SUSTAINABLE DATA CENTERS ROADMAP

TEXT BOX

Industry Initiatives

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Many large data center owners and operators have longstanding commitments to sustainability, including ambitious pledges to reduce greenhouse gas emissions and water use. Parallel to these corporate commitments, industry associations, such as The Green Grid, have advocated for and supported sustainable practices for many years.

Leading industry sustainability initiatives are summarized in Table 1.

A. Pledges and disclosures of major data center operators

Table 1 shows the pledges and disclosures of several leading hyperscalers and other major data center operators.

Water pledges are increasingly common, with most major hyperscalers targeting "water positive" status by 2030. Some report water usage effectiveness (WUE) at a fleetwide level, while others report at a facility level. Coverage is incomplete and inconsistent (three-fifths of data center operators surveyed in 2024 do not actively track water usage metrics), creating problems for estimating absolute water consumption, especially in water-stressed regions.[19,20]

E-waste receives less attention than greenhouse gas emissions or water use. Microsoft has a pledge to reuse or recycle 90% of servers and components by 2025 and to implement zero-waste data centers by 2030; Google pledges zero waste to landfill; and AWS notes sourcing hardware from reuse inventory where possible. As of 2025, none of the six major hyperscalers above have published publicly available up-to-date e-waste metrics at the facility-level.[1,2,9,16,18,21] Across the sector, fleetwide quantitative data on reuse, recycling and landfill diversion is missing for more than two-thirds of surveyed data center operators.[20]

The ambitious pledges from several hyperscalers with respect to renewable energy procurement, efficiency standards and water use have created ripple effects across the broader data center ecosystem. Most reporting is fleetwide rather than facility specific. Despite ambitious top-line pledges, progress on water use and e-waste reduction can be difficult to evaluate externally.

Table 1. Pledges and disclosures of leading data center owners and operators

■ Pledges (Successful) ■ Pledges (Ongoing) ■ Disclosure

	Greenhouse Gas	Energy	Water	E-Waste
Amazon/ Amazon Web Services (AWS)	■ Match all electricity w/100% renewable energy by 2025 (Achieved in 2023 and 2024)[1]	■ Disclosed fleetwide average PUE (1.15 in 2024)[1]	■ Water positive by 2030[1] ■ WUE: 0.15 L/kWh in 2024[1]	■ Source hardware from its own reuse inventory[1]
Microsoft	■ Carbon negative by 2030[2] ■ Eliminate historical emissions since 1975 by 2050[3]	■ Disclosed fleetwide average PUE (1.12 in 2024)[3]	■ Water positive by 2030 for direct operations[2] ■ Reduce data center WUE by 40% from its 2022 baseline by 2030[3] ■ WUE: 0.30 L/kWh in 2024[4]	■ Reuse or recycle 90% of servers and components by 2025[2] ■ Implement zero-waste data centers by 2030[2]
Google	■ 24/7 carbon-free energy by 2030[5] ■ Reduce absolute emissions (combining scope 1, 2, and 3) by 50% from its 2019 baseline[6]	■ Disclosed fleetwide average PUE (1.09 in 2024)[7]	■ Use air cooling in highly stressed watershed areas, which fail the responsible use threshold for water cooling[8] ■ Achieve 120% water replenishment by 2030[8] ■ Adopted Water Risk Framework in 2023[8]	■ Achieve zero waste to landfill from data center operations[8]
Meta	■ 75% reduction in operational greenhouse gases from 2017 baseline[9] ■ 42% reduction in Scope 1 and 2 emissions from 2021 baseline by 2031[9] ■ 100% renewable energy for all owned data centers by 2020[9,10] ■ Net zero emissions in Scopes 1-3 by 2030[11]	■ Disclosed fleetwide average PUE (1.08 in 2023)[12] ■ Facility-level reporting of electricity use[13]	■ Water positive by 2030[12] ■ Discloses facility-level water data; WUE: 0.18 L/kWh in 2023[12]	■ Recycled 91% of data center construction waste in 2023[12]
Equinix	■ 100% renewable energy by 2030[14] ■ Captures Scope 1-3 emissions[15]	■ Disclosed fleetwide average PUE (1.39 in 2024)[16] ■ Targets an average PUE of 1.33 by 2030[14]	■ WUE: 0.95 L/kWh in 2024[16] ■ Began disclosing fleetwide WUE in 2023[15]	■ Certify all centers to ISO 14001 e-waste standards by 2027[17] ■ Redeployed 86% of excess server hardware in 2024[17]
Digital Realty	■ Carbon neutrality in the European Union by 2030[18] ■ Reduce Scope 1 and 2 emissions by 68% from 2018 baseline per square foot[18] ■ Reduce Scope 3 emissions by 24% from 2018 baseline by 2030[18]	■ Improve PUE by 5% in North America and 3% in Europe annually (■ in 2023)[18]	■ Improve WUE by 5% in North America from 2023[18]	■ Disclosed 80% waste diversion in data center construction in 2024[18]

B. Industry associations and other initiatives

Industry consortia and international bodies have developed standards and targets to align data centers with global climate goals and other environmental objectives. Some of these have since been integrated into legally binding regulations.

- The Green Grid: Formed in 2007 as the first industry body to advocate for and support sustainable data center practices, The Green Grid developed and introduced standards to support data centers to improve efficiency, including power usage effectiveness (PUE), WUE and carbon usage effectiveness (CUE).[22-25] In 2016, these standards and others developed by The Green Grid were adopted by the International Organization for Standardization (ISO) as part of ISO/IEC (International Electrotechnical Commission) 30134.[26]

- International Telecommunications Union (ITU) - Best Practices for Green Data centers: The ITU, with its mandate from member states as the specialized telecommunications agency of the United Nations, has developed a set of non-binding recommendations for developing green data centers.[27]

- EU Code of Conduct (CoC) for Data center Energy Efficiency: Launched in 2008 by the European Commission's Joint Research center, the CoC addresses rising data center energy use by targeting information technology (IT) load (equipment power) and facilities load (supporting systems).[28] It helps operators assess performance and set time-bound improvement targets. The goal of the CoC was to support data centers to achieve voluntary EU-set targets on efficiency. Companies join as Participants (implementing the CoC) or Endorsers (promoting it).

- Climate Neutral Data Center Pact (CNDCP): The CNDCP is a European industry-led agreement aligning with the EU's Green Deal, representing more than 85% of the EU's data center capacity.[29] Originally set up as a way to support data centers to become more energy efficient by setting targets and standards, since 2025 the CNDCP has abolished its own standards and instead now focuses on supporting regulators to set effective targets to reach the goal of climate-neutral data centers by 2030.[30] Members are now expected to report against EU standards.

- iMasons Climate Accord (ICA): The ICA is a voluntary industry coalition that develops standards and guidelines to support the industry in reporting carbon in data center power, materials and equipment.[31] The ICA has also developed a maturity model to support participating companies in improving sustainability. In particular, the ICA has provided a standardized carbon accounting framework, including Scope 3 and embodied emissions in data center materials and IT equipment, through spend-based embodied carbon accounting.

- LEED (US)/BREEAM (UK) certifications: LEED (US) and BREEAM (UK) are private organizations that have developed green building standards applied to data centers worldwide.[32] In a 2019 survey, data center professionals had much lower awareness of LEED and BREEAM than they did of the EU CoC.[33]

- Institute of Electrical and Electronics Engineers (IEEE) P7100 Environmental Impacts of Artificial Intelligence (AI) Working Group: According to the IEEE website, the P7100 standard "defines a measurement framework for reporting environmental indicators for training models and deriving inference on AI systems. This includes harmonized measurements of compute intensity (e.g., energy use) with associated environmental impacts (e.g., carbon dioxide (CO_2) emissions or water consumption).[34]

Recommendations

1. *Industry consortia and standards bodies should **provide technical support to small and medium operators** to assist with adopting and implementing sustainability pledges.*

2. *Data center owners and operators should **adopt third-party auditing of sustainability pledges as standard protocol** to enhance stakeholder confidence in reporting on sustainability pledges.*

3. *Financial institutions should **tie financial support to sustainability performance and disclosures**.*

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