing efforts to report AI's environmental impact from corporations, academia, and international bodies, the absence of standardised metrics undermines progress. Current reporting remains fragmented: while some measure absolute energy use (MWh) or emissions (tCO_2), others track relative efficiency (CO_2 per query). This inconsistency in methodology, terminology, and reporting formats renders cross-industry comparisons meaningless and enables selective disclosure of favourable metrics.[16]

Drawing inspiration from the Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD)[17] – which the G20 endorsed to harmonise climate risk reporting – the G20 should now convene governments, industry, and standards bodies to establish a global framework for AI energy and emissions disclosure. This would involve:

- **Fast-tracking existing efforts** (e.g., IEEE P7100,[18] ISO standards[19]) as the technical foundation.

[16] IEEE Standards Association. "P7100 - Environmental Impacts of Artificial Intelligence Working Group." Accessed February 17, 2025. https://sagroups.ieee.org/eiai/#:~:text=Scope%3A%20This%20standard%20defines%20a,other%20purposes%20like%20cloud%20services.
[17] Task Force on Climate-related Financial Disclosures (TCFD). *2023 Status Report* (September 13, 2023). https://www.fsb.org/uploads/P121023-2.pdf.
[18] IEEE Standards Association. "P7100 - Environmental Impacts of Artificial Intelligence Working Group." Accessed February 17, 2025. https://sagroups.ieee.org/eiai/#:~:text=Scope%3A%20This%20standard%20defines%20a,other%20purposes%20like%20cloud%20services.
[19] ISO - International Organization for Standardization. "Artificial Intelligence," accessed March 24, 2025. https://www.iso.org › sectors › it-technologies › ai https://www.iso.org/sectors/it-technologies/ai.

- **Mandating core metrics** – at minimum, total kWh and tCO_2 per major training run, using standardised calculation methods.
- **Pre-empting fragmentation** through high-level alignment, avoiding conflicting national rules.

Just as the TCFD created a global baseline for financial climate disclosures, this initiative could establish equivalent norms for AI's environmental impact – turning voluntary best practices into measurable, comparable reporting requirements.

By combining coordinated governance, targeted finance, and transparent metrics, this framework offers a plausible path forward – one where South Africa's AI ambitions need not come at the expense of its energy stability, and where Silicon Valley's breakthroughs align with Paris Agreement goals. Parallel agendas have been somewhat effective in the past but, going forward, a coordinated approach is essential – and the AI–energy twin transition must begin now.

T20 South Africa convenors

The Institute for Global Dialogue (IGD)

The South African Institute of International Affairs (SAIIA)

The Institute for Pan-African Thought and Conversation (IPATC)

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