

Sector brief

UN
environment
programme



finance
initiative

Principles for
Responsible Banking

Data Centres and AI Services

October 2026

Disclaimers

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Mention of a commercial company or product in this document does not imply endorsement by the United Nations Environment Programme or the authors. The use of information from this document for publicity or advertising is not permitted. Trademark names and symbols are used in an editorial fashion with no intention on infringement of trademark or copyright laws.

The views expressed in this publication are those of the authors and do not necessarily reflect the views of the United Nations Environment Programme. We regret any errors or omissions that may have been unwittingly made.

© Maps, photos and illustrations as specified

Suggested citation: United Nations Environment Programme Finance Initiative (2026). *Data Centres and AI Services: Sector Brief*. Geneva.

Production: United Nations Environment Programme Finance Initiative

Cover photo: unsplash.com/photos/a-blue-background-with-many-lines-and-dots-X9Ev6PPCtqA



Acknowledgements

Lead authors

Alice Anders, Johanna Dichtl

Contributing authors

Magdalena Garcia Elorrio, Esther Tsang

UNEP FI reviewers

Careen Abb, Mia Brinkmann, Aaron Cantrell, Gabriel David, Wendy Dobson, Sarah Kemmitt, Cate Lamb, Puleng Ndjwili-Potele, Joana Pedro, Gary Power, Kavita Sachwani, Jessica Smith, Paul Smith

External reviewers

Polina Koroleva and Rocio Soledad Garcia (UN Environment Programme), Ioana Tuta (Danish Institute for Human Rights), Stephanie Seale and Benjamin Pitler (UN B-Tech Project, OHCHR), Dan Saccardi (Ceres), Eva Meyer (MSCI).

This brief draws on discussions with member banks in the data centres and AI workstream of the PRB Client Engagement Worktrack.



Abbreviations and acronyms

AI	artificial intelligence
BGS	British Geological Survey
CPU	central processing unit
CRD	Capital Requirements Directive
CRR	Capital Requirements Regulation
CSDDD	Corporate Sustainability Due Diligence Directive
CSRD	Corporate Sustainability Reporting Directive
DRC	Democratic Republic of the Congo
E&S	environmental and social
EBA	European Banking Authority
EP	Equator Principles
ESG	environmental, social, and governance
ESRS	European Sustainability Reporting Standards
EU	European Union
GDFA	Green Digital Finance Alliance
GPU	graphics processing unit
GW	gigawatt
GWP	global warming potential
H&IE	healthy and inclusive economies
IEA	International Energy Agency
IFRS	International Financial Reporting Standards
ILO	International Labour Organization
ISSB	International Sustainability Standards Board
IT	information technology
ITU	International Telecommunication Union
MW	megawatt
OECD	Organisation for Economic Co-operation and Development
PAI	principal adverse impacts
PFAS	per- and polyfluoroalkyl substances
PPA	power purchase agreement
PRB	Principles for Responsible Banking
PUE	power usage effectiveness

REC	renewable energy certificate
REIT	real estate investment trust
SFDR	Sustainable Finance Disclosure Regulation
SME	small and medium-sized enterprise
SPV	special purpose vehicle
TNFD	Taskforce on Nature-related Financial Disclosures
TWh	terawatt hour
UN	United Nations
UNCTAD	UN Trade and Development
UNEP	United Nations Environment Programme
UNEP FI	United Nations Environment Programme Finance Initiative
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNGPs	UN Guiding Principles on Business and Human Rights
UNITAR	United Nations Institute for Training and Research
US\$	United States dollar
WBA	World Benchmarking Alliance
WEF	World Economic Forum
WUE	water usage effectiveness



Glossary

AI factory	A hyperscale facility built for AI training and inference, typically liquid cooled.
Campus	A site with several data centre buildings sharing power, water, cooling, and network infrastructure, often with different owners, operators, and tenants across the buildings.
Circular economy	Production and supply chains that use resources efficiently and keep materials in use, through reduced raw material use and waste by design, reuse, repair, refurbishment, remanufacturing, and recycling. For data centres this means longer hardware lifetimes, resale and recovery of servers and chips, and formal end-of-life treatment rather than disposal.
Colocation	A facility whose operator provides space, power, and cooling to several tenants, who install and run their own computing equipment. The operator controls the building and the cooling. The tenants control the IT load.
Compute	Computing capacity: the processing power available to train and run models, measured in hardware, chip hours, or energy. Demand for compute drives data centre construction.
Conditions precedent	Requirements a borrower must satisfy before a loan can be drawn, such as permits in hand, insurance in place, or an environmental and social assessment completed.
Covenant	A promise in loan documentation to do or not do something for the life of the loan, for example to report emissions annually or to maintain a permit. Breaches give the lender contractual rights.
Data localization	A legal requirement that certain data be stored and processed within national borders.
Deployer and provider	Under the EU AI Act, a provider develops an AI system or model and places it on the market or puts it into service under its own name. A deployer uses it under its own authority. A bank that develops a credit scoring model is a provider. A bank that buys one and runs it is a deployer.
Direct and indirect impact	An impact is direct where it arises in a company's own operations and indirect where it arises upstream or downstream in its value chain. The Sector Impact Matrix tags each likely impact with the value chain segment it arises in. The Systemic and higher-order effects chapter uses direct and indirect in UNEP's sense, by causal distance from AI use.
Do no significant harm	The EU Taxonomy test that an activity contributing to one environmental objective must not significantly harm any of the other five. For data centres the criteria attach climate adaptation, water, and circular economy conditions to Taxonomy alignment.

Dual-use technology	Technology with both civilian and military or security applications, such as facial recognition or targeting systems. Human rights risk is higher where these are deployed in conflict-affected areas.
E-waste	Discarded electrical and electronic equipment, including servers, storage, and network hardware.
Financed emissions	The share of a client's or project's greenhouse gas emissions attributed to a bank in proportion to its financing.
Financial materiality	Whether a factor, internal or external, might affect an organization's financial performance and value.
General-purpose AI model	An AI model, such as a large language model, trained on large amounts of data that can perform a wide range of tasks and be built into many downstream systems. Providers have had documentation, copyright, and energy-use obligations under the EU AI Act since August 2025.
Green bond	A bond whose proceeds are ring-fenced for defined eligible investments, such as renewable power or efficient cooling. Unlike a sustainability-linked instrument, it constrains what the money is spent on, not the borrower's overall performance.
Grievance mechanism	A channel through which workers, communities, or other affected people can raise concerns and seek remedy.
Healthy and inclusive economies	One of the four PRB priority areas, covering financial health and inclusion, decent work, gender equality, affordable housing, circular economy, and inclusive growth, and the structural conditions these depend on. In the Impact Radar the closest topics are under Society: income and wealth, economic health and security, and resilience.
Higher-order effects	The wider consequences of widespread AI use across an economy, such as changes in total resource demand, labour markets, consumption, or information flows, as distinct from the direct footprint of any one facility or service.
Hourly clean-power matching	Matching a facility's electricity consumption with clean generation in every hour, on the same grid, rather than offsetting annual consumption with certificates bought anywhere. Also called 24/7 carbon-free energy.
Hyperscaler	One of the largest cloud and platform companies, such as Amazon, Microsoft, Google, and Meta, which build and operate data centres at very large scale and also lease colocation capacity. The brief uses hyperscaler for the company and hyperscale for the facility type.
Impact analysis	The PRB requirement that a bank identify the most significant positive and negative impacts of its portfolio on people, society, and the environment, as the basis for setting targets. The Impact Radar and the Sector Impact Matrix are UNEP FI tools that support it.
Impact materiality	Whether an organization's activities have significant effects on people, society, and the natural environment, regardless of whether those effects affect its finances. Impact and financial materiality start from different questions but are linked: a negative impact can become a financial risk, and the link can change over time.

Impact Radar	UNEP FI's structured list of sustainability topics, used across its resources so that impacts are named consistently.
Inference	Running a trained model to answer a request. A small cost each time, repeated across every user, so inference demand grows with adoption and usually runs close to users. See training.
Intensity metric	Resource use or emissions per unit of output, such as energy per query or emissions per unit of revenue. Intensity can fall while absolute use rises.
IT load	The computing, storage, and network equipment in a facility and the electricity it draws. Power usage effectiveness and water usage effectiveness are both expressed relative to it.
Just transition	Managing the effects of economic change on workers and communities so that the costs do not fall on those least able to absorb them, through social dialogue, social protection, and reskilling.
Leverage	The ability of a business to effect change in the wrongful practices of another party that is causing or contributing to an adverse human rights impact. The term used by the UN Guiding Principles and the UNEP FI Human Rights Toolkit. The brief uses influence elsewhere. If leverage is limited, a bank should look for ways to increase it.
Location-based and market-based emissions	Two ways of reporting Scope 2 emissions. Location-based uses the average emissions of the grid the facility physically draws from. Market-based uses the contracts the operator holds, such as power purchase agreements and renewable energy certificates, and can show a fall while the location-based figure rises.
Physical climate risk	Risk from climate hazards to an asset and its dependencies, whether acute (flood, storm, heat wave) or chronic (rising temperatures, water scarcity).
Power usage effectiveness (PUE)	Total facility energy divided by IT equipment energy. A PUE of 1.5 means the facility uses 50 per cent more energy than its computing equipment alone. It measures overhead, not carbon: the same PUE on a coal grid and on a hydro grid produces very different emissions.
Project finance	Funding in which the lender looks primarily to the revenues of a single project as the source of repayment and security.
Rack density	The power drawn, and heat produced, by one rack of servers, in kilowatts. The power density of AI servers rose elevenfold between 2020 and 2025, which is why cooling requirements exceed older benchmarks.
Real estate investment trust (REIT)	A listed company that owns income-producing property and distributes most of its income to shareholders. Several large colocation operators are structured this way, so they typically borrow at group level, against many sites.
Rebound effect	When efficiency gains lower the cost of a service and so raise total use of it, eroding or reversing the resource saving. Efficiency gains in AI may not offset rising demand for this reason.
Remedy	The process and the outcome that seek to restore human dignity after an adverse impact, through compensation, restitution, apology, or guarantees of non-repetition.

Scope 1, 2, and 3	Scope 1 is a company's direct emissions, for example from backup generators and refrigerant leaks. Scope 2 is emissions from purchased electricity, heat, and cooling. Scope 3 is all other emissions in the value chain, including manufacturing the servers and disposing of them.
Sector Impact Matrix	UNEP FI's mapping of the likely positive and negative impacts of each economic sector against the Impact Radar topics, showing for each impact the affected parties, the driver, and the value chain segment it arises in.
Severity	The measure by which human rights impacts are prioritized, assessed on scale (the gravity of the harm), scope (how many people are affected), and irremediable character (how far the harm can be put right).
Sustainability-linked loan	A loan whose pricing moves with the borrower's performance against agreed sustainability targets, such as PUE or WUE. Proceeds are unrestricted.
Training	Building a model by processing very large datasets. Compute-intensive but time-limited, and flexible about where it runs, so it can be scheduled where power is clean or cheap. See inference.
Transition risk	Financial risk arising from the shift to a lower-carbon economy: tighter regulation, changing markets and technology, and reputational pressure. For data centres it takes the form of connection conditions, efficiency mandates, and the capital needed to meet targets.
Value chain segment	Where in the chain an impact arises: upstream (suppliers, extraction, manufacturing), midstream (the facility and its operation), or downstream (customers and end use). Figure 1 applies these segments to the sector. Upstream covers minerals, hardware manufacturing, construction, and power. Midstream covers hardware supply, data centre operation, and compute provision. Downstream runs from data sourcing to end use. Hardware end of life applies across all three.
Water usage effectiveness (WUE)	Litres of water consumed on site per kilowatt hour of IT load. It captures facility cooling water only. The water used at the power stations that supply the facility is excluded, and in the United States this is around 75 per cent of the total.

Contents

Acknowledgements	iii
Abbreviations and acronyms	iv
Glossary	vi
Executive summary	xi
Introduction	1
1. Market overview	4
Growth and market dynamics	4
Market structure	5
Facility and client types	6
Geographic distribution	6
Financing structures	7
Financial risk considerations	10
Applying the sector brief across the financing lifecycle	11
2. Sustainability profile of data centres	13
Climate and energy access: power demand	17
Water: demand and cooling	18
Land, biodiversity and equality: siting and land acquisition	18
Decent work: construction and subcontracting	20
Circular economy: hardware, from minerals to e-waste	20
Pollution and health: local emissions	21
Climate adaptation: physical risk and resilience	21
Where banks can act	22
3. Sustainability profile of AI services	26
Climate, water and resource efficiency: compute demand	31
Decent work and digital safety: data work	31
Equality: bias and unequal access	32
Digital and physical safety and security: downstream use and misuse	32
Employment: effects on work and labour markets	33
Sector diversity and healthy economies: market concentration and dependency	33
Opportunities for advancing positive sustainability outcomes through responsible AI	34
Where banks can act	35
4. Systemic and higher-order effects	38
5. Regulatory and policy considerations	41
Client regulation: data centres	41
Client regulation: due diligence for operators and AI providers	45
Client regulation: AI services	45
Bank regulation: sustainable finance	46
Annex	48
How data centres and AI services work	48
Coverage of the Sector Impact Matrix for cloud computing	54
References	56

Executive summary

Rising demand for artificial intelligence (AI) and other digital services is driving investment in data centres, creating financing opportunities and risks for banks. Demand for computing capacity, or compute, requires investment in data centre facilities, power connections, cooling systems, hardware, and associated infrastructure. Electricity demand from data centres is projected to nearly double by 2030 (IEA 2026). New capacity is also increasingly constrained by grid access, electricity supply, water, land, planning consent, community acceptance, physical climate risks, infrastructure resilience, and insurance availability and cost (IEA 2026). These constraints can affect whether projects proceed, when they become operational, what they cost, and how reliably they generate revenue.

Sustainability impacts arise across the data centre and AI services value chain, from site selection and construction through power, cooling, and water use to hardware production and end-of-life management, as well as from the AI services that shape demand for compute. This brief considers these sustainability topics mapped against the Principles for Responsible Banking (PRB) priority areas: climate, nature, human rights, and healthy and inclusive economies.

Banks should seek to identify and address material environmental and social impacts connected to their financing, alongside managing the financial and other risks arising from them. The extent to which a bank can assess or influence these impacts and risks depends on the client, the financing structure, and the contractual rights available to it.

The sector also presents financing, advisory, and engagement opportunities. These may include projects that improve resource efficiency, extend hardware life, or deliver demonstrable social and environmental benefits through AI services. Such benefits should be defined and evidenced rather than assumed from a project's technology or intended purpose.

Project finance generally provides greater scope for site-level due diligence and financing conditions, while corporate and portfolio lending may provide stronger routes for client-wide engagement. In some cases, influence will remain indirect, particularly where outcomes depend on utilities, public infrastructure, tenants, customers, or upstream suppliers.

The implications for banks differ between physical data centre infrastructure and the AI services that drive demand for compute.

For data centres, the main sustainability topics are related to energy demand and power supply, water, land use and siting, labour and decent work, circular economy, pollution, physical climate risk and resilience, and human rights across construction and supply chains.

Table 1: Summary of sustainability topics related to data centre infrastructure, and implications for clients and banks.

Sustainability topic	What it means for the client	What a bank can do
Climate and energy access: power demand	Connection timing, capex for decarbonization that may not yet be funded, energy costs, efficiency considerations, renewable procurement	Finance clean power, grid, and efficiency; link sustainability-linked terms to what the site draws
Water: demand and cooling	Permits and operating continuity in water-stressed areas, replenishment claims, cooling water, local community engagement	Screen on local water stress; finance alternative water supply and efficient cooling
Land, biodiversity and equality: siting and land acquisition	Permits, community consultation, delays, and litigation	Engage early on siting and consultation; free, prior and informed consent where Indigenous Peoples' land or resources are affected, before financial close
Decent work: construction and subcontracting	Labour risks, particularly in subcontracting chains and for migrant workers	Labour standards in construction contracts; lower-carbon construction
Circular economy: hardware, from minerals to e-waste	Recurring capex and residual value; supply chain abuses; e-waste; embodied carbon	Supply chain due diligence; finance recovery, reuse, and formal end-of-life treatment
Pollution and health: local emissions	Permits, enforcement, and community health	Air and discharge controls in the environmental and social assessment; finance pollution controls
Climate adaptation: physical risk and resilience	Resilience of the facility and its supporting infrastructure; insurance cost and availability	Price physical risk site by site; finance resilience

For AI services, attention shifts towards the decisions that drive compute demand and resource use, human rights risks associated with AI development and deployment, and workforce, access, and distributional effects. Six sustainability topics arise from these: compute demand and resource efficiency, data work, bias and unequal access, downstream use and misuse, effects on work and labour markets, and market concentration and dependency.

Table 2: Summary of sustainability topics related to AI services, and implications for clients and banks.

Sustainability topic	What it means for the client	What a bank can do
Climate, water and resource efficiency: compute demand	Resource demand that grows with adoption; footprint figures without a common basis	Ask for training and inference footprints and where compute runs; finance computational efficiency
Decent work and digital safety: data work	Harm to outsourced labelling and moderation workers; privacy and copyright exposure in training data	Standards that cover outsourced workers; finance local data and language capability
Equality: bias and unequal access	Discriminatory outcomes in decisions on credit, employment, and essential services; uneven reach across languages and markets	Bias testing and routes to challenge decisions; finance services in underserved languages
Digital and physical safety and security: downstream use and misuse	Liability and reputational exposure from surveillance, targeting, and other high-risk uses	Ask how misuse is restricted, monitored, and acted on; evidence of safeguards
Employment: effects on work and labour markets	Changing mix of tasks in the client's workforce and its customers'	Engage on workforce transition; assess portfolio exposure to task substitution
Sector diversity and healthy economies: market concentration and dependency	Dependence on a small set of compute, model, and hardware providers	Assess security of access to compute; review clients' policy positions; finance hardware recovery

What a bank can do depends on the type of financing. Conditions and covenants are realistic mainly in project finance and some portfolio structures, while engagement and disclosure are the main tools in general corporate debt and bond underwriting. Table 4 sets out the routes.

Sustainability constraints can also create financing and advisory opportunities where addressing them requires investment, changes project economics, or creates demand for new products and services. A positive impact claim is more credible where the outcome would not have occurred without the financing, where it is measurable against an agreed indicator, and where the intent is embedded in the structure through use of proceeds, a key performance indicator, or a covenant. A bank's exposure, however, does not necessarily give it influence over the relevant outcome.

The appropriate response depends on the transaction, the client's role, and who controls the relevant decision. To address sustainability impacts, banks can use information requests, engagement, financing conditions, and, where appropriate, escalation. If direct influence is limited, portfolio level analysis and collaborative approaches may be more relevant. For human rights, prioritization follows the severity of the impact on people rather than financial materiality, including where the bank's influence is limited. The brief identifies sustainability impacts and sets out where banks can credibly assess and influence them.



Introduction

Who this brief is for

This brief gives sustainability, environmental and social risk, sustainable finance, and credit and coverage teams at PRB signatory banks a common view of the data centre and AI services sector. It is intended to support client engagement, high-level transaction screening, portfolio and risk analysis, and sector strategy and policy.

This brief provides guidance. It does not set binding rules for signatory banks or create obligations beyond the applicable law or regulation. The brief does not replace transaction-level due diligence. It focuses on the issues that banks can address through client relationships and financing structures. Where a transaction falls within the scope of a more detailed project finance framework,¹ that framework should be applied alongside this brief.

What the brief covers

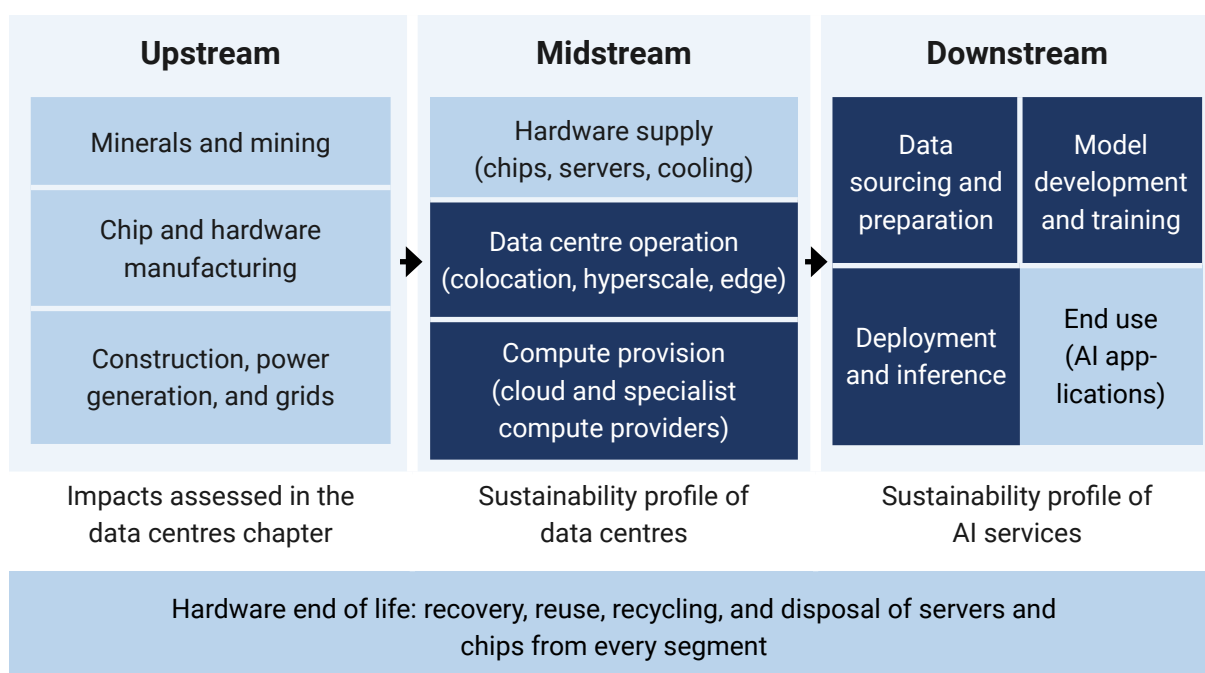
The brief covers the following parts of the value chain and considers systemic and higher-order effects where they arise at portfolio or strategy level:

- data centre facilities and infrastructure directly connected to their construction and operation;
- hardware procurement, refresh, recovery, reuse, and end-of-life management where these activities are closely connected to the facilities;
- companies that operate or contract for dedicated computing capacity; and
- companies that train, host, or run AI models commercially using dedicated computing capacity.

The brief discusses these parts of the value chain through the four PRB priority areas: climate, nature, human rights, and healthy and inclusive economies. Circular economy is a topic in its own right for data centres, and just transition considerations are included where they clarify a material impact or opportunity.

The brief uses one value chain throughout (Figure 1). Companies in data centre operation, compute provision, and the first three downstream stages (data sourcing and preparation, model development and training, and deployment and inference) are covered as clients. Impacts that arise upstream, in hardware supply, in end use, and at hardware end of life are also assessed, although the companies there are not the subject of the brief. The data centres chapter covers the upstream and midstream segments and the AI services chapter covers the downstream segment.

¹ The Equator Principles Association's guidance for data centre projects sets out the transaction-level recommendations (EP 2026) and may be used alongside this brief. The two are intended to complement each other.



■ Companies the brief covers as clients ■ Impacts assessed, but companies not covered as clients

Figure 1: The data centre and AI services value chain used in this brief. Source: UNEP FI internal work.

The sustainability profile of a data centre is shaped in part by decisions made in adjacent industries. Four adjacent activities appear throughout this brief without being its primary subject:

- Power generation, where grid carbon intensity and the generation mix determine a facility's real-world carbon and water footprint from purchased electricity, and grid connection timelines are a primary constraint on where new capacity can be built in several major markets;
- Hardware supply chains, from critical mineral extraction and semiconductor fabrication to server assembly and end-of-life management, where relevant environmental and social impacts arise;
- Telecommunications, where access to fibre infrastructure influences siting decisions; and
- Water and wastewater utilities, where municipal supply and treatment networks determine how much a facility can draw and return, so utility capacity can constrain siting.

What this brief does not cover

- End-user hardware, including laptops, smartphones, and servers purchased by individual companies for their own offices;
- Software companies and use of third-party cloud or AI services without operating or contracting for dedicated computing capacity;
- Construction firms that build the shells of data centres but do not operate them;
- Quantum computing, which is not yet deployed at commercial scale in this sector;
- Ocean and marine environments, including subsea cables and offshore facilities; and
- Orbital and space-based data centres, which are not yet deployed at commercial scale.

How to read the brief

The brief can be used at different stages of the financing lifecycle. The list below indicates which parts are most relevant to each use.

- **Market overview:** understand the client, the asset, and the bank's exposure when assessing transactions or portfolios. [Credit and coverage; portfolio and strategy teams]
- **Financing structures:** judge how much influence the bank may have in a particular transaction and where influence can be built. [Environmental and social (E&S) risk; credit and coverage teams]
- **Sustainability profiles of data centres and AI services:** identify the most relevant impacts, risks, and questions for risk assessment and due diligence. [E&S risk; sustainable finance teams]
- **Systemic and higher-order effects:** identify concentration, correlated dependencies, and strategic priorities. [Portfolio, strategy, and policy teams]
- **Regulatory and policy considerations:** understand regulatory, taxonomy, and sustainable finance developments. [Sustainable finance; policy and strategy teams]

How the brief is applied will depend on, among other factors, the client's role, the financing structure, and the jurisdiction. Banks may also wish to apply more detailed environmental, social, or human rights frameworks in their decision-making.²

² These include the UN Guiding Principles on Business and Human Rights (UNGPs), the OECD Guidelines for Multinational Enterprises on Responsible Business Conduct, the ILO Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy, International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability, and the Equator Principles.

1. Market overview

Technical terms are defined in the Glossary. The Annex gives a concise explanation of how data centres and AI services work and the metrics commonly used.

Growth and market dynamics

Data centres³ are a rapidly growing infrastructure sector. AI is the largest current source of growth, and capital expenditure by the largest technology companies exceeded US\$ 400 billion in 2025 (IEA 2026).

AI growth is leading to larger, more capital-intensive facilities, with higher rack densities, more demanding cooling, and larger grid connections. AI-focused data centres are about 10 times more capital-intensive than an aluminium smelter (IEA 2025). Data centre electricity demand is projected to nearly double from about 485 TWh in 2025 to roughly 950 TWh by 2030. Within that, demand from AI-focused data centres is expected to triple over the same period (IEA 2026).

New capacity is increasingly constrained by power and grid access, land, planning and permitting, fibre, water, and equipment supply (IEA 2026). Overcoming these constraints requires additional investment in infrastructure, including grid capacity, power supply, connectivity, and water systems, as well as measures to improve the resilience of new and existing facilities. These constraints create new financing needs as well as risks.

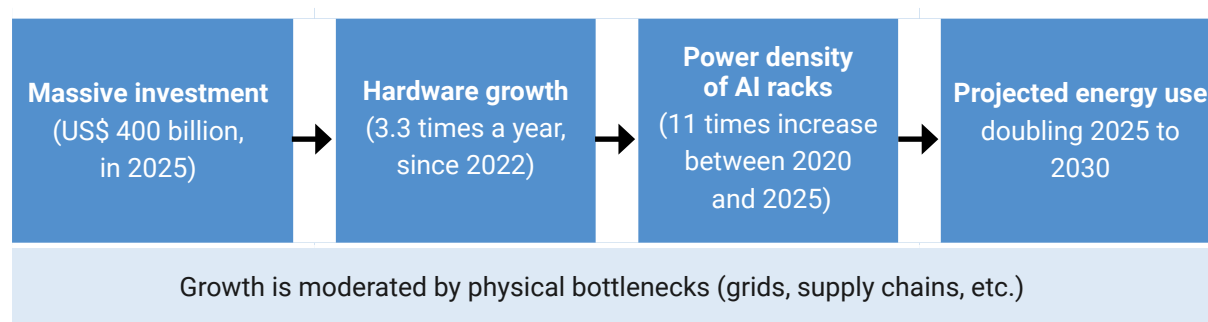


Figure 2: Demand drivers, physical constraints, and financing implications in the data centre sector. Source: UNEP FI internal work, based on IEA 2026; Sajadieh and Fattorini 2026; UNCTAD 2025.

3 For an explainer on how data centres connect to the impacts discussed throughout this brief, see the Annex on page 48.

Market structure

Data centres are part of a wider set of interconnected value chains spanning hardware, power, connectivity, cloud and compute provision, AI model development, and applications (Figure 3) (WBA 2025). Some firms specialize, while others operate across several parts of these value chains.

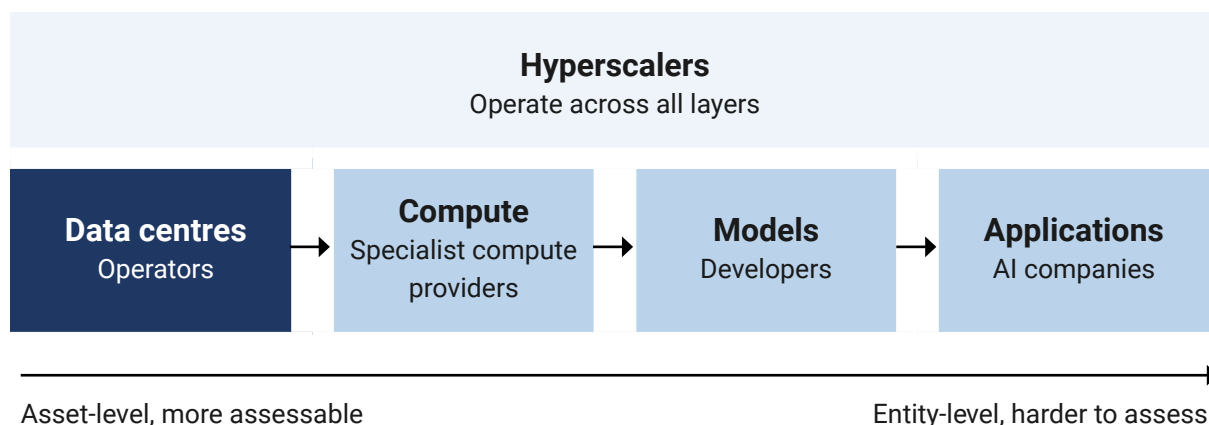


Figure 3: The types of counterparties by segment of the value chain. Source: UNEP FI internal work, based on Sajadieh and Fattorini 2026.

The main distinction is between the physical infrastructure that houses computing equipment and the services that use that equipment. A data centre operator may provide the facility, while a tenant or separate compute provider supplies and operates the computing equipment.

Table 3: The data centre and AI services value chain: functions and typical counterparties. Source: UNEP FI internal work, based on EP 2026; IEA 2026; WeLoop 2020.

Value chain segment	What it provides	Typical companies / counterparties
Data centre operations*	Space, power, and cooling	Colocation operators; hyperscalers operating owned or leased sites; telecoms firms; enterprises
Compute provision	Processing capacity, often using specialized chips	Cloud providers; specialist compute providers; hyperscaler cloud businesses
Model development and training	Trained models for various uses	Model developers and technology companies
End use (AI applications)	Products and services built on models, often without owning hardware	Banks, enterprises, and software companies

*The following section breaks these down further.

Cloud infrastructure provision is concentrated. Amazon Web Services, Microsoft Azure, and Google Cloud together held 63 per cent of global enterprise spending on cloud infrastructure services in the third quarter of 2025, with Oracle and specialist compute providers gaining share (Synergy 2025).

Facility and client types

Facility types describe the physical infrastructure. Client and business models describe the companies or entities involved. These dimensions overlap. For example, a hyperscaler may own a hyperscale site, lease colocation capacity, and contract with a specialist compute provider. For banks, the key questions are who owns and operates the asset, who controls the IT load, and who finances it.

Facility types

- **Hyperscale⁴ facilities** are very large sites typically built or operated for hyperscalers or other major compute users. They are increasingly being designed for AI workloads.
- **Colocation** facilities provide space, power, and cooling to multiple tenants, including hyperscalers, enterprises, and digital platforms. Long-term tenant contracts can support infrastructure financing.
- **Edge** facilities are smaller, distributed sites close to users or industrial processes, often embedded in telecoms or other digital infrastructure exposures.
- **Enterprise** and sovereign facilities are primarily used by a single company or public-sector entity, where security, operational control, or data localization requirements are material.

Client and business models

- **Hyperscalers** can span several parts of the value chain, combining data centre ownership or operation with cloud services, models, and applications.
- **Colocation operators, specialist compute providers, enterprises, telecoms firms, and infrastructure owners** may each appear as counterparties to a data centre transaction.

Geographic distribution

Local conditions increasingly shape where new data centre capacity can be built. Access to electricity and grid capacity, land, water, fibre, and planning and permitting capacity are key constraints (IEA 2025). Figure 4 shows the projected data centre energy consumption in TWh broken down by region.

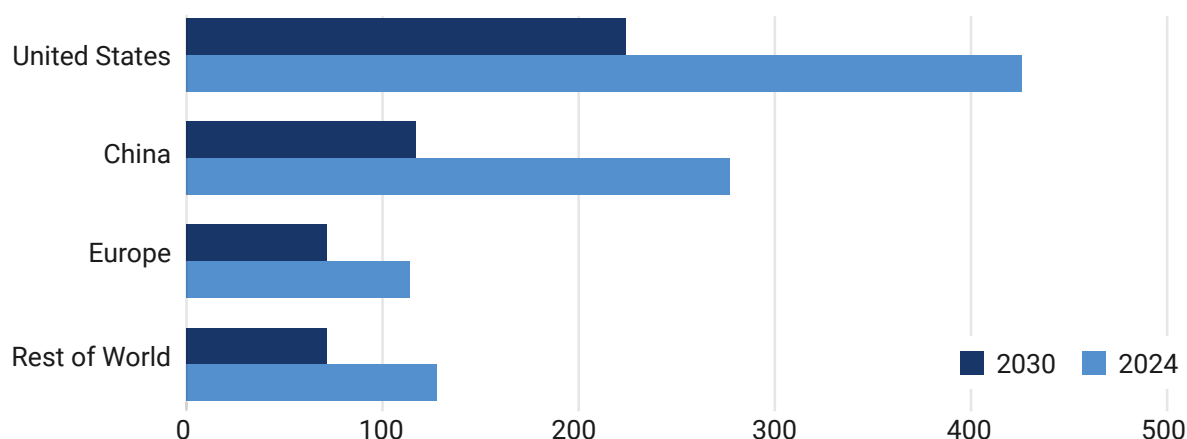


Figure 4: Projected data centre electricity consumption by region in TWh. Source: IEA 2025.

4 A note on terminology. This brief uses hyperscaler for the company and hyperscale for the facility type, which could also be built by a colocation operator.

The United States accounted for almost half of global data centre electricity use in 2024, followed by China (around 25 per cent) and Europe (around 15 per cent) (IEA 2025). In Ireland, data centres accounted for 23 per cent of total metered electricity consumption in 2025, up from five per cent in 2015 (CSO 2026). This has intensified scrutiny of the sector's effects on the wider energy system and has led to stricter connection requirements or pauses on new grid connections. Grid constraints are contributing to delays in major markets in the United States, including Northern Virginia and Texas (IEA 2026). These are discussed in more detail in the Regulatory and policy considerations chapter.

By contrast, some markets classify data centres as strategic or critical infrastructure (UNCTAD 2025). Such designations can influence permitting priority, grid access, public support, and regulatory oversight, but their practical effects vary by jurisdiction.

Outside the established markets, new clusters are forming across Southeast Asia, the Middle East, Latin America, and Africa. These markets may offer access to growing digital demand, land, and energy resources, or public-sector development incentives. Projects in these markets often face tighter constraints around grid reliability, permitting, water availability, connectivity, and infrastructure readiness (IEA 2026).

China's regulatory, ownership, and financing environment differs materially from the principal internationally financed data centre markets. This limits direct comparability of capacity and investment data, although developments remain relevant to global hardware supply chains and technology markets.

Financing structures

Financing structure determines both a bank's financial exposure and the extent to which it can influence sustainability outcomes. The relevant route depends on the client's role, how the asset is owned and operated, which cash flows repay the exposure, and who controls the outcome the bank may wish to address.

A single campus can involve several parties: a corporate borrower, a property owner, an operator, tenants, a special purpose vehicle (SPV), and separately financed power, water, or network assets (EP 2026). Ownership of the building is not the same as control. For each material outcome, the bank should identify who actually decides it.

Banks participate as lenders, arrangers, and underwriters across corporate facilities, bonds, project finance, bilateral and syndicated lending, and financing for associated infrastructure. The main types of financing below are grouped by how directly a bank can influence site-level outcomes.

Table 4: Main types of financing and what they may mean for a bank. Source: UNEP FI internal work, based on EP 2026; IEA 2026.

Type of financing	Typical borrower / repayment base	What the bank can usually assess or influence	Further points to consider
General corporate debt and bond underwriting	Hyperscalers and large technology firms; group cash flow	Group-level strategy, disclosure, and reporting	Banks may arrange or underwrite bonds, while institutional investors typically hold them; site-level conditions are usually limited
Portfolio or whole business lending	Colocation operators and real estate investment trusts (REITs); portfolio cash flow	Portfolio-wide data, targets, and investment programmes	Individual sites may have different tenants, designs, and contractual controls
Single-site project finance	SPV or campus; contracted project revenues	Site diligence, conditions precedent, covenants, and monitoring	The owner or SPV may not control tenant IT load, power procurement, or operating decisions
Contract- and collateral-backed lending	Specialist compute provider; customer contracts and/or hardware collateral	Contract concentration, collateral, refresh assumptions, and customer quality	Hardware may depreciate rapidly; risk can resemble venture or asset-backed credit
Separate project or corporate finance	Utility, independent power producer, municipality, or infrastructure sponsor; regulated or contracted revenues	Asset-specific diligence and conditions	The asset may be essential to the campus but financed separately from it

The sections below examine the main types of financing described in Table 4. Corporate and whole business financing provide primarily client- or group-level influence. Single-site project finance provides the clearest asset-level route. Contract- and collateral-backed lending and separate project or corporate finance illustrate important indirect exposures.

General corporate debt, bond underwriting, and whole business lending

Group-level financing generally gives the bank less site-level influence but can provide a route to group-wide disclosure, targets, and engagement.

Large hyperscalers and technology firms traditionally funded expansion through internal cash, but AI infrastructure pushed them to borrow in capital markets (IEA 2026). In 2025, these companies issued roughly US\$ 200 billion in debt (IEA 2026). A bank involved in the transaction can seek group-level disclosure through annual or sustainability reports and through reporting covenants, but typically has limited visibility or influence (EP 2026).

Whole business lending is a claim on a group of the borrower's assets rather than on a single facility. Colocation operators and REITs use corporate debt, revolving facilities, bonds, and green or sustainability-linked instruments. These structures can support client-wide targets, but may not allow a lender to prescribe requirements for one facility. Examples of instruments include:

- **Green bonds:** use of proceeds can be linked to defined eligible investments, such as renewable power or efficient cooling.
- **Sustainability-linked loans:** pricing can be linked to key performance indicators such as power usage effectiveness (PUE) or water usage effectiveness (WUE), but proceeds are unrestricted and apply to the borrower's whole business (UNEP 2025a; GDFA 2025).

Material obligations are often held in leases, guarantees, and SPVs. The largest cloud firms have also committed capacity through long-term leases, as Meta did for its Hyperion campus, creating dependencies on specific landlords, campuses, and associated facilities (Meta 2025).

When a bank lends to a hyperscaler's parent company, it is exposed to the whole business. Engagement with a large technology company generally covers both the data centre asset and the AI business, including model governance, privacy, bias, and whether the model's decisions can be explained.

Single-site project finance

Single-site project finance is the clearest case where a bank can tie conditions to the asset. Repayment comes from one campus and contracted income. The lender is exposed to the site's electricity source, water use, land footprint, and construction arrangements. This is where banks can write environmental and social requirements directly into loan documents (EP 2026).

Contract- and collateral-backed lending

Specialist AI compute providers such as CoreWeave, Nebius, and Lambda are often financed through private credit and equity, with debt secured against chips or customer contracts (CoreWeave 2026). For banks, this creates additional risk because these assets can lose value quickly as technology changes (IEA 2025).

Some new capacity is also being financed through separate vehicles, often backed by private credit. For example, Meta developed its Hyperion campus through a joint venture with funds managed by Blue Owl Capital, which hold 80 per cent of the equity against Meta's 20 per cent, for around US\$ 27 billion of total development cost (Meta 2025). Part of Blue Owl's capital was funded by debt placed privately with bond investors. Meta leases the campus back from the joint venture, with a residual value guarantee for the first 16 years of operations (Meta 2025). This can separate the building owner from the operator, but their risks remain linked: the owner's income depends on the operator's ability to pay rent.

Separate project or corporate finance

Associated infrastructure may be essential to a campus but financed separately. This can include substations, power generation, water supply, and backup generators, usually financed through different structures and borrowers: utilities, independent power producers, municipalities, or specialist infrastructure sponsors. The bank may therefore have a separate financing relationship through which to assess the dependency and its sustainability implications.

Financial risk considerations

The routes above differ in what secures the exposure and how quickly that security can lose value. Three considerations apply to all of them: the availability of insurance, the value of the collateral, and the degree of concentration in the same counterparties and assets.

Insurance cover is limited. AI campuses can cost tens of billions of US dollars, more than the insurance market can cover in full at competitive prices (Swiss Re Institute 2026). Policies may therefore be capped at the largest loss expected from a single event, leaving any larger loss with the owner and, through the collateral, with its lenders.

Hardware collateral in this sector has a short life. Debt secured against chips or customer contracts depends on hardware that is replaced on three to five year cycles, and recovery depends on a secondary market whose depth is uncertain. Hardware recovery, refurbishment, and resale therefore affect residual value as well as environmental performance.

Concentration is relevant to all of the routes. Cloud infrastructure provision is concentrated among three providers, clients in unrelated sectors may depend on the same compute and model providers, and hardware supply is concentrated upstream. The Systemic and higher-order effects chapter sets out what this may mean at portfolio level.

Who controls the outcome?

Exposure does not equal influence. The party a bank lends to may not be the party that decides how a facility is cooled, where its power comes from, or what happens to its hardware. Banks may wish to identify the decision-maker for each material outcome and then assess whether the counterparty has contractual or operational influence over that party.

Applying the sector brief across the financing lifecycle

Table 5 translates the sector's sustainability risks and impacts into questions for each stage of a financing relationship, from initial screening through monitoring, refinancing, and exit. The suggested actions are illustrative and should be adapted to the transaction, the borrower's responsibilities, and the bank's ability to influence outcomes.

Table 5: Applying the sector brief across the financing lifecycle: sustainability questions and bank actions by stage. Source: UNEP FI internal work.

Stage	Sustainability questions	What a bank can do
Origination and screening	<p>Was the site assessed as part of a strategic environmental assessment?</p> <p>Does the client or site carry a flag worth pricing into the relationship (water-stressed basin, grid-constrained region, jurisdiction with weak enforcement)?</p>	<p>Screen for location-specific grid, water, and physical climate constraints, as well as material land, labour, and AI service concerns, mindful of cumulative impacts. Record the issues that trigger enhanced due diligence.</p>
Due diligence	<p>Which risks, impacts, and dependencies are material, who can manage them, and what evidence is missing?</p>	<p>Review relevant permits, contracts, site and operational data, management plans, and stakeholder evidence. Distinguish the borrower's responsibilities from those of other parties. Test important gaps and seek specialist or independent assessment where warranted.</p>
Structuring and underwriting	<p>How might the identified issues affect repayment, operations, or affected stakeholders, and what can the borrower realistically deliver?</p>	<p>Assess sensitivities such as power or water availability, delays, capital costs, and insurance. Record financial risk and impact conclusions separately. Match proposed conditions, covenants, and measurable commitments to the borrower's control, the financing structure, and the bank's influence.</p> <p>See Financing structures and Table 4 for what each type of financing allows, and the Where banks can act tables for data centres (Table 9) and AI services (Table 14).</p>

Stage	Sustainability questions	What a bank can do
Documentation and closing	Are the agreed requirements clear, feasible, and enforceable against the relevant parties?	<p>Confirm applicable conditions precedent, permits, and key contractual rights. Specify reporting boundaries, frequency, verification, escalation triggers, cure periods, and remedies where proportionate. Check that loan requirements are consistent with relevant leases and project documents.</p> <p>See Financing structures for structure-specific conditions, and Regulatory and policy considerations for the requirements a client is already subject to.</p>
Monitoring and servicing	Are actual performance and impacts departing from the assumptions made at approval?	<p>Compare reported results with agreed baselines and commitments. Review material incidents, grievances, permit status, and changes in grid or water access, insurance, regulation, or operations. Escalate exceptions through the bank's credit and environmental and social risk processes.</p> <p>See Climate and energy access: power demand and Water: demand and cooling for the operational metrics of a facility, Climate, water and resource efficiency: compute demand for the footprint of an AI service, and Regulatory and policy considerations for disclosure that is becoming mandatory.</p>
Amendment, waiver, and refinancing	What has changed since approval, and should the bank revise its assessment or terms?	<p>Reassess material changes before granting consent or new financing. Where the bank has influence, consider time-bound corrective actions, improved information rights, or revised terms. Document any residual risk that the bank accepts.</p> <p>See Systemic and higher-order effects for what changes at portfolio level, and Regulatory and policy considerations for regimes likely to tighten over the life of the financing.</p>
Remediation, escalation, and exit	Has a serious problem persisted, and what would disengagement mean for affected people?	<p>Seek a corrective plan with clear responsibilities and deadlines and use available contractual and commercial influence. If the problem persists, consider remedies, non-renewal, or exit within the bank's legal rights. Assess whether disengagement could worsen harm and whether the bank has a role in remedy.</p> <p>See the human rights due diligence steps in Where banks can act for data centres (Table 9) and AI services (Table 14) where a model or service provider is involved.</p>

2. Sustainability profile of data centres

This chapter considers the sustainability impacts associated with data centre development, construction, operation, and hardware use. It covers the physical asset and its immediate value chain, mainly the midstream segment in Figure 1, plus construction and power generation upstream and hardware end of life: land acquisition and construction; electricity, water, and cooling; servers and other equipment; and end-of-life management. It also considers upstream extraction and manufacturing where these create material nature or human rights impacts. The chapter is organized around seven sustainability topics. The table below shows how each topic relates to the four PRB priority areas. The topic sections that follow set out the evidence, and the final section brings together where banks can act.

Table 6: Sustainability topics for data centres and the PRB priority areas they relate to. Source: UNEP FI internal work.

● main relationship ○ secondary relationship

Sustainability topic	Climate	Nature	Human rights	Healthy and inclusive economies
1. Climate and energy access: power demand	●	○		●
2. Water: demand and cooling	○	●	○	○
3. Land, biodiversity and equality: siting and land acquisition	○	●	●	●
4. Decent work: construction and subcontracting	○		●	
5. Circular economy: hardware, from minerals to e-waste	●	●	●	
6. Pollution and health: local emissions		●	●	
7. Climate adaptation: physical risk and resilience	●			○

Read by priority area, the same topics combine into the impacts and risks summarized in the table below, where each row lists its main issues.

Table 7: Impacts of, and risks to, data centres by PRB priority area. Source: UNEP FI internal work.

PRB priority area	Impacts of data centres	Risks to data centres
Climate Main issues: power demand; siting; physical risk and resilience	Negative: Large, fast-growing power demand; mostly fossil fuel grids leading to high emissions; rising embodied carbon from hardware.	Grid moratoria and conditional connections; efficiency and renewable mandates; physical risks (heat, flood, storms); higher energy and insurance costs.
Potential actions: Efficient equipment, on-site renewables, and cleaner grid siting.		
Nature Main issues: water demand and cooling; siting; circular economy; pollution and local emissions	Negative: High water use; land conversion; local pollution; upstream mineral extraction and downstream e-waste.	Water scarcity and permit limits; pollution incidents and enforcement; community opposition over land and water; higher costs for water-saving technology.
Potential actions: Water-efficient cooling, site-level biodiversity measures such as habitat retention and restoration, longer equipment lifetimes, hardware reuse, and responsible end-of-life management.		
Human rights Main issues: siting and land acquisition; construction labour and subcontracting; circular economy; pollution and health	Negative: Mineral supply chain abuses; construction labour risks; community harms (air, water, land); inadequate consultation.	Community opposition and planning refusals; litigation over land, water, or consultation; supply chain due diligence claims; delays and reputational damage.
Potential actions: Respect for labour standards through human rights due diligence, effective grievance mechanisms, meaningful engagement with affected communities, community benefit arrangements, and responsible supply chain and e-waste management.		
Healthy and inclusive economies Main issues: power demand; access to land and water; siting; equality	Negative: Grid investment and water demand placing costs or constraints on households and other users; relatively few permanent jobs; local benefits and costs falling unevenly across communities.	Community opposition and planning refusals; delays and reputational damage.
Potential actions: Early consultation, transparent impact assessment, credible grievance mechanisms, and community benefit arrangements.		

Climate impacts and risks are driven mainly by electricity demand, hardware, and physical climate risk. A data centre's operational emissions largely reflect the electricity it draws (Scope 2). The carbon intensity of the local grid is the main determinant of its footprint. Emissions from hardware and construction (Scope 3) also count, and their share of the footprint grows as grids decarbonize (Lin *et al.* 2023). Adaptation can reduce, but not eliminate, physical climate risks to the facility and its supporting infrastructure.

Nature impacts are driven by water, land use, hardware supply chains, and pollution. These impacts are often poorly captured by standard facility metrics, even though the sector depends on the same ecosystems and resources it affects. For example, operators typically report water consumed on site, but in the United States around 75 per cent of data centre water consumption occurs at the power stations that supply them (Siddik *et al.* 2021).

Human rights impacts are related to land use, construction, hardware supply chains, and pollution. Impacts on healthy and inclusive economies are mostly driven by energy costs and the uneven local distribution of benefits and costs.

Some of the most severe human rights risks associated with data centres arise in the hardware supply chain and at construction sites, but impacts can also arise from land acquisition, resource use, pollution, and inadequate community engagement and procedural rights. Human rights in this chapter refers to the internationally recognized rights set out in the International Bill of Human Rights, the International Labour Organization (ILO) Declaration on Fundamental Principles and Rights at Work, and the ILO fundamental conventions. These include, among other rights, the rights to just and favourable working conditions, health, and freedom from forced labour. The UN Guiding Principles on Business and Human Rights (UNGPs) and the OECD Guidelines for Multinational Enterprises on Responsible Business Conduct set an expectation that companies, including financial institutions, should respect human rights and conduct human rights due diligence to identify and address negative impacts on people. Operator disclosures largely cover the running facility, leaving supply chain and construction human rights impacts and risks less visible.

The table below summarizes where human rights impacts may arise across the data centre value chain and the rights that may be engaged. It draws on the UNGPs, ILO standards, and the sources cited in the paragraphs that follow. The rights listed are illustrative, and other rights may be relevant depending on the circumstances.

Table 8: Where human rights impacts may arise across the data centre value chain and the rights that may be engaged. Source: UNEP FI internal work, based on the UNGPs, ILO standards, and other sources.

Affected group	Where the impact may occur in the data centre value chain	Relevant rights
Mining workers, including children in small-scale informal mining	Minerals and mining	Freedom from forced and child labour; health and safety
Semiconductor workers	Chip and hardware manufacturing	Freedom from forced labour; just and favourable working conditions; freedom of association
Construction workers	Construction and subcontracting	Just and favourable working conditions; health and safety; freedom from forced labour
Communities near extraction sites	Minerals and mining	Health; water; land; adequate standard of living; access to remedy
Host communities	Construction and operations	Health; adequate standard of living, including water; rest and leisure
Indigenous Peoples	Land acquisition and associated infrastructure	Prior consultation and free, prior and informed consent; land; cultural rights
Informal e-waste workers and surrounding communities	Hardware end of life	Health; life; freedom from child labour
Human rights defenders	Cross-cutting	Right to life; freedom of expression, assembly, and association
People whose personal data are hosted in the facility	Data centre operation	Privacy; freedom from arbitrary interference; access to remedy

Climate and energy access: power demand

Fossil fuels supply more than half of the electricity consumed by data centres globally. Coal accounts for around 30 per cent and natural gas for 26 per cent (IEA 2025). Renewable energy still cannot reliably meet data centres' continuous power needs (IEA 2025). At the same time, new data centre capacity is being commissioned faster than dedicated clean generation can be built and connected (IEA 2025). For banks, this creates a capex risk. A client's decarbonization pathway may require grid upgrades, energy storage, and other capacity to balance intermittent renewable generation, as well as interim generation, that may not yet be funded.

A facility's power usage effectiveness (PUE) rating does not capture its carbon footprint. The global average PUE has remained at 1.54 for six years (Uptime Institute 2025), meaning that for every unit of energy delivered to IT equipment, another 0.54 units are consumed by overhead. PUE may improve as workloads shift to larger, more efficient hyperscale facilities (IEA 2026), but this does not necessarily reduce emissions: the same PUE can produce very different emissions depending on the electricity source (Gröger *et al.* 2025).

Data centre emissions reporting remains incomplete, particularly for Scope 3. Only around one-third of operators track Scope 1 emissions, around one-quarter track Scope 2, and only 18 per cent track Scope 3 (Uptime Institute 2025). Even among those reporting Scope 3, most exclude servers and storage, treating them as tenant property rather than part of the facility's footprint (The Shift Project 2025). Scope 1 reporting can also underestimate refrigerant emissions because operators often use assumed leakage rates rather than measuring actual losses (Lin *et al.* 2023).

Renewable procurement does not necessarily mean lower actual emissions. Large operators are buying renewable energy at scale, but market-based Scope 2 reporting, which includes renewable energy certificates (RECs)⁵ and power purchase agreements (PPAs),⁶ can diverge significantly from location-based emissions, which reflect the grid supplying the facility. Across 87 digital firms with verified targets, market-based Scope 2 emissions fell 42 per cent between 2020 and 2023, while location-based emissions⁷ rose 18 per cent. The same pattern appears among the largest operators: operational emissions from Amazon, Microsoft, Alphabet, and Meta were on average around 50 per cent higher in 2023 than in 2020 despite their substantial renewable procurement (ITU and WBA 2025). None of the 10 largest emitters among digital companies has a reduction target validated by the Science Based Targets initiative as aligned with 1.5°C (ITU and WBA 2025).

Energy efficiency per task is improving, but total electricity demand is rising faster. Google reported a 33-fold reduction in the energy used per Gemini prompt over 12 months, driven by improvements in chip design and model optimization (IEA 2026). Earlier efficiency gains kept global data centre energy use almost flat between 2010 and 2018 despite a 550 per cent increase in compute instances (Masanet *et al.* 2020). That relationship no longer holds: global data centre electricity consumption grew 17 per cent in 2025 alone as demand growth outpaced those efficiency gains (IEA 2026).

5 RECs, or Guarantees of Origin in the EU, are tradeable instruments representing one megawatt hour of renewable electricity fed into the grid. They can be purchased separately from the electricity, often for a different place or period, meaning a facility's reported renewable coverage does not reflect when or where its actual consumption occurred.

6 PPAs are long-term contracts to buy electricity, or its attributes, from a specific generator, typically at a fixed price. Unlike RECs, they are linked to a named source and can support new capacity, but they still match generation to consumption annually rather than hourly.

7 Hourly matching tracks whether carbon-free generation was available on the same local grid at the same hour as consumption, rather than averaged across a full year. The 24/7 Carbon-Free Energy Compact, a voluntary initiative coordinated by Sustainable Energy for All, formalizes this approach (SEforALL 2026).

Rising electricity demand can also affect energy affordability for households and other local users.

A single gigawatt facility can require two to four square kilometres of land and consume electricity equivalent to a European city of one million people (Gröger *et al.* 2025). Grid investment and water demand can place additional costs or constraints on households and other users, particularly in lower-income or water-stressed areas (IEA 2025).

Water: demand and cooling

Data centres use water and depend on it to operate. Global data centre water consumption is projected to roughly double by 2030, driven partly by AI facilities, which can require around twice as much water per kilowatt hour as traditional sites (IEA 2025). In water-stressed catchments, securing water is therefore an environmental issue and an operational requirement.

Reported water use captures only part of a facility's footprint. Operators typically report water consumed on site, while the power generation supplying the facility also requires water for cooling. In the United States, this indirect consumption accounts for around 75 per cent of total data centre-related water consumption on average (Siddik *et al.* 2021). The share varies with the electricity mix: it falls on wind and solar heavy grids and rises on grids that rely on coal, gas, or hydropower. Water replenishment claims can also obscure local scarcity if replenishment takes place outside the catchment where water is withdrawn (Gröger *et al.* 2025).

Water availability is becoming a constraint on new data centre development. Drought can reduce available supply just as higher temperatures increase cooling demand and household water use (Han *et al.* 2026). In Chile, a court partially reversed a data centre's environmental permit over aquifer concerns in 2024, pausing around US\$ 200 million of investment (Associated Press 2024). In Uruguay, a proposed facility faced sustained opposition over its projected water use during the country's worst drought in 74 years (Livingstone 2023). France has also introduced powers allowing authorities to refuse data centre permits in water-stressed areas ([Loi n° 2026-403](#)).

Cooling creates a trade-off between water and energy use. The power density of AI servers rose elevenfold between 2020 and 2025 (IEA 2026). Cooling technologies can reduce water use at the cost of higher electricity consumption, or vice versa, depending on the technology, climate, and operating conditions. Closed-loop and immersion cooling⁸ can reduce both water and energy use, but require significant capital and may not suit all workloads or existing infrastructure (IEA 2025). At high rack densities, liquid cooling can become necessary (IEA 2026).

Land, biodiversity and equality: siting and land acquisition

Siting is becoming a source of competitive advantage. Fewer than five per cent of subbasins in the United States rank in the top quartile for both low grid carbon intensity and low water scarcity (Siddik *et al.* 2021). Sites that combine low-carbon power and low water stress are consequently scarce. Developers that identify and secure these sites early can gain an advantage over competitors facing tighter planning, grid, and water constraints.

Data centre development also changes the land and ecosystems on which facilities depend.

Buildings, paved areas, drainage works, and supporting infrastructure can reduce natural drainage, flood buffering, and habitat, while access roads can fragment surrounding ecosystems (TNFD 2026). The global data centre land footprint is estimated at around 100 square kilometres and is projected to more than double within five years (TNFD 2026; WEF 2025a). Planning requirements are becoming more stringent in some jurisdictions: in England, developments have been required to deliver at least

8 For example, immersion cooling can reduce water consumption by up to 91 per cent, energy consumption by 50 per cent, and space occupancy by 85 per cent (WEF 2025b).

10 per cent biodiversity net gain since February 2024, with the requirement extending to nationally significant infrastructure projects from November 2026 (UK Government 2026). Protecting natural drainage and retaining vegetation can reduce the need for engineered stormwater infrastructure while also reducing flood exposure. These are increasingly quantifiable through defined mitigation measures, costs, and long-term management obligations.

Rapid data centre expansion can create human rights impacts and risks where growth outpaces the planning and regulatory systems that manage its impacts. This is particularly relevant in emerging data centre markets in South and Southeast Asia, Latin America, and Africa, where hyperscalers are investing to serve growing digital demand (UNCTAD 2025). Where planning and regulatory frameworks do not fully capture data centre-scale water use, waste heat, electricity demand, or other impacts, affected communities may have limited opportunities to participate in decisions that affect their rights to a clean, healthy, and sustainable environment and an adequate standard of living.⁹

The local benefits and costs of data centre development can fall unevenly across communities, with potentially disproportionate impacts on groups in vulnerable situations. Large facilities use large amounts of land, electricity, and water, which can affect people's right to an adequate standard of living while creating relatively few permanent jobs once construction ends (JLARC 2024). Where communities bear these costs without sharing the economic benefits, opposition and disputes can follow. The scale of local opposition to proposed projects shows that these impacts can also become a planning and financing issue: in Q1 2026, around US\$ 130 billion of planned projects in the United States had reportedly been blocked or delayed by local opposition (Data Center Watch 2026).¹⁰ Early consultation, transparent impact assessment, and credible grievance mechanisms can reduce the risk that local concerns escalate into litigation or planning delays.

Land acquisition without adequate consultation of communities can negatively impact Indigenous Peoples' rights, the right to a clean environment, and the right to an adequate standard of living. A data centre campus can require not only the main building but also substations, transmission lines, roads, and water infrastructure, increasing the potential impact on land rights and, in some locations, Indigenous Peoples. In Ceará, Brazil, an Indigenous community filed a complaint in 2025 seeking suspension of the environmental licensing of a large data centre, on the grounds that its right to prior consultation had not been respected (DCD 2025). Similar concerns over water use are documented in Chile and Uruguay (Associated Press 2024; Livingstone 2023). Large infrastructure projects also carry documented risks of reprisals against community leaders and human rights defenders who oppose them (UNEP FI 2025).

9 Under the Equator Principles, the IFC Performance Standards apply in Non-Designated Countries, while in Designated Countries they may be used as guidance based on project-specific risks and the discretion of the financing institution. For data centre projects, their use should therefore be considered where host-country requirements may not sufficiently address relevant environmental and social risks (EP 2026).

10 Data Center Watch is a project of 10a Labs, a private company. Its figures combine blocked and delayed projects and are not independently verified.

Decent work: construction and subcontracting

Human rights impacts and risks are particularly relevant during the construction phase, especially in jurisdictions with limited labour rights protections, and where projects rely on migrant labour and complex subcontracting chains. Data centre construction draws on the same labour markets and contractors as other large infrastructure projects. In countries where migrant workers face restrictions linked to their employment status, these structures can increase exposure to recruitment debt, unsafe conditions, and barriers to remedy. In Saudi Arabia, for example, documented abuses among migrant construction workers illustrate the risks associated with systems that tie workers' legal status to their employer (Human Rights Watch 2024). Grievance mechanisms are often managed by the developer or main contractor, while the workers most exposed to abuse are employed several subcontracting layers below them.

Construction materials also contribute to a facility's embodied emissions, which are discussed with hardware under the circular economy topic.

Circular economy: hardware, from minerals to e-waste

As grids decarbonize, emissions from construction and hardware manufacture become a larger share of a data centre's footprint (Lin et al. 2023). Operational emissions currently dominate under average global grid conditions (Arup 2025), but the balance shifts as the grids supplying them decarbonize. Equipment replacement is particularly important: servers are typically replaced every three to eight years, while storage and network equipment are replaced every three to five years (WeLoop 2020). Each refresh therefore creates another round of manufacturing emissions. The cleaner the grid, the more the remaining emissions reduction opportunity shifts from electricity procurement to construction, equipment specification, and refresh cycles (Arup 2025). Chip manufacturing is also becoming more carbon-intensive: producing silicon wafers at the node sizes required for modern AI chips generated nearly three times as many emissions in 2024 as in 2010 (WEF 2025a). Refresh cycles are recurring capex, so this trend increases the carbon associated with each cycle.

The environmental footprint also extends beyond the site to the hardware supply chain.

Semiconductor manufacturing consumes more than one trillion litres of freshwater annually, with water recycling rates varying significantly by manufacturer and region (Ceres 2025; WEF 2025a). Data centre hardware also depends on minerals such as cobalt, rare earths, lithium, and tantalum, whose extraction can cause habitat loss and ecosystem fragmentation. These impacts may fall within an operator's wider value chain footprint, but reporting boundaries vary depending on the operating and equipment-ownership model. Nature-related impacts are therefore difficult to assess from facility-level data alone. The share of operators recording their water consumption has been steadily climbing and reached more than half in 2026 (Uptime Institute 2026).

The hardware supply chain creates human rights impacts and risks well beyond the data centre itself. These minerals, including tantalum and cobalt, are concentrated in a small number of producing countries, including conflict-affected and high-risk areas, where the risk of severe human rights abuses may be heightened. The Democratic Republic of the Congo (DRC) and Rwanda account for around 64 per cent of global tantalum production, while the DRC accounts for around 74 per cent of global cobalt production (BGS 2026). Mining in the DRC has been associated with labour abuses, child labour, land rights concerns, and weak governance (Amnesty International 2016; Global Witness 2022). Low recycling rates mean that rising demand for data centre hardware continues to drive demand for

primary extraction (Martelo *et al.* 2023). The resulting risks include impacts on workers' health and safety, access to land and water, community rights, and access to remedy.¹¹ For further guidance, see the UNEP FI Human Rights Toolkit (UNEP FI 2025) section on minerals and metals extraction.

Chip manufacturing may involve separate labour rights impacts and risks in highly concentrated supply chains. Around 90 per cent of the world's most advanced chips are manufactured in Taiwan, China (SIA and BCG 2021). Migrant workers make up a large share of the manufacturing workforce there. Recruitment fees charged to migrant workers in the electronics and other manufacturing sectors of Taiwan, China, can leave workers indebted to brokers or employers (Transparentem 2025), a practice recognized by the ILO as an indicator of forced labour (ILO 2022). The documented cases are in electronics and appliance factories rather than chip fabrication plants (Transparentem 2025). Because advanced chip production is concentrated among a small number of suppliers, individual clients may have limited leverage over working conditions upstream, although collective engagement with those suppliers may increase it.

Rapid hardware refresh cycles create a growing waste stream: servers and other equipment become e-waste sooner as operators replace them with newer, more efficient hardware. Improper disposal can release hazardous metals into soil and waterways.

The informal processing and disposal of e-waste creates human rights impacts and risks for the workers and communities involved. Global e-waste reached 62 million tonnes in 2022 and is projected to reach 82 million tonnes by 2030, while only 22 per cent was formally recycled in 2022 (ITU and UNITAR 2024). Informal processing is concentrated in lower-income countries. Unsafe handling and burning of components there can expose workers and communities to hazardous substances such as dioxins, lead, mercury, and cadmium, potentially affecting their rights to health, safe and healthy working conditions, and an adequate standard of living. For data centre operators, faster hardware refresh cycles increase this waste stream. For banks, documented reuse, resale, recycling, and end-of-life arrangements can therefore form part of responsible supply chain and asset management due diligence.

Pollution and health: local emissions

Operations can also create local pollution and waste liabilities. Cooling systems can discharge heated wastewater containing biocides and corrosion inhibitors, creating permit and enforcement risks where discharge limits are exceeded (WEF 2025a). Some cooling and fire-suppression compounds can also persist in soil and groundwater beyond the facility's operating life (TNFD 2026).

Local environmental impacts can adversely affect the right to health and contribute to social opposition when facilities are located near communities. In Virginia, for example, researchers have projected significant health impacts from emissions associated with the region's data centre cluster (Gour *et al.* 2026).

Climate adaptation: physical risk and resilience

Physical climate risk at data centres is site-specific and may be underestimated. Facilities are geographically dispersed, so exposure depends on each site's location and its dependence on local power, water, transport, and telecommunications infrastructure. Historically, sites were often selected for grid access, land availability, and fibre connectivity rather than long-term climate resilience. Northern Virginia, the world's largest concentration of data centres, faces rising summer temperatures (Gour *et al.* 2026). A well-adapted facility may continue operating through a severe event as

11 Both practices, artisanal mining using child labour and recruitment-fee debt bondage, are covered by ILO Convention 182 on the worst forms of child labour and ILO Convention 29 on forced labour respectively.

surrounding infrastructure fails. During Hurricane Milton in 2024, one operator reported that its Florida data centres remained fully operational while widespread power and network outages affected the state (DCD 2024).

Many physical risk models rely on historical climate and loss data. These data become less reliable as climate change alters the frequency and severity of hazards faster than historical data can capture. Forward-looking assessments therefore indicate materially higher exposure than historical-loss models may suggest. One analysis of 8,868 data centres found 6.25 per cent at high physical risk in 2025, and projected that 20 to 64 per cent of facilities in some major hubs, including New Jersey, Hamburg, and Tokyo, would be at high risk by 2050 (XDI 2025).

Insurance markets are already responding to this exposure. Commercial insurers are repricing, and in some locations restricting, cover for assets facing higher physical climate risk. Data centre insurance costs could triple or quadruple by 2050 (XDI 2025). Adaptation can reduce, but not eliminate, risk.

A data centre can also increase the physical climate vulnerability of the communities around it. During droughts and heat waves, facilities draw on the same water and power systems as households, just as higher temperatures increase cooling demand and household water use (Han *et al.* 2026). Site development can also reduce the natural drainage and flood buffering on which neighbouring land relies (TNFD 2026). Resilience assessment can therefore consider the exposure of surrounding communities and infrastructure as well as that of the facility.

Where banks can act

These sustainability risks create four main financial exposures across the topics above: higher capex, financing risk, insurance risk, and project delay. Clients may need additional investment in grid connections, backup generation or storage, clean generation, equipment, water supply, pollution controls, and site upgrades to meet their climate targets and permit conditions. Where emissions or other sustainability performance is linked to loan pricing, weak or poorly designed key performance indicators can also create sustainability-linked financing risk. Physical climate risks can increase insurance costs and restrict availability of cover. Permit challenges, community opposition, and supply chain due diligence claims can also delay projects or disrupt operations, as the cases under water and land use show.

The table below brings together the actions and financing opportunities from across the sustainability topics. The columns show which PRB priority areas each action addresses. Many address several at once. What a bank can do depends on the type of financing route (see Financing structures). The level column shows whether an action is taken on a single transaction, with the client as a whole, or across the portfolio. For data centres, most actions apply at transaction level, because project finance and asset-level structures allow conditions and covenants.

Table 9: Where banks can act on data centres to manage impacts and risks and support solutions, by PRB priority area. Source: UNEP FI internal work.

Action	Level	Climate	Nature	Human rights	H&IE
Assess before approval					
1. Screen deals on grid carbon intensity, local water stress, and physical hazard; price physical risk site by site to differentiate underwriting; map portfolio concentration and nature exposure before approval	Transaction; portfolio	•	•		•
2. Apply a recognized screening basis: EU Taxonomy alignment, including do no significant harm criteria; IFC Performance Standards where host-country requirements may not sufficiently address environmental and social risks	Transaction	•	•	•	
3. Implement human rights due diligence to identify, prevent, mitigate and account for adverse human rights impacts, including engagement with affected and potentially affected communities; prioritize actions, including client engagement, by severity (scale, scope and irremediable character); see the UNEP FI Human Rights Toolkit (UNEP FI 2025)	Client			•	•
Engage and set conditions					
4. Engage early on site selection and associated infrastructure: power, water, transmission, and roads	Transaction	•	•	•	•
5. Require evidence of meaningful consultation, effective grievance mechanisms and, where Indigenous Peoples' land or resources are affected, free, prior and informed consent before financial close	Transaction		•	•	•

Action	Level	Climate	Nature	Human rights	H&IE
6. Require construction contracts to carry labour standards, a prohibition on worker-paid recruitment fees, and grievance access for subcontracted and migrant workers, with monitoring and remedy mechanisms	Transaction			•	
7. Request evidence of supply chain due diligence on minerals and chip procurement, including the responsible sourcing policies and audit results of the client or its equipment suppliers; where leverage is limited, engage collectively with other lenders or through industry and public-private initiatives, asking for the same evidence from each operator or equipment buyer financed	Client; portfolio		•	•	
8. Set environmental conditions precedent and covenants in project finance, including air and discharge controls in the environmental and social assessment	Transaction		•	•	
Structure financing					
9. Structure sustainability-linked loans and green bonds around what the site actually draws: a contracted clean-power share or an emissions threshold that reflects the local grid's carbon intensity, location-based emissions or hourly clean-power matching, and water efficiency	Transaction	•	•		
Financing opportunities					
10. Power and grid infrastructure: grid connections, storage, and cleaner power, including on-site clean power	Transaction	•			•
11. Retrofit and efficiency pipeline: efficient and advanced cooling, including liquid and immersion cooling, power systems, and building upgrades; lower-carbon construction	Transaction	•	•		

Action	Level	Climate	Nature	Human rights	H&IE
12. Alternative and recycled water supply; nature-positive site and drainage measures	Transaction	•	•		•
13. Resilience investment that protects asset value and insurability	Transaction	•			•
14. Wastewater treatment and other pollution controls	Transaction		•	•	
15. Lower-carbon equipment, life extension, recovery, reuse, and formal end-of-life treatment of hardware, with documented chain of custody	Transaction	•	•	•	
Monitor and disclose					
16. Request disclosure on greenhouse gas emissions (location- and market-based Scope 2; Scope 3 including IT equipment), procured and on-site energy, energy and water efficiency, and how human rights impacts are addressed, with measures taken and outcomes	Client	•	•	•	

3. Sustainability profile of AI services

AI services refer to the training, hosting, and running of AI models as a commercial product. A firm is in scope of this brief where it operates or contracts for dedicated compute to do this. This means that model developers and specialist compute providers are in scope, while firms building products on third-party models without dedicated compute are not. In Figure 1 these firms sit in the first three downstream stages, from data sourcing and preparation to deployment and inference. Impacts in end use are also assessed.

Where the previous chapter addressed the facilities and hardware, this chapter addresses the models that run on them. The two are closely linked: optimizing a model reduces the compute a product requires, and with it the energy, water, and hardware consumed on its behalf. That link also explains why the energy, water, and hardware impacts of an AI service appear in the previous chapter. They are realized in facilities the service provider frequently does not own, and are assessed there. What is distinct at service level is the set of decisions that determine how much compute a product needs in the first place. The three kinds of model that account for most of these impacts are described in How an AI service works in the Annex.

Responsibility is often distributed across this value chain: a client may control the model but not the underlying compute, training data, or downstream use, so the bank's influence varies by impact and by stage.

For a bank, AI services counterparties can be among the largest technology exposures in the book. They are financed mainly through parent company debt, and specialist compute providers through private credit and debt secured against chips or a small number of customer contracts (IEA 2026). Project finance and asset-level structures are largely absent, because there is no single asset to secure, so a bank's default influence is lower here than for a colocation facility. The Financing structures section covers this in more depth. In practice the conversation with a large technology client is likely to cover both the facility and the service, and the assessment here focuses on what the compute does, who trains and moderates the models, and whose laws govern the data.

For a bank, the questions are what decisions determine an AI service's compute demand, where the resulting impacts occur, who is affected, and which of those decisions the client can influence.

The analysis is organized around six sustainability topics that relate to the PRB priority areas: climate, nature, human rights, and healthy and inclusive economies. It uses the downstream stages of the value chain in Figure 1 (data sourcing and preparation, model development and training, deployment and inference, and end use) as a lens within each topic. The table below shows how each topic relates to the priority areas. The topic sections that follow set out the evidence, a further section brings together the positive outcomes of responsible AI, and the chapter closes with where banks can act. Systemic and higher-order effects that arise from widespread adoption of AI are considered in the Systemic and higher-order effects chapter.

Table 10: Sustainability topics for AI services and the PRB priority areas they relate to. Source: UNEP FI internal work.

● main relationship ○ secondary relationship

Sustainability topic	Climate	Nature	Human rights	Healthy and inclusive economies
1. Climate, water and resource efficiency: compute demand	●	●		
2. Decent work and digital safety: data work			●	●
3. Equality: bias and unequal access			●	●
4. Digital and physical safety and security: downstream use and misuse			●	○
5. Employment: effects on work and labour markets			○	●
6. Sector diversity and healthy economies: market concentration and dependency		○		●

Read by priority area, the same topics combine into the impacts and risks summarized in the table below, where each row lists its main issues. Climate and nature impacts are driven by compute demand and the hardware it requires. Human rights impacts arise from data work, biased or unequal outcomes, and downstream use. Impacts on healthy and inclusive economies arise from how work changes, how value and access are distributed, and how concentrated the sector is.

Table 11: Impacts of, and risks to, AI services by PRB priority area. Source: UNEP FI internal work.

PRB priority areas	Impacts of AI services	Risks to AI services
Climate and nature Main issues: compute demand and where it runs; market concentration and dependency	Climate: Compute demand drives electricity use and emissions. Nature: Growing compute demand increases pressure on hardware and resource supply chains.	Higher compute costs; constraints on access to sufficient or lower-carbon compute; increasing environmental measurement and disclosure expectations.
Potential actions: Efficiency, lower-carbon compute, longer hardware lifetimes, and recovery.		

PRB priority areas	Impacts of AI services	Risks to AI services
Human rights Main issues: data work and the people behind it; downstream use and misuse; bias and unequal access; employment	Negative: Processing of personal data without consent; discriminatory outcomes in access to credit, employment, housing, and other essential services; use of creative work without consent or payment; harmful working conditions in data labelling and content moderation; surveillance and targeting of individuals and groups.	Legal and regulatory liability, reputational damage, litigation, loss of clients, operational disruption, and financial losses arising from human rights abuses linked to AI services.
Potential actions: Human rights due diligence, bias and discrimination testing, safeguards on high-risk uses, and routes for affected people to challenge decisions.		
Healthy and inclusive economies Main issues: effects on work and labour markets; data work and the people behind it; bias and unequal access; downstream use and misuse; market concentration and dependency	Negative: Task automation changing the mix of work in clients' and customers' businesses; value from data work captured outside the markets where it is done; uneven access across languages, markets, and income groups; concentration of compute, model, and hardware supply.	Demand, workforce, and social licence implications; dependence on a small set of compute, model, and hardware providers.
Potential actions: Workforce transition capability, local data and language capability, services in underserved languages, and hardware recovery and reuse.		

The first topic, Climate, water and resource efficiency: compute demand, considers climate and nature together because both are driven primarily by the compute required to develop and operate AI services. It focuses on service-level decisions (model design, training, inference, efficiency, and workload location).

The most significant human rights risks associated with AI services can arise across the value chain, from data sourcing and preparation to model development and training, deployment and inference, and end use. End use includes certain dual-use technologies. These may be deployed in conflict and other high-risk areas, and the risk of gross human rights abuses is higher there (OHCHR 2011). These risks affect workers preparing training data, people whose data or work is used, end users, and people subject to decisions or surveillance enabled by AI. The main rights at risk include privacy, equality and non-discrimination, freedom of expression and access to information, and just and favourable conditions of work.¹²

¹² For further detail on the main rights at risk, see OHCHR, UN B-Tech Project, Taxonomy of Human Rights Risks Connected to Generative AI, a supplement to B-Tech's Foundational Paper on the Responsible Development and Deployment of Generative AI (2023).

This chapter draws on the UNGPs, the OECD Due Diligence Guidance for Responsible AI (OECD 2026), and the B-Tech Taxonomy of Human Rights Risks Connected to Generative AI (OHCHR 2024).

The table below maps where human rights impacts may arise across the stages of an AI service, who is affected, and the rights at risk. The rights follow the B-Tech Taxonomy (OHCHR 2024) and the stages correspond to the planning, building, testing, deployment, and operation stages used in the OECD Due Diligence Guidance for Responsible AI (OECD 2026).

Table 12: Where human rights impacts may arise across the stages of an AI service, who is affected, and the rights at risk. Source: UNEP FI internal work, based on OHCHR 2024; OECD 2026.

AI service stage	Affected group	Key human rights at risk
Data sourcing and preparation	Data labelling and content moderation workers	Working conditions, health, and freedom of association and collective bargaining; freedom from physical and psychological harm
Data sourcing and preparation	People whose personal data or creative work is used as training data	Privacy, property, and authorship
Model development and training	Groups underrepresented in training data	Non-discrimination and equal protection
Deployment and inference	End users of hosted services	Privacy and freedom from arbitrary interference
End use	People subject to automated decisions	Non-discrimination, access to essential services, and remedy
	People exposed to AI-generated misinformation, disinformation, impersonation, or harmful content	Freedom of expression and access to information; freedom of thought, conscience, and opinion; right to privacy; freedom from physical and psychological harm
	Workers whose tasks or livelihoods are displaced, transformed, or intensified by generative AI	Right to work and to gain a living; right to just and favourable conditions of work; freedom of association
	Populations subject to surveillance or targeting	Life, privacy, expression, and assembly

Healthy and inclusive economies is a socioeconomic priority that serves as an umbrella for several topics. The inclusivity dimension is captured by financial health and inclusion, decent work, gender equality, affordable housing, and inclusive growth. The health dimension extends to the structural conditions these depend on: employment, sectoral diversity, market concentration, economic convergence, small and medium-sized enterprise (SME) development, strong and accountable institutions, economic resilience, and technological safeguards. Technological safeguards means society's ability to benefit from the systems, policies, and practices that ensure technologies such as AI are developed and deployed in ways that are safe, ethical, transparent, and accountable.

Circular economy acts as an enabler here: for example, it can strengthen economic resilience by reducing dependencies on globalized value chains. This priority area is where AI services have some of their most consequential effects, because they bear directly on these structural conditions, reshaping labour markets and the future of decent work, concentrating market power in a small number of infrastructure and model providers, and deepening dependencies within global value chains. That same breadth is what makes it the hardest area to raise with a client: the effects are diffuse, cut across the client's whole business model, and rarely sit with a single owner inside the institution.

Internationally recognized human rights span both immediate protections and long-term socioeconomic guarantees, but institutional due diligence frameworks (referred to above) are optimized as operational guardrails for 'do no harm' risk management. The healthy and inclusive economies priority area complements them by supporting the progressive realization of economic, social, and cultural rights, including the rights to health, housing, and decent work. In addition to a focus on discrete operational harms, financial institutions can use financing strategies, product design, and market leadership to advance broader and longer-term development goals.

Table 13: Where healthy and inclusive economies impacts may arise across the AI value chain and who is affected. Source: UNEP FI internal work, based on OECD 2025b; Perrigo 2023; UNCTAD 2025; UNEP 2024.

H&IE impact area	Impact	Value chain stage	Who is affected
Decent work; just transition	Value capture in the data labelling supply chain	Data sourcing and preparation	Workers and economies hosting that labour
Decent work; just transition	Task automation in the client's business	Deployment and inference	The client's own workforce
Decent work; inclusive growth	Task automation in customers' businesses	End use	Workers in sectors adopting these services
Financial health and inclusion; inclusive growth	Uneven access, affordability, and language coverage	Deployment and inference, and end use	Populations and markets underserved by model capability
Market concentration and monopoly risk; economic resilience	Concentration of compute and model capability	Across the chain	Economies and firms dependent on a small provider set
Circular economy; economic resilience	Dependency on concentrated hardware supply	Hardware supply	The client, and economies hosting adoption
Institutions and governance	Jurisdictional control over hosted data and capability	Deployment and inference	States and firms relying on sovereignty assurances

Climate, water and resource efficiency: compute demand

What remains distinct at the service level is a set of software decisions: how the model is designed, how large it is, how much of its training data it keeps, and how efficiently it runs once in use. These dictate how much physical hardware is actually engaged (Sajadieh and Fattorini 2026).

Training and inference create different patterns of compute demand. The environmental impact of AI was until recently thought to arise mainly in training, given its data and computational load. With generative AI and large language models, inference now requires equal or greater resources (UNEP 2024). A model's training footprint is fixed once it completes, but inference scales continuously with product adoption, so a client's ultimate resource demand is driven as much by how widely its application is used as by how it was built (IEA 2026).

Where compute is located affects its associated emissions. Training workloads are often flexible and can be scheduled in regions with low-carbon grids or high water availability. Inference is more geographically constrained because serving users requires fast response times (IEA 2026). The client's ability to choose where workloads are run is therefore an important service-level choice, distinct from the facility-level energy and grid assessment covered in the data centres chapter.

AI environmental impacts remain difficult to measure consistently. No standardized method currently exists for measuring and reporting the energy, carbon, and water impacts of AI services (UNEP 2024). Client disclosures are therefore difficult to compare,¹³ particularly where they do not distinguish between training and inference or disclose the location of the underlying compute. This limits the usefulness of aggregate footprint metrics and makes the basis of preparation an important part of client assessment. The Regulatory and policy considerations chapter makes the same finding from the regulatory side: the EU AI Act's documentation obligation for general-purpose models produces figures without a common basis.

Growing demand for AI compute drives demand for specialized hardware, such as graphics processing units (GPUs) and other chips, intensifying pressure on global manufacturing, mineral supply, and electronics supply chains. The number of chips sold quadrupled between 2001 and 2022, and the key minerals and metals needed to manufacture this hardware are nearly the same as those required for the low-carbon transition (UNEP 2024). These physical constraints are further tightened by low circularity: while the end-of-life recycling rate for copper is around 46 per cent, it is around one per cent for the rare earth elements used in magnets and storage drives (UNEP 2024). The associated mineral extraction, manufacturing, and e-waste impacts are assessed in the data centres chapter. For AI services, the question is how model and compute demand drives the scale and pace of that hardware requirement.

Decent work and digital safety: data work

Data sourcing and preparation can create risks for both workers and the people whose data or work is used. Model developers may collect, license, or scrape training data and contract out data labelling and content moderation. These workers may be outside the client's own workforce, while the use of personal data and copyrighted material can affect people whose interests are not directly represented in the client relationship. Content moderation can also expose workers to significant psychological harm, making working conditions as well as remuneration relevant to assessment (Perrigo 2023).

¹³ Banks may evaluate whether the client discloses structured metrics via AI Model Cards, Datasheets for Datasets, or a Data Bill of Materials (Lee *et al.* 2025).

Value from AI services is unevenly distributed across the value chain. Data preparation, labelling, and content moderation are often carried out in lower-income markets while the value generated by the resulting models is captured elsewhere.

A well documented case is the data labelling work carried out in Kenya for OpenAI through the outsourcing firm Sama, where labellers reviewing traumatic content took home between roughly US\$ 1.32 and US\$ 2 an hour against US\$ 12.50 an hour paid to the supplier (Perrigo 2023).

In a separate case involving Sama's work for Meta, a Kenyan appeal court has since allowed claims that the technology client, not only the outsourcing firm, is the employer to proceed to trial, which could change where responsibility for these conditions is placed (Meta Platforms, Inc & 2 others v Motaung & 186 others; Kenya National Human Rights and Equality Commission & 14 others (Interested Parties) 2024). Investment in local data, language, and processing capability can increase the value added and economic participation in these markets.

Equality: bias and unequal access

Training data can reproduce or amplify existing discrimination. The data used to train AI systems influence what models learn and how they perform across different groups. Bias and poor-quality or incomplete training data are potential mechanisms through which AI can reinforce existing inequalities, particularly for women, minorities, and low-income populations (UNEP 2024). The resulting impacts may materialize later, when a model is used in decisions affecting employment, credit, welfare, or other essential services.

Access to AI services varies across languages, markets, and income groups. Model capabilities are uneven across languages, with languages that have little training data generally less well served, while affordability and connectivity constrain access in many markets (UNCTAD 2025). If AI-enabled products primarily reach populations that already have better infrastructure and purchasing power, productivity gains may reinforce existing inequalities. For clients whose business models depend on broad adoption, access and language coverage are therefore both inclusion and product strategy considerations.

Access to computing resources is one of the structural barriers smaller firms face when adopting AI. Connectivity, access to data and compute, skills, and finance are the four enablers that determine whether SMEs can adopt AI across G7 countries (OECD 2025a). Cloud-based, pay-as-you-go services can reduce the need for firms to own computing infrastructure. However, they do not necessarily resolve constraints related to data access, connectivity, skills, or finance. The gains are uneven, and smaller for firms with limited existing digital capabilities.

Digital and physical safety and security: downstream use and misuse

Downstream use can give rise to adverse human rights impacts, including impacts that the provider does not cause but may contribute to, or be directly linked to through its business relationships. AI providers may not determine how customers use their models, but their contractual terms, customer screening and due diligence, and monitoring and escalation processes can influence whether high-risk uses are permitted. Privacy risks can also arise where a provider is subject to laws that allow its home government to require access to data it holds abroad, even where customers have been promised that their data stay under a particular country's jurisdiction (Sénat 2025). High-risk uses can include surveillance or targeting, where impacts may engage privacy, freedom of expression and assembly and, in extreme cases, the right to life.

Disclosure of AI-related human rights risks and impacts remains limited. Significant gaps remain in systematic reporting and assessment of human rights impacts (WBA 2025). This makes client policies, testing practices, contractual controls, and evidence of remediation particularly important where public disclosure is limited.

Employment: effects on work and labour markets

AI is changing work through task automation, but the scale and timing of employment effects have not yet played out. AI could affect around 40 per cent of jobs worldwide, with the effect falling differently across occupations and skill levels (UNCTAD 2025). The change in the mix of tasks within jobs is already relevant for clients adopting AI, even where net employment effects are unresolved. For a bank, the assessable question is how a client manages the effects within its own workforce. Wider employment effects are assessed at portfolio level.

Sector diversity and healthy economies: market concentration and dependency

Concentration in AI capabilities creates dependencies for firms and economies. Compute capacity, frontier model development, and the hardware required to run AI services are concentrated among a relatively small number of providers and jurisdictions (OECD 2025b). Dependence on these providers can create resilience and governance risks where alternatives are limited. At client level, the relevant question is how the client manages its own dependencies. Correlated exposure across sectors is addressed in the Systemic and higher-order effects chapter.

Hardware recovery reduces exposure to concentrated primary supply, so it supports resilience as well as resource efficiency.

Opportunities for advancing positive sustainability outcomes through responsible AI

Set against the physical costs described in this chapter, AI technologies are also delivering documented ecological and social benefits. For example, satellite-based monitoring deployed by the International Methane Emissions Observatory supports faster leak detection and repair (IEA 2025). The Observatory uses AI to screen satellite data for large leaks. It has helped mitigate sources estimated to have emitted 1.2 million tonnes of methane, a climate benefit comparable to removing the annual emissions of almost 24 million passenger cars (UNEP 2026). AI is similarly being used to optimize electricity grids (IEA 2025), monitor deforestation (Lee *et al.* 2025), accelerate materials and battery discovery (IEA 2026), and translate complex climate science for non-academic readers (UNEP 2024). Clients building these applications are a financing opportunity, and research into reducing computational complexity and data usage is an can improve efficiency.

AI can also support positive human rights outcomes where applications are responsibly developed and deployed.

- **Inclusion and non-discrimination:** supporting accessibility and reducing barriers faced by people in vulnerable groups, including people with disabilities (OECD 2021).
- **Health and safety:** enabling earlier diagnosis, disease prevention, and safer working environments, including by reducing exposure to hazardous tasks (OECD 2024).
- **Labour rights:** helping identify and prevent forced labour, child labour, and other labour abuses across supply chains, and improving occupational safety (OECD 2026).
- **Freedom of expression and access to information:** expanding access to information and communication tools, where developed and deployed consistently with human rights.
- **Resilience:** supporting disaster preparedness and early warning systems through AI-based technologies, such as AI-powered flood forecasting, which can give communities and humanitarian organizations time to take anticipatory action, with potential benefits for health and safety.
- **Livelihoods:** supporting skills development and the productive transformation of work where adoption is managed with the workforce, with effects that differ by economic sector.

Any financing strategy should also aim to understand the trade-offs between the benefits of AI and the negative impacts on people and the planet (UNEP 2024). Comprehensive research is still scarce, many statistics in media coverage lack credible backing, and data on indirect and higher-order effects are insufficient (UNEP 2024).

Where banks can act

The table below brings together the actions and financing opportunities from across the sustainability topics. The columns show which PRB priority areas each action addresses. Many address several at once. What a bank can do depends on the type of financing route (see Financing structures). The level column shows whether an action is taken on a single transaction, with the client as a whole, or across the portfolio. For AI services, most actions apply at client and portfolio level, because financing runs mainly through corporate debt and project finance is largely absent.

Table 14: Where banks can act on AI services to manage impacts and risks and support solutions, by PRB priority area. Source: UNEP FI internal work.

Action	Level	Climate	Nature	Human rights	H&IE
Understand the client					
1. Understand the client's role in the AI product lifecycle and the rationale for developing a specific AI system, including its nature, intended use, and deployment context	Client			•	•
2. Implement human rights due diligence to identify, prevent, mitigate and account for adverse human rights impacts, including engagement with affected and potentially affected communities; consider all dimensions of severity (scale, scope and irremediable character), recognizing that an impact of limited gravity for an individual may affect large numbers of people, and prioritize actions accordingly; see the UNEP FI Human Rights Toolkit (UNEP FI 2025)	Client			•	
3. Ask what compute demand looks like under the client's own growth projections, not only today, and where training compute physically sits and on what grid, rather than accepting aggregate energy figures	Client	•	•		
4. Assess how secure the client's access to compute is, and on what terms, where capacity is contracted rather than owned	Client				•
5. Ask for training and inference footprints separately, with the measurement method, and establish what the figures cover (training or inference, which facilities, which scope)	Client	•	•		

Action	Level	Climate	Nature	Human rights	H&IE
Engage on the client's practices					
6. Engage with clients on how they identify and assess human rights risks in developing and deploying their AI systems, including discrimination, privacy, surveillance, freedom of expression, labour rights, and impacts on vulnerable or marginalized groups	Client			•	
7. Ask how clients address foreseeable misuse and high-risk downstream applications: what restrictions they place on customers or end users, how compliance is monitored, and what action is taken when misuse or significant adverse impacts are identified	Client			•	○
8. Request evidence of concrete safeguards: bias and discrimination testing, privacy protections, meaningful human oversight, data governance controls, and procedures to restrict, suspend, or discontinue AI systems where significant impacts cannot be adequately mitigated	Client			•	•
9. Require clients to demonstrate how affected individuals can raise concerns and challenge AI-enabled decisions: access to human review, meaningful information about decisions, grievance channels, and remediation where harm has occurred	Client			•	
10. Support clients building workforce transition capability (reskilling and redeployment) where AI adoption is changing the mix of tasks within jobs	Client				•
11. Set expectations on hardware retirement: chain of custody to final disposal or recovery	Client		•		
12. Require clients to disclose how they are addressing human rights impacts, the measures taken and outcomes	Client			•	
13. Where the client owns or contracts dedicated capacity, apply the facility-level questions in the data centres chapter	Transaction	•	•	•	•

Action	Level	Climate	Nature	Human rights	H&IE
Portfolio and collective action					
14. Assess portfolio concentration in sectors and regions where employment is particularly exposed to AI-driven task substitution, and consider whether portfolio engagement or financing can support workforce and economic transition	Portfolio				•
15. Act jointly in partnerships on measurement standards, since no single lender can establish a common basis alone	Portfolio	•	•		
Financing opportunities					
16. Set sustainability-linked terms on measurable commitments within the client's control, such as compute location, carbon intensity, hardware chain of custody, supplier standards coverage, or contractor pay floors, rather than on aggregate AI footprint measures or economy-wide outcomes	Transaction	•	•		•
17. AI applications with identifiable positive environmental outcomes, such as emissions monitoring, grid optimization, deforestation monitoring, and materials discovery, where there is a credible commercial case and a defined outcome	Transaction	•	•		
18. Computational efficiency that lowers the energy, water, and hardware required for a given AI output	Transaction	•	•		
19. Applications extending access: services in underserved languages, and delivery models reaching populations that current products do not	Transaction				•
20. Local data and language infrastructure, and processing capability in the markets where data preparation work is done	Transaction				•
21. Hardware recovery, resale, and reuse, which extend asset life and reduce primary material demand and dependency on concentrated mineral supply	Transaction		•		•

4. Systemic and higher-order effects

The preceding sections focus on direct impacts, those that can be linked to an identifiable client and addressed through engagement. Direct impacts arise from the AI lifecycle itself, which the two preceding chapters cover as data centre infrastructure and as AI services: the energy, water, and mineral resources it consumes, and the emissions and e-waste it generates.¹⁴

This chapter turns to effects that emerge from the combined adoption of AI services. These effects are not simply the sum of the effects of individual financings and are therefore better assessed at portfolio or strategy level. This chapter concentrates on negative effects. Positive outcomes are covered in the opportunities section of the AI services chapter.

- **Indirect effects** are the further environmental and social harms that follow from what AI *enables*, for instance, the additional vehicle use unlocked by advances in autonomous driving, or the reinforcement of existing inequalities across society where systems are trained on biased or unrepresentative data.
- **Higher-order effects** are more profound and longer-term: the behavioural and structural shifts AI causes across the economy and society, reshaping patterns of consumption and production, lifestyles, social trust, the information environment, and governance (UNEP 2024). They may be positive as readily as negative.

These effects are consequential, but the evidence base remains limited, particularly for indirect and higher-order impacts. UNEP therefore recommends concentrating on direct impacts while continuing to research these wider effects (UNEP 2024).

AI efficiency gains can reduce resource use per task while increasing total consumption, as lower costs and improved performance drive greater use. Efficiency alone is therefore unlikely to offset rising demand for data centre energy, water, and materials (EEA 2026). Cloud services may also reduce the use of printed materials, some physical products, and travel where digital alternatives genuinely replace them. These potential savings should be assessed against the resources used by digital infrastructure and any additional demand stimulated by lower costs (The Shift Project 2025). For a bank, this means a portfolio can become more efficient at client level while its absolute environmental footprint continues to grow. Portfolio-level monitoring should therefore consider absolute demand and emissions alongside client-level intensity metrics.

14 The UNEP FI Impact Radar (UNEP FI 2026) classifies effects not by causal distance but by the sustainability topic affected, so these three levels map onto it as follows. Direct impacts fall on the environmental topics *Climate stability*, *Environmental quality & health*, *Water preservation/use*, and *Circular economy & resource efficiency* (covering resource intensity and e-waste). Indirect effects span both pillars: AI-enabled mobility on *Climate stability* and *Air quality/pollution*, and biased training data on *Equality & non-discrimination* and *Technological safeguards*. Higher-order effects surface as cascading interlinkages across societal topics, notably *Technological safeguards*, *Information*, and *Strong & accountable institutions under Peace & rule of law*.

Regulatory and measurement gaps create uncertainty over the life of AI exposures. No standardized method currently exists for measuring and reporting AI's environmental impacts (UNEP 2024). Liability for AI-related harms is developing through two routes: 1) general product and liability rules that treat software as a product and 2) national civil or sectoral law, rather than a single AI-specific regime. Enforcement capacity also varies across jurisdictions. A client's compliance position today may therefore provide limited information about its position over the life of the financing. The Regulatory and policy considerations chapter considers the relevant regulatory developments.

Labour market effects also arise at economy level, not only at client level (UNCTAD 2025). While automation within clients' businesses and those of their customers is important, the broader concern is job losses concentrated in particular occupations, sectors, regions, or segments of the workforce (e.g., labour market entrants) outpacing retraining and redeployment. No single employer or client can address these effects. The risk is that the costs of technological change fall on the workers and regions least able to absorb them. This is the same concern addressed by just transition frameworks for decarbonization, even though the driver is different. For banks, the relevant exposure depends on where they lend, particularly in sectors and geographies where jobs are more exposed to automation. Evidence on the scale and timing of these effects remains contested and is changing quickly.

Widespread use of AI can affect information, social trust, and governance beyond any individual client's control. UNEP identifies potential systemic effects on consumption and production, lifestyles, social trust, misinformation, and governance (UNEP 2024). The same technology can support beneficial uses, such as communicating complex scientific information, while also enabling the rapid creation and dissemination of misinformation. These effects are difficult to attribute to individual clients and to quantify.

Dependence on a small number of AI providers can create correlated portfolio exposure. Clients across otherwise unrelated sectors may depend on the same providers, creating correlated exposure if a provider fails, withdraws a service, or becomes subject to export controls or other restrictions. This dependency is not necessarily visible in individual credit assessments and is therefore relevant to portfolio and strategy functions.

Lobbying by the AI sector in the United States is now measurable and growing rapidly. Public Citizen identified 3,570 federal lobbyists, around a quarter of the total, who reported lobbying on an AI-related issue at least once in 2025. Its definition includes artificial intelligence, autonomous vehicles, and data centres. The figure does not represent lobbyists working exclusively on AI or solely for AI-sector firms. The number whose filings mentioned data centres rose from 68 in 2022 to more than 400 in 2025 (Public Citizen 2026).

These figures measure reported lobbying activity, not its influence on any particular regulatory outcome. Where relevant, banks should examine clients' disclosed policy positions and trade association memberships, and assess whether their advocacy is consistent with their stated safety, human rights, and environmental commitments.

What a bank can do at portfolio level

- Measure resource use and emissions from AI-related activity at portfolio and strategy level, not only through client-level intensity metrics.
- Map dependencies across sectors, including common model, compute, and infrastructure providers (e.g., reliance on the same providers, jurisdictions, or hardware supply), and assess how easily each could be replaced.
- Map portfolio exposure to AI sector corporates and to regions and infrastructure where data centre buildout competes with other borrowers for grid capacity, water, or land.
- At underwriting, treat a client's regulatory compliance as a snapshot and assess how likely the regulatory regime is to tighten over the life of the financing.
- Track developments in AI measurement, liability, and regulatory frameworks, particularly where these affect the bank's ability to assess or price risk.
- Engage on measurement and other standards through partnerships, initiatives, or associations, where no individual lender can establish a common basis.

5. Regulatory and policy considerations

This chapter separates the regulation that applies to a bank's clients from the regulation that applies to the bank itself:

- **Policy that applies to the client falls into three groups in this chapter:**
 - Policy about data centres (covering whether and where they may be built, what performance thresholds they must meet, and whether they are designated as strategic).
 - Policy on due diligence that applies to data centre operators and AI providers.
 - Policy about AI services.
- **Policy that applies to the bank is sustainable finance regulation.** It regulates how the bank identifies, manages, and discloses its exposures.

Examples are drawn largely from the European Union, where binding regulation is furthest advanced, but the mechanisms are not EU-specific: moratoria, performance thresholds, and strategic designation also appear in markets outside the EU.

Client regulation: data centres

Most jurisdictions have some form of regulation affecting data centres. Data centre policy regulates the client across three domains.

1. Environmental rules cover permits, water use, and heat recovery.
2. Infrastructure and energy rules cover planning, grid access, and efficiency.
3. Digital governance rules cover cybersecurity and data protection.

The first two domains work through four mechanisms: outright bans, conditions attached to grid access or approval, designation as strategic national infrastructure, and, in many markets, no dedicated rules at all. Cybersecurity and data protection rules are outside the scope of this brief.

In a small number of markets, governments have banned or paused new data centre construction, regardless of facility efficiency. The Netherlands prohibits new hyperscale facilities across most of the country, with only two municipalities exempt.¹⁵ The ban protects limited supplies of land and renewable power. Similarly, Singapore imposed a permit moratorium for all new builds between 2019 and 2022 and Ireland a grid connection moratorium in Greater Dublin between 2021 and 2025 (CRU 2025).¹⁶ Singapore and Ireland then moved to the conditional access frameworks discussed next. Of the three, only the Dutch measure is still in force.

¹⁵ Under the Dutch rules, a hyperscale facility is one above 10 hectares and at least 70 MW. The prohibition applies only to new builds. A caveat is that several projects that were approved before this was enacted will still be built.

¹⁶ In that period, one fully off-grid data centre with a 110 MW microgrid was built in the Dublin region.

Some national regulators tie access to a performance threshold. Facilities must meet efficiency standards, renewable electricity requirements, or both to connect to the grid or receive development approval. Ireland makes new grid connections conditional on matching generation or storage and on meeting at least 80 per cent of annual demand from additional renewables (CRU 2025). Singapore allocates new capacity only to projects meeting efficiency and green energy requirements (EDB and IMDA 2025). Other jurisdictions are preparing similar rules. Spain put a draft decree to consultation in August 2026. In September 2026, the European Commission put forward a common EU rating scheme for data centres and opened a consultation on possible minimum performance standards (European Commission 2026b).

At the same time, governments increasingly treat compute capacity as national infrastructure. State-backed AI supercomputing clusters across Europe and Central Asia rose from three in 2018 to 44 in 2025 (Sajadieh and Fattorini 2026). Governments are also implementing data localization rules. These mandates require certain data to be stored and processed within national borders. East Asia and the Pacific had recorded 77 such measures by 2024, and sub-Saharan Africa 71 (Sajadieh and Fattorini 2026). The European Union's proposed Cloud and AI Development Act aims to triple EU data centre capacity within five to seven years through simplified permitting, offered only to projects that meet resource efficiency criteria (European Commission 2026a).

Other markets see strategic value in data centres and incentivize their construction. For example, Saudi Arabia takes a largely investment-enabling approach to data centre regulation. Facilities are classified mainly by infrastructure standards and development status rather than environmental performance, although higher-tier facilities must submit energy-management and sustainability plans. The [Data Center Services Regulations](#) of the Communications, Space and Technology Commission explicitly aim to stimulate investment in the sector. The Republic of Korea's 2026 law, in force from 2027, classifies qualifying AI data centres as national strategic facilities, granting faster approvals and, for projects outside the capital region, exemption from grid-impact checks (Shin and Kim 2026). The United Kingdom's 2024 Critical National Infrastructure status instead provides priority support in disruptions, but not faster permitting (UK Government 2024).

In some jurisdictions, particularly emerging markets, data centres are permitted under general industrial, commercial, telecommunications, or environmental frameworks rather than dedicated data centre policies. These frameworks were often developed before hyperscale facilities became significant users of power and water. While this can simplify and accelerate deployment, it may also create uncertainty around grid access, water allocation, community impacts, and future regulatory change as the sector and its impacts grow. Permit compliance in these markets is weak assurance that impacts are managed, so the lender's own standards become the effective constraint.

Table 15: How jurisdictions regulate data centre development, by mechanism. Sources: CRU 2025; EDB and IMDA 2025; European Commission 2026b; IEA 2025.

Jurisdiction	Mechanism	Regarding	Status
Netherlands	Ban	New hyperscale builds	In force
Ireland	Conditional access	New connections nationally	Conditional (moratorium lifted 2025)
Singapore	Conditional access	New capacity allocation	Conditional (moratorium lifted 2022)
Germany	Performance mandate	New and existing facility efficiency (PUE)	In force; amendment before parliament
China	Performance mandate	Project approval, hub regions	In force
Spain	Conditional access	Grid access permits, new builds of 1 MW or more	Draft decree, consultation closed September 2026
EU	Performance mandate	Data centres of 500 kW or more, efficiency and water	Rating scheme proposed September 2026, under scrutiny; standards consultation to December 2026
Saudi Arabia	Strategic designation	Registration by build quality	In force
Republic of Korea	Strategic designation	Strategic facility status, grid exemption	2026 law, effect from 2027
UK	Strategic designation	Priority support in disruption	In force from 2024

The thresholds behind these conditions differ by theme.

On climate, a few advanced markets set binding efficiency and renewable obligations on data centres.

The EU Energy Efficiency Directive requires energy reporting, the voluntary Taxonomy sets classification thresholds, and Germany's Energy Efficiency Act sets the strictest national efficiency mandate (IEA 2025). The amendment agreed by the Federal Cabinet in June 2026 kept the PUE target of 1.2 for new builds but doubled the period to meet it from two years to four, and moved the scope threshold from 300 kilowatts of connection capacity to 500 kilowatts of installed IT capacity, so smaller facilities fall outside the law (Deutscher Bundestag 2026). China sets binding PUE caps tied to project approval in its major cities and hub regions (IEA 2025). Outside these markets, governments regulate mainly through grid access. Table 16 sets out the thresholds themselves.

On nature, water rules range from reporting duties to limits set through permitting. Several markets now condition or refuse new capacity on water performance. The EU Energy Efficiency Directive requires water-use reporting for facilities of 500 kilowatts or more (WEF 2025a). Under [Commission Delegated Regulation \(EU\) 2021/2139](#), the Taxonomy's do no significant harm criteria attach water and circular economy conditions to how a deal is classified, before any money is disbursed. Water use is

already reported under the EU reporting scheme and is graded in the rating scheme the Commission proposed in September 2026 as part of its data centre energy efficiency package.

Beyond EU law, governments act through access and permitting. Singapore conditions new capacity on water efficiency targets. In Chile, a court partially reversed a data centre’s environmental permit on aquifer grounds in 2024 (see Water: demand and cooling). In France, a new law lets authorities refuse building permits for data centres in water-stressed areas, but the same law lets a data centre be designated a project of major national interest and permitted faster ([Loi n° 2026-403](#)).

Two further obligations apply regardless of local water stress. The phase-down of fluorinated gas refrigerants and liability for per- and polyfluoroalkyl substances (PFAS) in fire-suppression systems can create retrofit and clean-up costs for facilities that use them (UNEP 2025b).

Table 16: Regulatory thresholds in force or proposed, as set by the jurisdictions themselves. These are reference points, not UNEP FI benchmarks. Source: UNEP FI internal work, based on national legislation and CNDCP 2021; IEA 2025.

Jurisdiction or framework	Metric	Threshold	Status
Germany	PUE	1.2 for new builds; 1.5 from July 2027 and 1.3 from July 2030 for existing facilities (draft amendment: 1.6 and 1.4)	In force; draft amendment before parliament
China	PUE and renewable share	Binding caps by hub region. At least 80 per cent renewables for new hub-region facilities	In force
Spain	PUE, WUE, and renewable share	PUE 1.15 and WUE 0.1 L/kWh provisionally until the EU scheme applies. 80 per cent renewables matched hourly. New builds of 1 MW or more	Draft decree
EU Taxonomy 8.1	Refrigerant global warming potential	Ceiling on refrigerant GWP. No efficiency or water threshold today	Voluntary classification
Climate Neutral Data Centre Pact	PUE and renewable share	1.3 in cool and 1.4 in warm climates for new builds. Fully renewable or carbon-free electricity by 2030	Voluntary commitment

Client regulation: due diligence for operators and AI providers

The EU Corporate Sustainability Due Diligence Directive, as amended by the 2026 Omnibus package (Directive (EU) 2026/470), applies only to companies with more than 5,000 employees and EUR 1.5 billion turnover, so most data centre operators fall outside it directly. The largest AI providers fall inside it on the EU turnover test. Obligations apply from July 2029. Two indirect routes matter more. National law is the active framework: Germany and France have enacted their own supply chain due diligence laws (Germany's [LkSG](#) and France's [Loi n° 2017-399](#)), both of which have already generated complaints, and in France litigation, in other sectors. And in-scope companies pass due diligence obligations down their value chains contractually, so operators below the threshold can still face the Directive's requirements through customer agreements, which is the more likely route for colocation operators serving large enterprise and hyperscaler tenants. Human rights regulation applies to operators almost entirely through general supply chain law rather than sector-specific rules.

Banks themselves are excluded from applying the Directive to their lending and investment relationships and face disclosure obligations under the Corporate Sustainability Reporting Directive (CSRD), the Sustainable Finance Disclosure Regulation (SFDR), and Pillar 3. The Directive provides for a review of this exclusion around 2028. Direct liability exposure therefore depends on whether the bank's own jurisdiction has national supply chain law and how its courts interpret it. Through the lending relationship, a client's compliance position under these fragmented frameworks can be a credit and litigation risk for the lender regardless of whether the bank is itself in scope.

Client regulation: AI services

The EU AI Act is the most comprehensive binding cross-sector AI regulation to date and a main reference point. Obligations are tiered by risk and fall on both providers and deployers, including those outside the EU where a system's output is used within the EU. It therefore applies to a bank's clients as providers and deployers of AI, and to the bank itself where it deploys AI in its own operations, since systems that assess the creditworthiness of natural persons or set their credit scores are classified as high-risk. Data protection law applies in parallel: the General Data Protection Regulation governs the processing of personal data by any organization within its scope ([Regulation \(EU\) 2016/679](#)).

Where the law applies to the client

A developer's own compliance with the Act can become a credit risk for its lender. Providers of general-purpose models have had to meet transparency, copyright, and documentation rules since August 2025. The most capable models also carry risk management, testing, and incident reporting duties. Enforcement powers, including fines, apply from August 2026, and the obligations on providers of high-risk systems from December 2027. A developer's compliance record, its copyright exposure on training data, and its standing with the regulator now affect its risk as a borrower.

Tracking of the environmental impacts of AI models is limited, though work on standardization is increasing. Providers of general-purpose models must document their energy use, and the Commission was tasked with requesting standards on the energy efficiency of those models. No standardized, verified method for measuring a model's energy, water, or carbon use yet exists, so the obligation produces figures that cannot easily be compared between clients.

From 9 December 2026, liability for harm caused by an AI system falls under revised product liability rules ([Directive \(EU\) 2024/2853](#)). The European Union dropped its planned AI liability law in 2025. The revised product rules treat software and AI as products and make the manufacturer liable without proof of fault. National rules apply alongside them and differ by country.

Where the law applies to the bank

A bank that uses artificial intelligence to assess the creditworthiness of natural persons is a deployer and subject to the high-risk rules. Those rules require documentation, human oversight, and a fundamental rights impact assessment before the system is used. The main high-risk obligations have been postponed from August 2026 to December 2027, with high-risk systems embedded in regulated products following in August 2028 ([Regulation \(EU\) 2026/1744](#)). Prudential supervisors are also acting. In July 2026 the European Central Bank told the banks it directly supervises to set out plans against AI-enabled cyber threats by 31 October 2026 (ECB 2026).

The EU AI Act is the most advanced AI regime, but others are emerging. The Republic of Korea's AI Framework Act took effect in January 2026 with a similar cross-sector, risk-based structure and reach beyond its borders, but operates under a grace period during which fines are largely deferred. Brazil's equivalent bill, [PL 2338/2023](#), has cleared the Senate and awaits the Chamber of Deputies. Canada's federal bill, [C-27](#), lapsed in 2025, leaving privacy law, sectoral rules, and provincial measures in its place. China regulates AI through binding rules for specific applications, such as the 2023 [Interim Measures for generative AI services](#), rather than a cross-sector framework.

Voluntary frameworks fill part of the gap left by binding law. The OECD AI Principles,¹⁷ the UNESCO Recommendation on the Ethics of Artificial Intelligence, and the AI Risk Management Framework issued by the United States National Institute of Standards and Technology set widely referenced expectations. The World Benchmarking Alliance scores 200 technology companies on responsible AI disclosure (WBA 2025).

Bank regulation: sustainable finance

Sustainable finance regulation governs how a bank identifies, manages, and discloses its own exposures. It falls into three categories.

1. Rules that define whether an exposure may be called sustainable, e.g., through the EU Taxonomy or other taxonomies, and the disclosure rules built on these.
2. Rules that require a bank to manage and report the environmental and social impacts of what it finances.
3. Rules that treat environmental, social, and governance factors as financial risks to be managed and capitalized.

The EU Taxonomy sets the EU definition of sustainable data centre activity in binding financial-market regulation. It draws its technical criteria from the European Code of Conduct on Data Centre Energy Efficiency and requires independent third-party verification every three years. Meeting it is demanding, primarily because of the evidence and audit burden rather than the thresholds themselves. It provides an indication of the direction of EU policy, although its criteria are currently under revision through the Commission's 2026 review of the Taxonomy delegated acts. Taxonomy alignment is voluntary and is not a condition for financing a facility.

Outside the European Union, the minimum level of required disclosure is lower. It rests mainly on national adoption of the standards issued by the International Sustainability Standards Board (ISSB), alongside a range of national rules. The table below sets out the main instruments and what each means for a data centre or AI exposure.

¹⁷ These Principles are complemented by the [OECD Due Diligence Guidance for Responsible AI](#)

Table 17: Main sustainable finance instruments and what they mean for a bank. Source: UNEP FI internal work.

Instrument	What it means for a bank
EU Taxonomy 8.1 and 8.2 (Climate Delegated Act)	The EU definition of a sustainable data centre in binding financial-market regulation, but the criteria are not automatically met
CSRD / ESRS (E1 climate, E3 water, S1 to S4 workforce, value chain workers, affected communities, and consumers)	Main source of counterparty climate, water, and social data, including data on the client's own workforce and on workers in its value chain. Now limited to companies with more than 1,000 employees and EUR 450 million turnover, reporting from financial year 2027
SFDR (Articles 8 and 9, PAI)	Governs how a data centre or AI exposure is disclosed inside sustainable financial products. ¹⁸ Under revision
CRR3 / CRD6 ESG risk rules (Art 87a; EBA Guidelines ; Pillar 3)	The binding, supervised regime requiring banks to manage and disclose ESG risk in exposures
National adoption of ISSB (IFRS S1 and S2) ¹⁹	Binding climate disclosure wherever a country has written the ISSB standards into law
CSDDD (Directive (EU) 2026/470)	Applies to banks above 5,000 employees and EUR 1.5 billion turnover, for their own operations and upstream chain. Lending and investment are excluded, with a review around 2028

Alongside the binding regime, several voluntary frameworks set the expectations a bank is measured against. The Equator Principles govern environmental and social risk management in project finance and now include specific guidance for data centre projects (EP 2026). The European Code of Conduct on Data Centre Energy Efficiency sets non-binding efficiency benchmarks that many operators report against. The Climate Neutral Data Centre Pact commits its signatories to a PUE of 1.3 in cool and 1.4 in warm climates for new builds, and to fully renewable or carbon-free electricity by 2030 (CNDCP 2021). The Partnership for Carbon Accounting Financials gives banks a common method for the financed emissions of these exposures. None of these is law, but each shapes how a deal may be assessed.

Outside the European Union, a growing number of jurisdictions base their sustainability disclosure rules on the standards issued by the ISSB. Still, a bank cannot assume one standard for a counterparty operating across borders. Rules outside the European Union are a patchwork of national and local measures. Disclosure is thin and the rules are changing quickly.

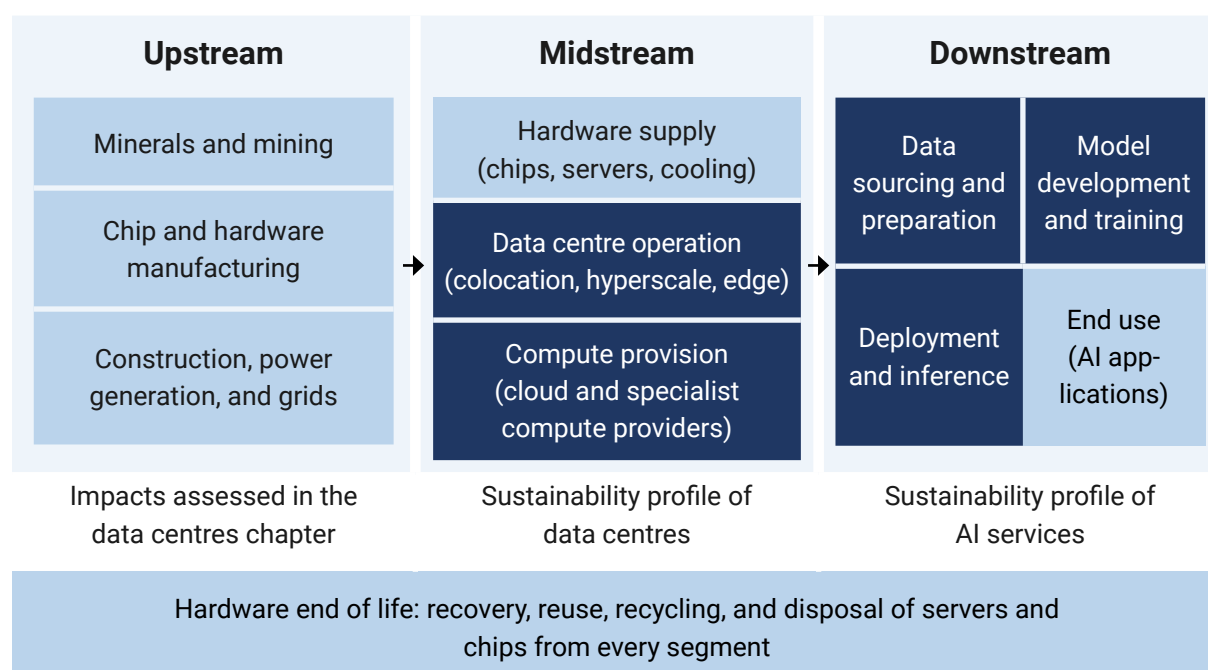
18 The SFDR is under review, and the Commission's proposed revision would replace the Article 8 and Article 9 product categories.

19 Mandatory or being phased in for some entities in several jurisdictions, including Australia, Hong Kong, China, and Singapore from 2025, and Japan from 2027. The United States has no federal climate disclosure rule in effect: the 2024 rule of the Securities and Exchange Commission (SEC) is stayed and the SEC proposed its rescission on 29 May 2026. In California, SB 253 requires first emissions reports in 2026, while SB 261 is suspended pending appeal.

Annex

How data centres and AI services work

A data centre and an AI service belong to adjacent segments of one value chain (Figure 1, repeated below). How a data centre works explains the midstream segment, where computing equipment is housed, powered, and cooled. How an AI service works explains the downstream segment, where models are built and run on that equipment. The same company can operate in both, for example a hyperscaler that develops models and runs its own data centres.



■ Companies the brief covers as clients ■ Impacts assessed, but companies not covered as clients

Figure 1 (repeated): The data centre and AI services value chain used in this brief. Source: UNEP FI internal work.

How a data centre works

A data centre is a facility built to house the physical hardware that stores, processes, and transmits digital information. Each facility is organized around three interdependent systems: IT equipment (servers, storage, and networking hardware arranged in racks), power delivery (utility grid connection, backup generators, and uninterruptible power supply units), and cooling infrastructure (chillers, cooling towers, and distribution pipework). Facilities range from a single server room to hyperscale campuses.

IT equipment

Data centres consumed approximately 415 TWh of electricity globally in 2024, around 1.5 per cent of global demand (IEA 2025). AI workloads depend on GPU-intensive computation, which concentrates more processing power and heat into a given physical footprint than conventional central processing units (CPUs). This intensifies demand on both power and cooling systems (UNEP 2025b).

Power delivery

Live services cannot tolerate interruptions to power supply, though training workloads are more flexible and can pause and resume. Data centre infrastructure is designed to secure power reliability through redundant grid connections, backup batteries that bridge the time until generators start, and automatic backup generators. If grid capacity is insufficient, some facilities add on-site natural gas generation.

METRIC power usage effectiveness (PUE) measures how much energy the facility consumes beyond the IT load itself (Avelar *et al.* 2012).

It is calculated as follows:

$$\text{PUE} = \frac{\text{Total Facility Energy}}{\text{IT Equipment Energy}}$$

Total Facility Energy includes the energy used by the IT equipment plus everything that supports it (power delivery, cooling systems, and miscellaneous).

IT Equipment Energy includes all energy consumed by equipment used to manage, process, store, or route data within the compute space.

A PUE of 1.5 means the facility consumes 50 per cent more energy than the IT equipment alone. The global industry average has remained at approximately 1.54 for six consecutive years (Uptime Institute 2025). Best-in-class hyperscale facilities reach scores around 1.1 (Uptime Institute 2025).

Most of this power comes from the electricity grid, which makes grid carbon intensity the main driver of most data centres' operational emissions. Globally, fossil fuels supply more than half of the electricity data centres physically consume (IEA 2025). An operator on a grid connection cannot directly control that intensity. It can influence its carbon footprint mainly through renewable energy procurement and site selection.

Cooling

Cooling is the largest energy demand on top of the IT load itself. Processors generate heat in proportion to the work performed, and cooling systems must continuously dissipate that heat to keep equipment within a narrow operating temperature range. As compute density rises with AI workloads, the thermal load per unit of floor area increases proportionally. Cooling accounts for about 7 per cent of electricity consumption in efficient hyperscale facilities and over 30 per cent in less efficient enterprise facilities (IEA 2025). It is also the primary source of on-site water use (Uptime Institute 2025).

METRIC water usage effectiveness (WUE) measures litres of water consumed per kWh of IT load. WUE ranges widely by cooling method and climate: some hyperscale sites report 0.1 to 0.3 litres per kWh, while 1.8 litres per kWh has long been used as an industry average and water-cooled systems can run higher (Shehabi *et al.* 2016, 2024).

Impact source	Location	Key metric
Direct cooling water	On-site	WUE (L/kWh)
Upstream power station water	Off-site	Electricity volume × grid water intensity

The water footprint of a data centre divides between on-site and upstream sources. On-site, cooling systems draw water directly, mostly through evaporation in cooling towers. In the United States, around 75 per cent of a data centre’s total water footprint arises from cooling at the power stations that supply its grid electricity, not from the facility itself (Siddik *et al.* 2021). The four main cooling approaches (air, evaporative, liquid, and immersion) each trade off energy against water differently.

Metrics commonly used

Both metrics depend on what a facility is built to do, so neither figure means much on its own. The table below sets out the main facility types against both. A hyperscale site and an enterprise site are modelled with the same water usage effectiveness while their power usage effectiveness differs by a wide margin. An AI factory runs at a slightly lower power usage effectiveness than a conventional hyperscale site while consuming close to twice the water for each kilowatt hour. The facility types broadly follow the market overview, with AI factories shown separately, so a reader can move between a client’s facility type and its likely resource profile.

Table 18: Typical PUE and WUE by facility type, United States, modelled for 2023. Source: Shehabi et al. 2024.

Facility type	Key characteristics	PUE	WUE
Hyperscale	<ul style="list-style-type: none">▪ Primary host for cloud services▪ Large capacity (100 MW to over 1 GW)▪ About 50 per cent evaporative cooling	1.22	0.32
Hyperscale (AI factory)	<ul style="list-style-type: none">▪ Specialized for AI training and inference▪ Large capacity (100 MW to over 1 GW)▪ Liquid cooling	1.14	0.61
Colocation	<ul style="list-style-type: none">▪ Multi-tenant shared facility for leasing space and power▪ About 5 MW to over 100 MW▪ Typically air cooling; increasingly hybrid	1.68	0.67
Edge	<ul style="list-style-type: none">▪ Distributed nodes near point of use for low latency▪ Low to medium capacity, about 1 MW▪ Primarily air cooling	Varies	Not reported ²⁰
Enterprise	<ul style="list-style-type: none">▪ Run by businesses for internal use▪ Typically smaller (10 to 25 MW)▪ 80 per cent air cooling	1.91	0.32

How an AI service works

An AI service is a trained model sold as a product, either directly to users or built into other companies’ software. It belongs to the downstream segment of Figure 1. One company can control all of it or rely on others for parts, so a bank’s client may not control the activity that creates the impact being assessed.

The kind of model determines where its impacts arise. An AI model is software trained on data to identify patterns and perform tasks such as generating content, making predictions, or classifying information (UNEP 2024). Three kinds of model account for most of the impacts in this brief:

- **Generative** models produce text, images, code, or audio, and their impacts arise in both training and inference.
- **Biometric** systems identify or verify people from their faces, voices, or other physical characteristics, and affect privacy most directly.
- **Predictive and scoring** systems rank or classify people for decisions on credit, employment, or insurance, and engage non-discrimination and access to essential services.

20 Edge facilities are predominantly air cooled, so on-site water use is minimal, but no comparable published WUE figure exists for the category.

Training and inference

Most AI energy use now goes to inference, and inference grows with every new user (IEA 2026). Training builds the model once. Inference runs it every time someone sends a request, so a client’s resource demand follows the commercial success of its product. The two stages differ on most points a bank would assess.

Training also depends on people and data. Developers collect, license, or scrape data that can include personal information and creative work, and often contract out the labelling of that data and the moderation of content. Where the data come from and how those workers are treated raise questions of privacy, consent, copyright, labour conditions, and bias.

Table 19: Training and inference compared. Source: UNEP FI internal work, based on IEA 2026; OHCHR 2024.

	Training	Inference
What it does	Builds the model from large datasets	Runs the finished model to answer each request
Where it can run	Wherever power is clean or cheap, since no user is waiting	Close to users, who expect an instant response
How demand changes	Ends when training ends	Grows as the service is adopted
People affected	Workers who label data and moderate content, and people whose data or creative work is used	People subject to the model’s outputs and decisions

Compute and who controls it

A model developer can own the compute its models run on or rent it, and that choice decides how much of the footprint it controls. A model developer that rents compute controls model design and workload but has little say over the electricity, cooling, or water behind it.

Table 20 shows which kind of client typically controls each part of the chain, and where the brief covers it.

Table 20: Which client typically controls each part of the chain.

Part of the chain	Model developer renting compute	Hyper- scaler	Specialist compute provider	Data centre operator	Covered in
Data sourcing and preparation	•	•			Decent work and digital safety: data work
Model development and training	•	•			Climate, water and resource efficiency: compute demand
Where training and inference run	○	•	•		Climate, water and resource efficiency: compute demand
Hardware supply		•	•		Circular economy: hardware, from minerals to e-waste
Data centre operation		•	○	•	How a data centre works
End use	•	•			Equality: bias and unequal access; Digital and physical safety and security: downstream use and misuse; Employment: effects on work and labour markets

• controls, ○ influences, blank means little or no control.

Indicative: one company can hold several roles. Source: UNEP FI internal work.

Measuring resource use

METRIC energy per query measures the electricity used to answer one request. Published figures range from 0.24 watt-hours for a median Gemini text prompt, as reported by Google, to around 2 watt-hours for a language model query in test conditions (IEA 2025, 2026). No standardized method yet exists, so the model, the task, and the measurement boundary each affect the figure (UNEP 2024).

Energy per query can fall while total demand rises. Cheaper answers bring more users, so an intensity figure says little on its own about the resource demand a bank is financing.

Coverage of the Sector Impact Matrix for cloud computing

UNEP FI's *Sector Impact Matrix* identifies 17 likely positive and negative impact associations for cloud computing. The table below shows where each association is discussed in this brief, with page references to the relevant sections.

Table 21: Coverage of the UNEP FI Sector Impact Matrix for cloud computing in this brief. Source: UNEP FI Sector Impact Matrix.

Impact Matrix	Type of impact	Explanation of the impact	Page(s)
Digital safety & security	Negative	Cloud design may expose users to breaches, surveillance, provider dependence, and exploitable vulnerabilities.	33, 39
Employment	Positive	Cloud growth may create specialist roles and productivity gains, although workers have unequal access to opportunities.	33, 39
Decent work	Negative	Cloud workers may face intense performance demands, long hours, low pay, insecure work, and burnout.	20, 32
Water & sanitation	Negative	Cooling-water demand may strain local supplies and compete with community water needs.	18, 22
Energy	Negative	Data centre electricity demand may strain grids and raise costs for other users.	17–18, 31
Information access	Positive	Cloud services can provide on-demand access to data, applications, and storage where connectivity and digital skills permit.	32, 34
Information control	Negative	Concentrated provider control may enable selective access, content restriction, ranking, removal, or modification.	33, 39
Responsible business conduct	Negative	Sector lobbying may influence oversight or favour self-regulation over public safeguards.	39
SME development	Positive	Cloud services may lower SMEs' technology costs and widen market access, subject to finance, skills, and connectivity.	32
Circular economy & resource efficiency: substitution	Positive	Digital services may replace some physical products and processes, but infrastructure has its own material footprint.	38

Impact Matrix	Type of impact	Explanation of the impact	Page(s)
Circular economy & resource efficiency: materials	Negative	Hardware production and operation require minerals and energy, adding pressure on natural resources.	20–21, 31
Circular economy & resource efficiency: e-waste	Negative	Server, storage, and network-equipment turnover generates difficult-to-recycle electronic waste.	20–21, 33
Climate stability: system effects	Negative	Widespread cloud adoption may increase system-wide greenhouse-gas emissions, including through rebound effects.	38
Climate stability: operations	Negative	Data centre, server, and network operations generate greenhouse-gas emissions.	17, 31
Land preservation / use	Negative	Data centre and supporting infrastructure may cause localized land disturbance.	18–19
Water preservation / use	Negative	Cooling-water withdrawals may deplete local water resources and add environmental stress.	18
Biodiversity	Negative	Infrastructure construction and operation may disturb habitats through clearance, noise, and light.	18–19

References

Amnesty International. 2016. *'This Is What We Die for': Human Rights Abuses in the Democratic Republic of the Congo Power the Global Trade in Cobalt*. Amnesty International. [amnesty.org/en/documents/afr62/3183/2016/en/](https://www.amnesty.org/en/documents/afr62/3183/2016/en/)

Arup. 2025. *Circular Thinking for Data Centres*. Arup. www.arup.com/globalassets/downloads/insights/c/circular-thinking-for-data-centres/arup-circular-thinking-for-data-centres.pdf

Associated Press. 2024. 'Google Says It Will Rethink Its Plans for a Big Data Center in Chile over Water Worries'. World News. *AP News*, September 17. apnews.com/article/chile-google-data-center-water-drought-environment-d1c6a7a8e8e6e45257ac84fb750b2162

Avelar, Victor, Dan Azevedo, and Alan French. 2012. *PUE: A Comprehensive Examination of the Metric*. White Paper No. 49. The Green Grid.

BGS. 2026. *World Mineral Production 2020-24*. British Geological Survey. bgs.ac.uk/mineralsuk/statistics/world-mineral-statistics/

Ceres. 2025. *Drained by Data: The Cumulative Impact of Data Centers on Regional Water Stress*. Ceres. ceres.org/resources/reports/drained-by-data-the-cumulative-impact-of-data-centers-on-regional-water-stress

CNDP (Climate Neutral Data Centre Pact). 2021. 'Climate Neutral Data Centre Pact—The Green Deal Need Green Infrastructure'. climateneutraldatacentre.net/

CoreWeave. 2026. 'CoreWeave Closes Landmark \$8.5 Billion Financing Facility, Achieving First Investment-Grade Rated GPU-Backed Financing'. March 31. investors.coreweave.com/news/news-details/2026/CoreWeave-Closes-Landmark-8-5-Billion-Financing-Facility-Achieving-First-Investment-Grade-Rated-GPU-backed-Financing/default.aspx

CRU. 2025. *Decision on New Electricity Connection Policy for Data Centres*. Commission for Regulation of Utilities. crui-live-96ca64acab2247eca8a850a7e54b-5b34f62.divio-media.com/documents/CRU2025236_Large_Energy_User_connection_policy_decision_paper.pdf

CSO. 2026. 'Data Centres Metered Electricity Consumption 2025, Key Findings'. Central Statistics Office (Ireland), July. cs.ie/en/releasesandpublications/ep/p-dcmec/datacentresmeteredelectricityconsumption2025/keyfindings/

Data Center Watch. 2026. 'Data Center Watch Report Q1 2026'. April. datacenterwatch.org/q1-2026

DCD (Data Centre Dynamics). 2024. 'US Carriers Working to Fix Network Outages Caused by Hurricane Milton across Florida'. October 11. datacenterdynamics.com/en/news/us-carriers-working-to-fix-network-outages-caused-by-hurricane-milton-across-florida/

DCD (Data Centre Dynamics). 2025. 'Brazilian Indigenous Community Files Complaint to Halt TikTok Data Center'. September 9. datacenterdynamics.com/en/news/brazilian-indigenous-community-files-complaint-to-halt-tiktok-data-center/

Deutscher Bundestag. 2026. 'Deutscher Bundestag—Beschleunigte Umsetzung der Energieeffizienzrichtlinie beraten'. September 24. bundestag.de/dokumente/textarchiv/2026/kw39-de-energieeffizienzrichtlinie-1211306

ECB. 2026. *Addressing AI-Enabled Cybersecurity Threats*. Letter to significant institutions. European Central Bank.

EDB and IMDA. 2025. *Fact Sheet: Launch of Second Data Centre, Call for Application*. Singapore Economic Development Board and Infocomm Media Development Authority. edb.gov.sg/content/dam/edb-en/about-edb/media-releases/news/launch-of-second-data-centre-call-for-application/Launch%20of%20second%20data%20centre-call%20for%20application.pdf

EEA. 2026. *Navigating the Twin Transition*. EEA Briefing 10/26. European Environment Agency. doi.org/10.2800/9993887

EP. 2026. *Guidance to Support Effective Application of the Equator Principles for Data Centre Projects*. Equator Principles. equator-principles.com/app/uploads/Guidance_Application-of-the-EPs-for-Data-Centre-Projects_May-2026.pdf

European Commission. 2026a. 'Cloud and AI Development Act'. August. digital-strategy.ec.europa.eu/en/policies/cloud-and-ai-development-act

European Commission. 2026b. *Commission Enhances Energy Efficiency and Sustainability of Data Centres in the EU*. Press Release IP/26/1667. ec.europa.eu/commission/presscorner/api/files/document/print/en/ip_26_1667/IP_26_1667_EN.pdf

GDFA. 2025. *Digital Impact Bonds—Where Finance Meets Tech for Impact*. Green Digital Finance Alliance. drive.google.com/file/d/1V8O5MCjcHWrRTU0GwSoz2oO8NuvAaJ9m/view?usp=drive_fs&usp=embed_facebook

Global Witness. 2022. *The ITSCI Laundromat*. Global Witness. globalwitness.org/en/campaigns/transition-minerals/the-itsci-laundromat/

Gour, Neha, Luis Ortiz, and Edward Maibach. 2026. 'Health Implications of the Rapid Rise of Data Centers in Virginia: An Exploratory Assessment'. *Frontiers in Climate* 8 (February). doi.org/10.3389/fclim.2026.1648912

Gröger, Jens, Felix Behrens, Peter Gailhofer, and Inga Hilbert. 2025. *Environmental Impacts of Artificial Intelligence*. Greenpeace.

Han, Yuelin, Pengfei Li, Adam Wierman, and Shaolei Ren. 2026. 'Small Bottle, Big Pipe: Quantifying and Addressing the Impact of Data Centers on Public Water Systems'. arXiv:2603.02705. Preprint, arXiv, March 18. doi.org/10.48550/arXiv.2603.02705

Human Rights Watch. 2024. "Die First, and I'll Pay You Later". Saudi Arabia's 'Giga-Projects' Built on Widespread Labor Abuses. Human Rights Watch.

IEA. 2025. *Energy and AI*. World Energy Outlook Special Report. International Energy Agency. iea.blob.core.windows.net/assets/de9dea13-b07d-42c5-a398-d1b3ae17d866/EnergyandAI.pdf

IEA. 2026. *Key Questions on Energy and AI*. World Energy Outlook Special Report. International Energy Agency.

ILO. 2022. *Measuring Sustainable Development Goal Indicator 10.7.1 on Recruitment Costs of Vietnamese Workers Overseas: Results of the Labour Force Survey 2021*. International Labour Organization. ilo.org/sites/default/files/wcmsp5/groups/public/%40asia/%40ro-bangkok/documents/publication/wcms_866858.pdf

ITU and UNITAR. 2024. *Global E-Waste Monitor 2024*. International Telecommunication Union and United Nations Institute for Training and Research. ewastemonitor.info/wp-content/uploads/2024/12/GEM_2024_EN_11_NOV-web.pdf

ITU and WBA. 2025. *Greening Digital Companies 2025*. International Telecommunication Union and World Benchmarking Alliance. itu.int/en/ITU-D/Environment/Pages/Publications/GDC-25.aspx

JLARC. 2024. *Report to the Governor and the General Assembly of Virginia: Data Centers in Virginia*. Joint Legislative Audit and Review Commission.

Lee, Sung Une, Harsha Perera, Yue Liu, et al. 2025. 'Integrating ESG and AI: A Comprehensive Responsible AI Assessment Framework'. *AI and Ethics* 5 (5): 5121–48. doi.org/10.1007/s43681-025-00741-5

Lin, Paul, Robert Bunger, and Victor Avelar. 2023. *Quantifying Data Center Scope 3 GHG Emissions to Prioritize Reduction Efforts*. Schneider Electric.

Livingstone, Grace. 2023. "'It's Pillage': Thirsty Uruguayans Decry Google's Plan to Exploit Water Supply'. World News. *The Guardian*, July 11. theguardian.com/world/2023/jul/11/uruguay-drought-water-google-data-center

Martelo, Liliana M., Paulo M. S. Sousa, Márcia A. D. Silva, and Helena M. V. M. Soares. 2023. 'A Critical Updated Review of All Stages of the Tantalum Recycling Chain from Waste of Tantalum Capacitors'. *Chemical Engineering Journal* 472 (September): 144917. doi.org/10.1016/j.cej.2023.144917

Masanet, Eric, Arman Shehabi, Nuoa Lei, Sarah Smith, and Jonathan Koomey. 2020. 'Recalibrating Global Data Center Energy-Use Estimates'. *Science* 367 (6481): 984–86. doi.org/10.1126/science.aba3758

Meta (Meta Investor Relations). 2025. 'Meta Announces Joint Venture with Funds Managed by Blue Owl Capital to Develop Hyperion Data Center'. October 21. investor.atmeta.com/investor-news/press-release-details/2025/Meta-Announces-Joint-Venture-with-Funds-Managed-by-Blue-Owl-Capital-to-Develop-Hyperion-Data-Center/default.aspx

Meta Platforms, Inc & 2 Others v Motaung & 186 Others; Kenya National Human Rights and Equality Commission & 14 Others (Interested Parties), 2024 KECA 1262 (Court of Appeal of Kenya 2024). new.kenyalaw.org/akn/ke/judgment/keca/2024/1262/eng@2024-09-20

OECD. 2021. *AI in Business and Finance*. OECD Business and Finance Outlook. OECD Publishing. oecd.org/content/dam/oecd/en/publications/reports/2021/09/oecd-business-and-finance-outlook-2021_377c2c18/ba682899-en.pdf

OECD. 2024. *AI in Health: Huge Potential, Huge Risks*. doi.org/10.1787/2f709270-en

OECD. 2025a. *AI Adoption by Small and Medium-Sized Enterprises: OECD Discussion Paper for the G7*. OECD Publishing. doi.org/10.1787/426399c1-en

OECD. 2025b. *Competition in Artificial Intelligence Infrastructure*. OECD Competition Law and Policy Working Papers. doi.org/10.1787/623d1874-en

OECD. 2026. *OECD Due Diligence Guidance for Responsible AI*. OECD Publishing. doi.org/10.1787/41671712-en

OHCHR. 2011. *UN Guiding Principles on Business and Human Rights*. Office of the High Commissioner. ohchr.org/sites/default/files/documents/publications/guidingprinciplesbusinessshr_en.pdf

OHCHR. 2024. *UN B-Tech Project's Taxonomy of Human Rights Risks Connected to Generative AI*. United Nations Human Rights Office of the High Commissioner. ohchr.org/sites/default/files/documents/issues/business/b-tech/taxonomy-GenAI-Human-Rights-Harms.pdf

Perrigo, Billy (TIME). 2023. 'Exclusive: The \$2 Per Hour Workers Who Made ChatGPT Safer'. January 18. time.com/6247678/openai-chatgpt-kenya-workers/

Public Citizen. 2026. *Generative Influence*. Public Citizen. citizen.org/article/generative-influence/

Sajadieh, Sha, and Loredana Fattorini. 2026. *Artificial Intelligence Index Report 2026*. Institute for Human-Centered AI. hai.stanford.edu/assets/files/ai_index_report_2026.pdf

SEforALL. 2026. *24/7 Carbon-Free Energy Compact Guidebook*. Sustainable Energy for All. 247-carbon-free-movement.cdn.prismic.io/247-carbon-free-movement/acU-QpGXnQHGY_60_GuidebookVersion2.pdf

Sénat (Sénat). 2025. 'CE Commande publique : compte rendu de la semaine du 9 juin 2025'. June 10. senat.fr/compte-rendu-commissions/20250609/ce_commande_publique.html

Shehabi, Arman, Alex Newkirk, Sarah Smith, and Alex Hubbard. 2024. *2024 United States Data Center Energy Usage Report*. Lawrence Berkeley National Laboratory. doi.org/10.71468/P1WC7Q

Shehabi, Arman, Sarah Smith, Dale Sartor, et al. 2016. *2016 United States Data Center Energy Usage Report*. escholarship.org/uc/item/84p772fc

Shin and Kim. 2026. "Special Act on the Promotion of the Artificial Intelligence Data Center Industry" Passes National Assembly Plenary Session'. May 11. shinkim.com/eng/media/newsletter/3270

SIA and BCG. 2021. *Strengthening the Global Semiconductor Supply Chain*. Semiconductor Industry Association (SIA) and Boston Consulting Group (BCG). semiconductors.org/wp-content/uploads/2021/05/BCG-x-SIA-Strengthening-the-Global-Semiconductor-Value-Chain-April-2021_1.pdf

Siddik, Md Abu Bakar, Arman Shehabi, and Landon Marston. 2021. 'The Environmental Footprint of Data Centers in the United States'. *Environmental Research Letters* 16 (6): 064017. doi.org/10.1088/1748-9326/abfba1

Swiss Re Institute. 2026. 'Insuring AI: Data Centre Value Accumulation Risks'. *Sigma Insights*, March 27. swissre.com/institute/research/sigma-research/sigma-insights-07-2026-insuring-ai-data-centre-risks.html

Synergy (Synergy Research Group). 2025. 'Cloud Market Share Trends - Big Three Together Hold 63% While Oracle and the Neoclouds Inch Higher'. Reno, NV, November 19. srgresearch.com/articles/cloud-market-share-trends-big-three-together-hold-63-while-oracle-and-the-neoclouds-inch-higher

The Shift Project. 2025. *AI, Data, and Computing: Shaping Infrastructures for a Decarbonised World*. The Shift Project. theshiftproject.org/app/uploads/2025/11/RF-IA-UK.pdf

TNFD. 2026. *Draft Sector Guidance Technology and Communications*. Taskforce on Nature-related Financial Disclosures. tnfd.global/wp-content/uploads/2026/01/Draft-sector-guidance_Technology-communications-DIGITAL-1.pdf?v=1771002609

Transparentem. 2025. *The Price of Work: A Brief on Widespread Migrant Worker Recruitment Fees in Taiwan's Manufacturing Sectors*. Transparentem. transparentem.org/wp-content/uploads/2025/02/The-Price-of-Work-Migrant-Worker-Recruitment-Fees-in-Taiwans-Manufacturing-Sectors.pdf

UK Government. 2024. *Data Centres to Be given Massive Boost and Protections from Cyber Criminals and IT Blackouts*. Press Release. UK Government. gov.uk/government/news/data-centres-to-be-given-massive-boost-and-protections-from-cyber-criminals-and-it-blackouts

UK Government. 2026. 'Understanding Biodiversity Net Gain'. GOV.UK, UK Government, June 2. gov.uk/guidance/understanding-biodiversity-net-gain

UNCTAD. 2025. *Technology and Innovation Report 2025: Inclusive Artificial Intelligence for Development*. UN Trade and Development.

UNEP. 2024. *Artificial Intelligence (AI) End-to-End*. United Nations Environment Programme. wedocs.unep.org/rest/api/core/bitstreams/07b3c8fc-bd30-4b92-b5f4-d665e927b59d/content

UNEP. 2025a. *Business Models and Finance to Enhance Energy Efficiency in AI and Data Centres in Emerging Economies*. United Nations Environment Programme. unepccc.org/wp-content/uploads/2025/10/business-models-and-finance-ai-data-centres-policy-brief.pdf

UNEP. 2025b. *Sustainable Procurement Guidelines for Data Centres and Servers*. United Nations Environment Programme. wedocs.unep.org/rest/api/core/bitstreams/cff85d99-d15e-431e-95fe-9fc5f0b675a6/content

UNEP. 2026. *Spotlighting Opportunity: How Artificial Intelligence Is Accelerating Methane Action*. United Nations Environment Programme. doi.org/10.59117/20.500.11822/49692

UNEP FI. 2025. 'Human Rights Toolkit for Financial Institutions'. unepfi.org/humanrightstoolkit/

UNEP FI. 2026. *Impact Radar 2026*. United Nations Environment Programme Finance Initiative. unepfi.org/publications/impact-radar-2026/

Uptime Institute. 2025. *Uptime Institute Global Data Center Survey 2025*. Uptime Institute.

Uptime Institute. 2026. *Uptime Institute Global Data Center Survey 2026*. Uptime Institute.

WBA. 2025. *Plugging the AI Transparency Gap: Collective Impact Coalition for Ethical AI 2025 Progress Report*. World Benchmarking Alliance. worldbenchmarkingalliance.org/sites/default/files/2026-03/2025_AI-CIC-Progress-Report_v2.pdf

WEF. 2025a. *Nature Positive: Role of the Technology Sector*. World Economic Forum. reports.weforum.org/docs/WEF_Nature_Positive_Role_of_the_Technology_Sector_2025.pdf

WEF. 2025b. 'What New Water Circularity Can Look like for Data Centres'. *World Economic Forum*, November 18. weforum.org/stories/2025/11/data-centres-and-water-circularity/

WeLoop. 2020. *A Situational Analysis of a Circular Economy in the Data Centre Industry*. Circular Economy for the Data Centre Industry.

XDI. 2025. *2025 Global Data Centre Physical Climate Risk and Adaptation Report*. XDI. xdi.systems/news/2025-global-data-centre-physical-climate-risk-and-adaptation-report



finance initiative

UNEP Finance Initiative brings together a large network of banks, insurers and investors that catalyzes action across the financial system to deliver more sustainable global economies.

For more than 30 years the Initiative has been connecting the UN with financial institutions from around the world to shape the sustainable finance agenda. We've established the world's foremost sustainability frameworks, helping the finance industry achieve sustainability goals, address sustainability risks and identify the business opportunities in taking a responsible approach to banking and insurance.

Convened by a Geneva, Switzerland-based secretariat, more than 550 banks and insurers are individually implementing UNEP FI's Principles for Responsible Banking and Principles for Sustainable Insurance. Financial institutions work with UNEP FI on a voluntary basis to apply these industry frameworks and

develop practical guidance and tools that drive institutional change, shaping the future of sustainable finance and positioning their businesses for the transition to a sustainable and inclusive economy. In parallel, UNEP FI also drives systems change and fosters enabling conditions in service of the broader mission to mobilize and align private finance to help achieve the UN Sustainable Development Goals.

Founded in 1992, UNEP FI was the first organization to engage the finance sector on sustainability and incubated the Principles for Responsible Investment, now the world's leading proponent of responsible investment.

Today, we cultivate leadership and advance sustainable market practice while supporting the implementation of global programmes at a regional level across Africa & the Middle East, Asia Pacific, Europe, Latin America & the Caribbean, and North America.

unepfi.org



unepfi.org



info@unepfi.org



UN Environment Programme Finance Initiative