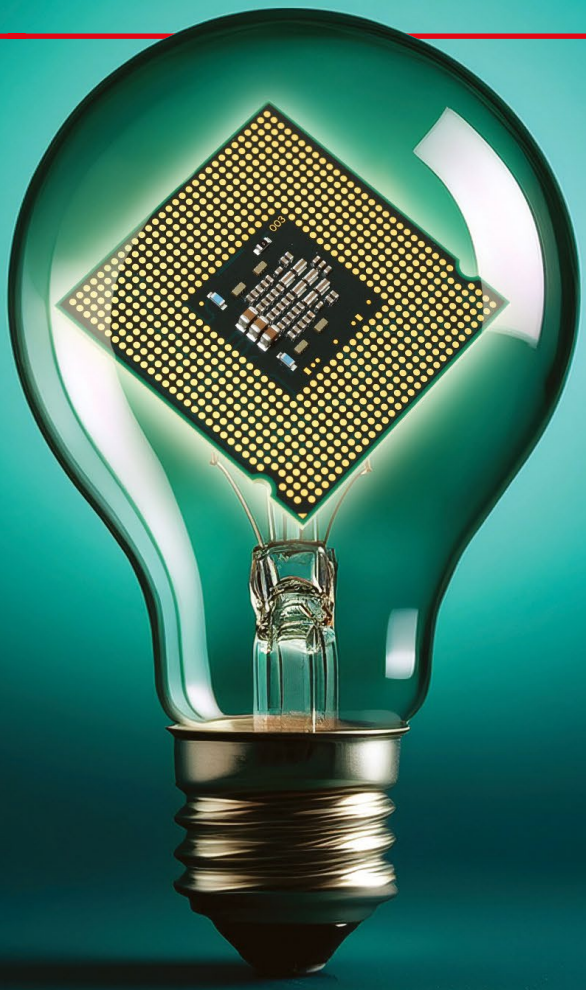
ECONOMIST IMPACT

Greening intelligence: Charting the future of sustainable AI



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About the report

Greening intelligence: Charting the future of sustainable AI is a report from Economist Impact, supported by Delta Electronics, that examines the challenges and opportunities that organisations worldwide face with Artificial Intelligence (AI) and sustainability.

The report is based on a survey of 608 senior executives conducted between November 2024 and January 2025; all of the survey respondents are familiar with their firm's plans for adoption and use of AI or providing AI services and products.

The largest proportion of respondents come from the Asia-Pacific region (40.6%), followed by North America (29.4%), Europe (28.5%), the Middle East (0.8%) and Latin America (0.7%).

Four in ten survey respondents (41%) are C-level executives or board members. Almost three-quarters (73%) of executives represent organisations with annual global revenue above US$500m. Respondents come from a mix of AI suppliers and AI users, with the latter having a wide range of industries represented.

Complete demographics can be found in the appendix.

In addition, in-depth desk research and interviews with business leaders and experts were conducted between February and March 2025. Our thanks are due to the following interviewees for their time and insights:

- **Prerit Mishra,** head of data & analytics, DHL Asia-Pacific
- **Josh Parker,** head of sustainability and senior director of corporate sustainability, Nvidia
- **Amitabh Sakar,** vice-president, Tata Communications
- **Ricardo Vinuesa,** associate professor, KTH Royal Institute of Technology, Sweden
- **Roger (ZhaoYang) Wang,** general manager, Global Data Center, Alibaba Cloud
- **Mario Zeng,** vice-president, Hardware System Engineering, Microsoft

Charles Ross is the project director, Kim Andreasson is the author of the report and Miguel Dorotan is the research manager.

Executive summary

Artificial Intelligence (AI) and Generative Artificial Intelligence (GenAI)—algorithmic technology based on large language models (LLM) capable of generating text, images or other data in response to user prompts—can boost productivity and create competitive organisational advantages. As a result, companies in a wide range of industries across the world have embraced AI to seize new opportunities, such as better customer service delivery and improved operational efficiency. Given the rise of GenAI in particular, awareness has risen to executive levels at industry-leading organisations seeking to reap the full benefits of implementation.

However, companies also face challenges in adopting this relatively new technology, including a lack of regulations at the international, national, industry, and organisational levels, which leads to concerns regarding protection of privacy and proprietary information, cybersecurity, and environmental sustainability linked to increased energy usage. Such concerns can hinder the full potential of AI implementation across all industries.

This report looks at current and future AI sustainability from both a supplier and user perspective globally. Research shows that some organisations have embarked on AI sustainability ventures and that a vast majority of executives expect more to be done in the near future. Cost is not a concern, but the roadmap towards AI sustainability is murkier.

The key findings of the research are as follows:

- **AI sustainability is becoming increasingly important to organisations globally.** Companies recognise the need to balance AI innovation with environmental concerns as the energy demand for AI surges, with a significant increase expected in the perceived importance of AI energy efficiency over the next 12 months.
- **There is no silver bullet to improve AI sustainability—organisations take diverse approaches based on specific needs.** Reflecting the complex and multifaceted nature of the challenge, companies are implementing various strategies including energy audits, partnerships with efficiency organisations and optimising hardware performance.
- **Cost is not a primary barrier to AI sustainability efforts.** Organisations are prioritising life-cycle assessments, infrastructure evaluations and real-time energy monitoring over cost considerations when evaluating the sustainability of AI solutions, indicating a willingness to invest in long-term sustainability.

- **Grid resilience challenges.** Power systems must contend with increasing climate volatility, ageing infrastructure and rising energy demands. Stable electricity supply and power-grid resilience grid are the top challenges among European survey takers, while energy consumption and carbon footprint is seen as the main barrier among executives from Asia-Pacific.
- **There are significant regional differences in approaches to AI sustainability.** Executives in North America, Europe and Asia-Pacific have varying views on the role of government regulations in encouraging AI sustainability, highlighting the need for global collaboration and standardised approaches.
- **The gap between AI users and suppliers in sustainability expectations is widening.** AI users increasingly expect suppliers to have sustainability targets, with a dramatic rise anticipated over the next 12 months, pushing the industry towards more sustainable practices.
- **AI-driven innovation offers great potential to advance sustainability, but industry obstacles continue to slow its progress.** Edge computing and hardware infrastructure are central to sustainability efforts, yet AI suppliers identify both technological and process innovation as significant barriers to faster uptake, underscoring that industries have yet to fully realise AI's sustainability benefits.

Introduction

The widespread media coverage of ChatGPT in 2023 served as a tipping point for GenAI, raising awareness of the opportunities—and challenges—of AI technology generally.[1] Bloomberg Intelligence, a consultancy, predicts that the global GenAI market alone will grow by over 40% annually, from US$40bn in 2022 to US$1.3trn by 2032.[2]

In the survey conducted for this report, the importance of AI solutions is expected to increase significantly: 47% of survey takers consider AI-related operations or solutions to be "important" today, rising sharply to 91% within 12 months—highlighting the near-universal role AI is set to play across industries.

"I guess it's an over simplistic conclusion, but AI is basically making things possible that were not possible before."

Ricardo Vinuesa, associate professor, KTH Royal Institute of Technology, Sweden

"Most of the benefits from AI come from new technologies or new resources, new methods that were not possible before," says Ricardo Vinuesa, associate professor at the KTH Royal Institute of Technology in Sweden. "I guess it's an over simplistic conclusion, but AI is basically making things possible that were not possible before."

As rapid technological advancements occur and the ability to process and analyse vast datasets increases, AI is expected to have a significant impact on a vast range of sectors, including logistics, finance, pharmaceuticals, education, technology and government. This impact extends not only to organisations that use AI but also those that supply AI solutions.[3] "We've been working on data analytics and AI for more than ten years," says Prerit Mishra, head of data and analytics at DHL Asia-Pacific. "We also adopted generative AI fairly quickly."

No silver bullet

The rapid growth of AI is driving up energy consumption and carbon emissions, with IT emissions in consumer products alone expected to triple.[4] Therefore, the importance of AI energy efficiency is expected to increase significantly: only 44% of respondents consider

[1] For Microsoft, OpenAI, the corporate spending boom is just starting
[2] Generative AI to Become a $1.3 Trillion Market by 2032, Research Finds | Press | Bloomberg LP
[3] Economic potential of generative AI | McKinsey
[4] bain_report_the_visionary_ceos_guide_to_sustainability-2024.pdf

“We’re in a period of chaotic innovation.”

Josh Parker, head of sustainability and senior director of corporate sustainability, Nvidia

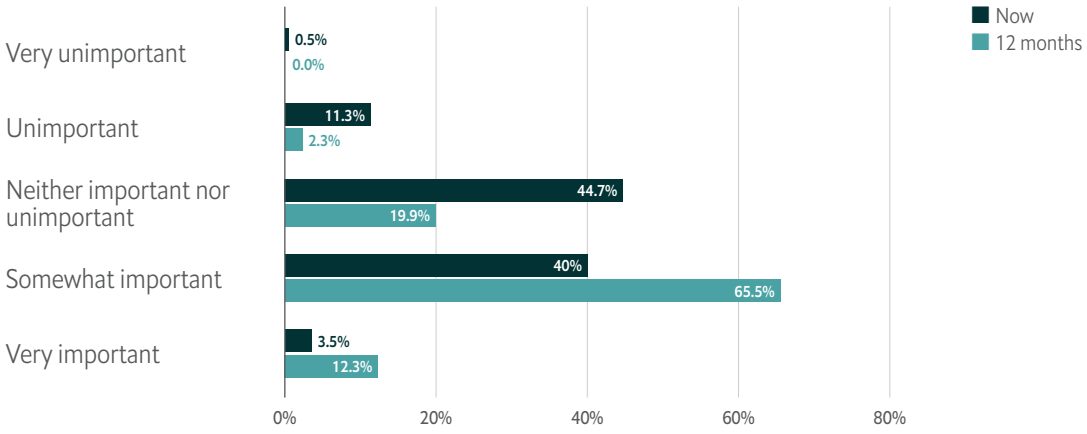
energy efficiency important in their AI-related operations or solutions today, but that figure rises to 78% when looking 12 months ahead from now. Companies are recognising the need to balance AI innovation with sustainability concerns, as the energy demand for AI is surging.[5] However, organisations do not see a “silver bullet” solution. Instead, companies are exploring a mix of strategies to address the complex challenges of balancing AI innovation with environmental concerns.

Organisations have adopted a range of strategies tailored to their operations. Alibaba, a China-based global technology company and an e-commerce giant, emphasises its “Five Greens” strategy, which includes green energy, green products, green architecture, green operations and green services. “We have adopted a holistic approach to sustainability,” says Roger (ZhaoYang) Wang, general manager, Global Data Center, at Alibaba Cloud. “This includes [using] metrics like carbon emissions per computing power and power consumption per computing power to guide our development.”

“We’re in a period of chaotic innovation,” says Josh Parker, senior director of corporate sustainability at Nvidia, an American technology company that manufactures important hardware (chips) for AI. “The value per watt is improving rapidly, but we’re still figuring out how to balance efficiency with growing demand.”

Energy efficiency will be important to everyone in the future

Figure 1. How important is energy efficiency in your AI-related operations or solutions today and in 12 months?



[5] bain_report_the_visionary_ceos_guide_to_sustainability-2024.pdf

Opportunities

"There is no one silver bullet — it's a system-level problem."

Mario Zeng, vice-president, Hardware System Engineering, Microsoft

Users and suppliers are aligned on the importance of AI sustainability: Almost seven in ten respondents (69%) say that the importance of AI sustainability will increase within the next 12 months. For example, AI can assist in developing sustainable offerings that save money, streamline innovation and build new business models.[6]

Meanwhile, consumers and customers continue to rate sustainability as an important purchase criterion, but often lack a clear understanding of what makes a product or service sustainable. In response, companies are using AI to improve communication about sustainable products and propositions to consumers.[7] "When you're talking about a global network, when you're talking about the number of deliveries that happen on a daily basis [at a global logistics company like DHL], I think that all of it adds up", says Mr Mishra (see case study).

"There is no one silver bullet — it's a system-level problem," says Mario Zeng, vice-president, Hardware System Engineering at Microsoft. "We're not just scaling within Microsoft — we're collaborating to shape industry standards."

Collaboration is key

Collaboration and partnerships play a crucial role in encouraging AI sustainability. Organisations emphasise that achieving sustainable AI requires collective efforts across industries, governments and customers. For example, Alibaba Cloud underscores the necessity of aligning sustainability goals with customer objectives. "If Alibaba Cloud becomes greener, this will help our customers achieve their carbon neutrality goals more easily," says Mr Wang. "In China, top AI companies and local stakeholders are forming strong partnerships to support rapid growth of AI sustainably."

Similarly, Tata Communications highlights the importance of collaboration in achieving sustainability targets. "We have partnered with companies to develop sovereign AI solutions tailored specifically for enterprises and government bodies," explains Amitabh Sakar, vice-president, Tata Communications. "These collaborations aim to create energy-efficient governance solutions aligned with national sustainability goals." Tata also stresses the importance of internal collaboration: "Implementing AI solutions for sustainability requires significant change management—employees must buy into the new technology and adapt quickly," says Mr Sakar.

[6] bain_report_the_visionary_ceos_guide_to_sustainability-2024.pdf
[7] The Uneven Distribution of AI's Environmental Impacts

"We're working with a lot of partners, including NGOs, to collect information and use AI systems to model environmental challenges at unprecedented speed and efficiency."

Josh Parker, head of sustainability and senior director of corporate sustainability, Nvidia

As an AI supplier, Nvidia also underscores the critical role of partnerships and collaborative innovation. "We're working with a lot of partners, including NGOs, to collect information and use AI systems to model environmental challenges at unprecedented speed and efficiency," says Mr Parker. "AI is our best hope of innovating to find an effective carbon capture solution or help regenerate oceans and forests—these moonshots require collaborative efforts."

Collectively, these insights illustrate that successful AI sustainability depends significantly on fostering strong partnerships across industry stakeholders, governments and customers.

Case study: Innovative corporate ideas

AI can help companies to deliver value to customers while boosting sustainability. There are several examples of such win-win situations around the world.

AI supplier

Alibaba Cloud, the largest cloud service provider in China and a leader in the Asia-Pacific region, has integrated sustainability into its AI strategy. Recognising that energy efficiency is crucial for both environmental and commercial success, Alibaba has adopted a comprehensive "Five Greens" strategy, encompassing green energy, green products, green architecture, green operations and green services.

The company has made significant investments to sustainably expand its global infrastructure, last year announcing plans to build new data centres in Thailand, Mexico, Malaysia, the Philippines and South Korea. "Energy costs account for about 40 to 60 per cent of operating costs, making energy efficiency crucial for inference model pricing and inclusive application of those models," explains Roger (Zhaoyang) Wang, general manager, Global Data Center, Alibaba Cloud.

To measure progress effectively, Alibaba Cloud has developed specific metrics beyond traditional energy usage effectiveness, including carbon emissions per computing power unit and power consumption per computing power unit. "These will be the essential indicators to guide the development of sustainable AI," says Mr Wang.

Alibaba also emphasises strategic site selection for data centres to optimise long-term sustainability, highlighting regions with favourable renewable energy resources. "We need to choose locations carefully to ensure we win the price competition in the long run," says Mr Wang. Alibaba's sustainability efforts are also closely aligned with customer goals. "We want to become the greenest cloud service provider in this market," says Mr Wang. "We are committed to have our global data centres running entirely on clean energy by 2030. Many of our customers also have carbon neutrality goals, so our strategies align directly with their needs."

AI user

DHL, a logistics company, has embraced AI use to revolutionise its operations and enhance customer experience, as well as implementing AI in various aspects of its logistics processes, particularly in last-mile delivery.[8] In order to understand AI's full potential to optimise logistics, one has to consider the challenges. Business to consumer (B2C) trade has rapidly expanded over the past decade: ten years ago, it was 10-15% of DHL volume; today it accounts for 40%. This also means increased customer demand and operational challenges.[9]

"If you increased your shipping duration by 15 days, that means you need to have inventory for 15 additional days at locations, and that becomes an inventory management problem," says Prerit Mishra, head of data and analytics at DHL Asia-Pacific. "This is where AI has a big role to play to optimise inventory."

In warehouses, DHL is exploring "vision picking" technology using smart glasses, which could potentially streamline parcel sorting and reduce errors. "If we could automatically read the barcodes to indicate that a specific parcel needs to be allocated to a specific vehicle, using glasses and some sort of visual reading or showing guidance, we would save time and reduce errors," says Mr Mishra.

Another key innovation to solve this problem is the use of AI-powered route-optimisation software. This technology analyses vast amounts of data to predict shipment arrivals with 90-95% accuracy, allowing for efficient courier route planning. The system can optimise a 120-stop route in seconds, considering factors like urgent deliveries and time-sensitive packages.

AI applications have resulted in improved efficiency, reduced fuel consumption and enhanced customer service, positioning DHL at the forefront of logistics innovation.

AI supplier and user

As both an AI supplier and user, Microsoft has been at the forefront of integrating sustainability into AI infrastructure, addressing the challenges posed by the increasing complexity and energy demands of AI systems. The company's approach is rooted in a systematic methodology that combines innovative technologies, collaboration and scalability.

The company emphasises a "system approach" to optimise AI infrastructure across power, cooling and data-centre design. "It's not about looking at one technology piece," says Mario Zeng, vice-president, Hardware System Engineering at Microsoft. "It's about a holistic review from power to chip-level optimization." This approach ensures that AI systems are deployed efficiently while minimising environmental impact. For instance, Microsoft has pioneered liquid cooling systems for high-power graphics processing unit (GPU) racks, enabling better energy efficiency and scalability.

The scale of AI deployments has grown exponentially compared to traditional high-performance computing (HPC) systems. "Think about the power consumed by a 500-kw rack—improving efficiency by just 1% saves 5 kw, enough to power several servers," explains Mr Zeng. This focus on incremental improvements demonstrates how even small gains in energy efficiency can have significant impacts at scale.

Microsoft recognises that sustainability in AI is an industry-wide challenge and emphasises the importance of partnerships. "We're collaborating with industry leaders to standardise next-generation technologies like high-voltage DC inputs and cooling solutions," says Mr Zeng. By working with peers and suppliers, Microsoft aims to reduce divergence in standards, enabling more sustainable practices across the sector.

[8] AI in Logistics and Last-Mile Delivery | DHL Global
[9] AI in Logistics and Last-Mile Delivery | DHL Global

Stakeholder perceptions

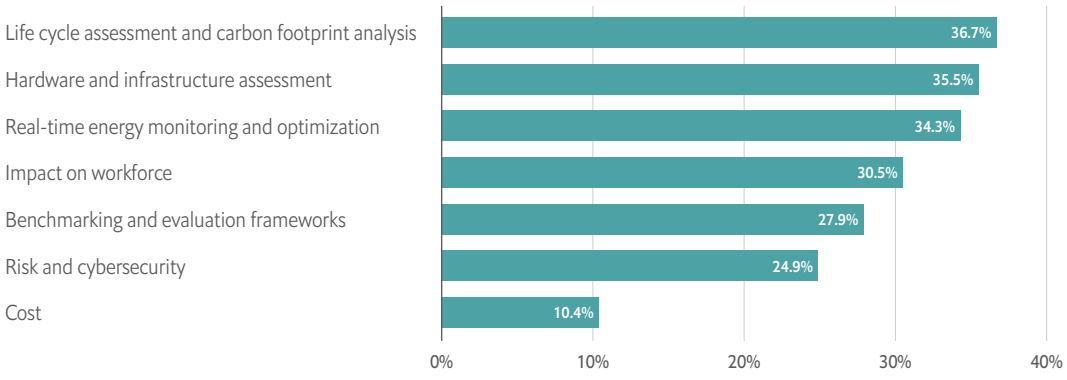
Cost is not a barrier to AI sustainability: only 10% of AI users evaluate the sustainability of AI solutions based on cost, whereas far more conduct life-cycle assessment and carbon footprint analysis (37%), hardware and infrastructure assessments (36%), and real-time energy monitoring and optimisation (34%).

Our survey revealed that executives from large companies (with revenues above US$500m) are more likely to adopt advanced metrics for AI sustainability, such as carbon emissions per computing power unit or power consumption per token. "Carbon emission per computing power unit is one of our key metrics," says Mr Wang. Meanwhile, executives from smaller companies (with revenues of less than US$500m) instead often rely on simpler frameworks like energy audits or basic life-cycle assessments.

But differences in perceptions on how to make AI infrastructure more sustainable are small and reinforce the point that many organisations approach the challenge in different ways. EY, a consultancy, notes that the absence of standardised metrics continues to hinder comparative progress tracking across the AI ecosystem.[10]

Impact of AI solutions, not cost, is the priority

Figure 2: How do you primarily evaluate the sustainability of AI solutions?



[10] AI and Sustainability: Opportunities, Challenges, and Impact | EY - Netherlands

Challenges

AI's environmental impact is significant and growing. One study suggests that a single LLM query requires 2.9 watt-hours of electricity, compared with 0.3 watt-hours for a regular internet search. Meanwhile, the number of data centres worldwide has surged from 500,000 in 2012 to over 8m, with energy consumption doubling every four years, partly because of the rise of AI.[11]

This is reinforced by our survey, in which both suppliers and users say that organisational AI sustainability policies are currently lagging but are underway. Almost two-thirds of executives (64%) say that they expect their organisation to issue AI policies regarding sustainability within the next 12 months, a figure that rises to 68% among European executives, in all likelihood owing to initiatives such as the EU's AI Act, the first-ever legal framework to address the risks of the technology.[12]

Organisations globally also recognise the transformative potential of AI but increasingly face challenges in balancing innovation with sustainability goals, highlighting issues around edge computing, hardware infrastructure, and resource usage, particularly water and chemicals. For example, edge computing and hardware infrastructure are central to sustainability efforts, yet in the survey conducted for this report only four in ten (42%) AI suppliers and a third (33%) of users said that they are adopting edge computing to improve energy efficiency.

"The complexity of legacy systems makes the integration of AI solutions for sustainability daunting," explains Mr Sakar. "You need to uncomplicate infrastructure before you can innovate effectively."

"Accelerated computing is much more energy efficient than traditional computing for the same workload," notes Mr Parker to highlight the potential for AI to reduce energy consumption in the future.

Infrastructure anew

The leading perceived challenge among suppliers in our survey when it comes to achieving greater AI sustainability is stable electricity supply and power-grid resilience to support AI services (38%), a sentiment supported by the literature.[13] However,

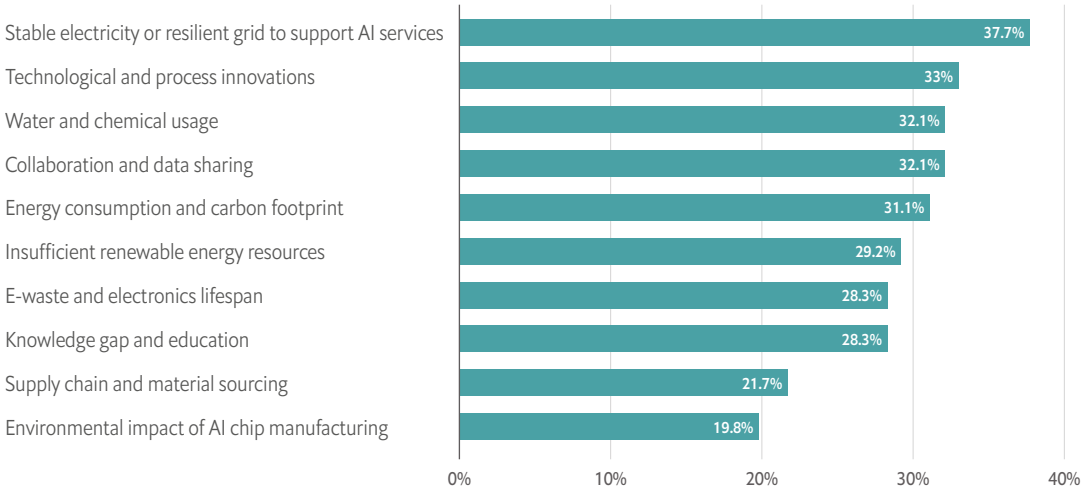
"The complexity of legacy systems makes the integration of AI solutions for sustainability daunting."

Amitabh Sakar, vice-president, Tata Communications

[11] AI Environmental Impact Issues Note (1).pdf
[12] AI Act | Shaping Europe's digital future
[13] The Uneven Distribution of AI's Environmental Impacts

AI suppliers are worried about keeping the lights on

Figure 3:As a supplier of AI solutions, what are the main challenges when addressing AI sustainability?



collaboration and innovation are also holding suppliers back: Around one-third of AI suppliers say that technological and process innovation (33%) and collaboration and data sharing (32%) are also key obstacles, which points to minor differences in perception in challenges facing suppliers, as well as illustrating that there is no clear strategy in place.

Hardware-related challenges, particularly in managing energy and water consumption in data centres, are fundamental to achieving greater AI sustainability. "Accelerated computing has higher power and cooling requirements," explains Mr Parker. Despite these advancements, he still sees availability of power as a primary challenge: "Our downstream partners cite availability of energy as by far their biggest factor when siting new data centres," says Mr Parker. As an AI supplier, Alibaba also emphasises the importance of strategic location selection for its data centres to manage energy consumption effectively. "We need to focus on choosing locations carefully to ensure that in the long run we win the competition," says Mr Wang, underscoring the critical role that geographic considerations play in sustainable AI infrastructure planning.

Water and chemical usage represent additional concerns. As a supplier, Nvidia takes a hardware-centric approach by innovating in accelerated computing—which similarly to edge computing, provides faster processing by bringing data closer to the source—and advanced cooling technologies.

"We've transitioned our reference designs from air-cooled to direct-to-chip liquid cooling, reducing water consumption by 300 times," says Mr Parker. Such advancements underscore the importance of hardware optimisation in sustainable AI. Meanwhile, Mr Sakar emphasises Tata Communications' focus on circular economy initiatives. "We implement IoT

"Our downstream partners cite availability of energy as by far their biggest factor when siting new data centres."

Josh Parker, head of sustainability and senior director of corporate sustainability, Nvidia

solutions across sectors, like smart metering for real-time water usage monitoring and rainwater harvesting," he explains.

Focus on innovation

Innovation in AI sustainability holds significant promise, yet industry challenges continue to impede progress. AI has the potential to revolutionise sustainable practices by optimising resource consumption, enhancing renewable energy integration and enabling smarter agricultural and transportation systems, among other significant benefits. However, approximately one-third (33%) of AI suppliers report technological and process innovation as a substantial obstacle. Additionally, the slow adoption of edge computing technologies further exemplifies this struggle, as seen in Apple's recent delay of its Siri 2.0 launch owing to difficulties integrating advanced AI capabilities into its edge devices like the iPhone.[14] Despite the clear potential for AI-driven sustainability solutions, these innovation barriers highlight that industries are not yet able to fully capitalise on the benefits.

"In three years, we'll continue seeing huge efficiency gains in AI—doing today's workloads with a fraction of current resources."

Josh Parker, head of sustainability and senior director of corporate sustainability, Nvidia

Looking ahead, companies see continued innovation as essential. "In three years, we'll continue seeing huge efficiency gains in AI—doing today's workloads with a fraction of current resources," says Mr Parker. When it comes to Tata Communications, which is both an AI user and supplier, Mr Sakar echoes optimism about the future: "Investments are getting done, hence you will see the technology industry getting excited to solve problems around sustainability."

In fact, recent news of the capabilities of DeepSeek, a Chinese AI start-up that claims to outperform established companies while using less energy, rattled stock markets and brought renewed awareness to the potential solutions of AI sustainability.[15] In our survey, developing and implementing energy-efficient AI algorithms and models was the second-ranking option to drive AI sustainability. However, some have also argued that the greater efficiency of DeepSeek and future solutions might actually increase energy usage, as it will be used in instances where it is not necessary.[16]

[14] Apple delays Siri AI improvements to 2026
[15] US power stocks plummet as DeepSeek raises data center demand doubts | Reuters
[16] Three things to know as the dust settles from DeepSeek | MIT Technology Review

Case study: Differences in perceptions

AI sustainability is important to both users and suppliers; however, perceptions vary by region as well as among providers and users of AI services. In our survey, users of AI cite a lack of standardisation as a major barrier.

"There's a lot of work that needs to be done on standardisation [globally]," explains Prerit Mishra, head of data and analytics at DHL Asia-Pacific, who emphasises the need for standardisation not only in training but also in inference.

Meanwhile, suppliers of AI highlight energy availability as the biggest challenge. "By far the most significant challenge we see in the near term is availability of power," says Josh Parker, senior director of corporate sustainability at Nvidia. Stable electricity supply and power-grid resilience to support AI are the top challenges among European survey takers (cited by 48%) while energy consumption and carbon footprint is seen as the main barrier among executives from Asia-Pacific (41%).

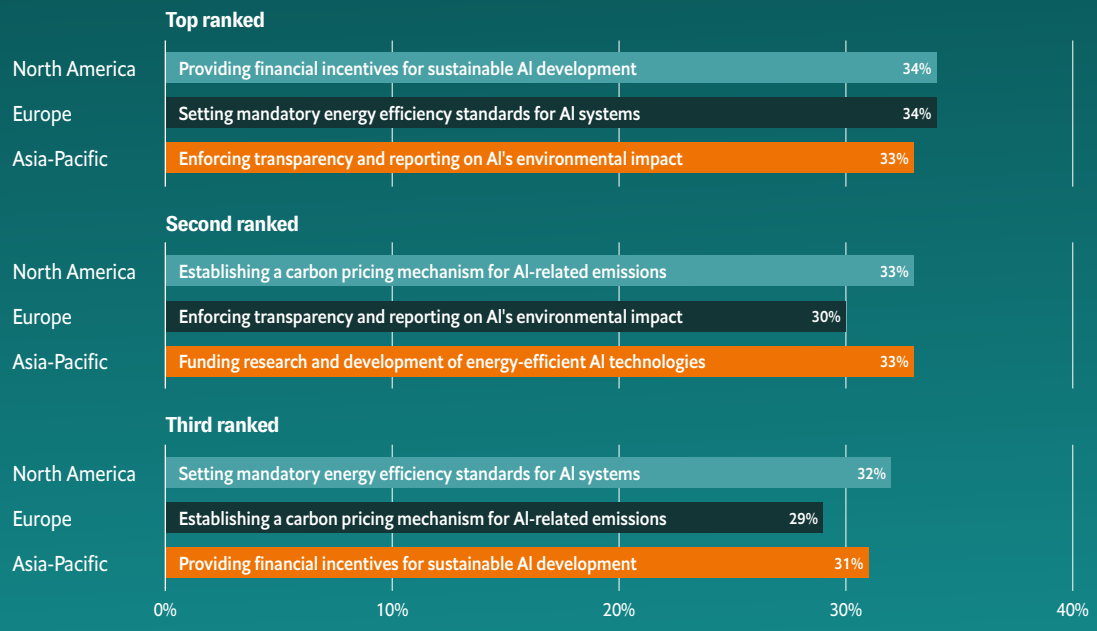
Geographical differences abound

A previous report from Economist Impact highlights potential risks, including the consolidation of AI power among a few large companies, the proliferation of malicious AI applications in unregulated environments and the widening global inequality owing to differing AI development capabilities.[17] The World Bank has also pointed out that AI may lead to increased inequality between rich and poor countries.[18]

Exemplifying that priorities differ between countries and regions, regardless of income levels, North American respondents to our survey believe that the primary role of government regulations in encouraging AI sustainability is to provide financial incentives for sustainable AI development (34%), whereas executives in Europe and Asia-Pacific say that government focus should primarily be on setting mandatory energy efficiency standards for AI systems (34%) and enforcing transparency and reporting on AI's environmental impact (32%) respectively. Asia-Pacific respondents are also more likely to agree that they expect their country's government to issue AI policies regarding sustainability (68%) compared to European and North American executives (56% and 59%).

[17] AI landscapes
[18] World Bank Document

Regional differences of opinion exist on the role of regulators



Supply versus demand

Providers of AI services and products rate establishment of industry-wide best practices and guidelines for sustainable AI (21%) as the least important role of industry in encouraging AI sustainability, yet it is the highest-rated among AI users (32%). AI users are also far more keen on collaborative efforts to develop and implement green AI metrics such as carbon footprint tracking (33%, versus 20% among suppliers), highlighting a gap in approaches to resolving AI sustainability.

"There are many hidden connections that are not obvious to anyone," says Ricardo Vinuesa, associate professor at the KTH Royal Institute of Technology in Sweden. "You may think, okay, I use more so I have a higher carbon footprint with these AI models, so their effect is really negative on climate and this is terrible; but you're missing the hidden connections of what those AI applications are being used for, which maybe are actually having a higher positive impact on certain goals that compensate for the carbon footprint."

Moving forward

The evolution of AI sustainability is at a critical juncture, with organisations worldwide recognising the importance of AI yet grappling with the complexity of implementation and trying out various strategic organisational approaches in which there is no silver bullet. Although significant strides have been made, the future of sustainable AI will depend on innovation, collaboration, and adaptability.

The UN Environment Programme recommends that Member States establish standardised methods and metrics and encourage the adoption of green data centres, renewable energy sources and carbon-offset practices to reduce the direct environmental impact of AI.[19] "AI is also helping us define new agendas beyond the [UN's 2030] Sustainable Development Goals and beyond planetary boundaries," explains Mr Vinuesa. "Beyond 2030, we need to be able to come up with smarter agendas with more streamlined goals for sustainability. And AI is helping us to do that."

As a result, organisations are exploring pioneering strategic applications of AI that generate true business value while advancing sustainability goals. The integration of AI and sustainability presents tremendous opportunities for business innovation, efficiency and resilience.[20] In fact, sustainability targets are becoming non-negotiable for AI users: today, about two-thirds (67%) of AI users say that it is important for their organisation to have AI suppliers with sustainability targets, and that number will rise to (96%) 12 months from now.

The immediate challenge is not cost and return on investment, but rather how to encourage and adopt regulations and partnerships while finding appropriate use cases to drive AI-led digital transformation of industry while maintaining the sustainability objectives of the technology from the perspectives of suppliers, users and customers.

Industries across the spectrum face similar opportunities and challenges when it comes to AI. The primary benefits of the technology are improved operations and enhanced productivity; the risks are data-related energy consumption and lack of regulations.

Hence, there is a need for a balanced approach to AI development that considers both innovation and sustainability. It should emphasise the importance of collaboration, standardisation and long-term planning in creating a responsible AI ecosystem, as per the results of the survey conducted for this report.

[19] AI Environmental Impact Issues Note (1).pdf
[20] The power of AI: Sustainability | IBM

Previous research conducted by Economist Impact has also emphasised the need for balancing innovation with responsible AI development, highlighting challenges such as regulatory harmonisation, technical standardisation and the role of open-source models, as well as underscoring the importance of involving researchers in policymaking.[21]

Forward-thinking organisations are therefore integrating sustainability considerations into their AI strategies from the outset while encouraging standardisation.[22] "Regulatory oversight needs to be preceded by regulatory insight," says Mr Vinuesa. "So you should not regulate something that you don't know about. To put it simply, it's essential to involve researchers and experts in the process, because they know what AI can and can't do."

Meanwhile, organisations are increasingly prioritising energy-efficient AI infrastructure to address surging computational demands where larger companies invest heavily in infrastructure expansion. For example, Alibaba has announced plans to invest over Rmb380bn (about US$53bn) in cloud and hardware infrastructure over the next three years.23 Nvidia also emphasises the rapid improvements in efficiency: "AI inference has improved in energy efficiency by 100,000 times over the past decade," says Mr Parker. This trajectory suggests that future advancements will continue to reduce resource consumption while enabling more sophisticated AI applications. Alibaba is similarly focused on optimising its infrastructure by implementing its "Five Greens" strategy to align sustainability goals with customer needs (see case study).

The role of partnerships in driving AI sustainability cannot be overstated. Mr Sakar highlights the importance of collaboration for creating impactful solutions. "[Tata Communications has] partnered with companies to develop sovereign AI solutions tailored specifically for enterprises and government bodies," says Mr Sakar. Mr Parker echoes this sentiment, emphasising Nvidia's work with NGOs and policymakers to model environmental challenges and devise solutions. Such collaborations will be essential to tackle global challenges like AI-linked carbon emissions and resource optimisation.

Future optimism

The next three years are likely to see continued efficiency gains and broader adoption of sustainable practices in AI. Organisations are making strides in diverse areas such as energy efficiency, hardware optimisation and sustainable business models, and they agree that no single strategy suffices. Instead, a mix of tailored approaches and ongoing innovation will be essential to address the multifaceted challenges of AI sustainability. "We are at an early stage of the AI boom," says Mr Wang. "Developing AI-native technologies with sustainability in mind is critical."

The future of AI sustainability lies in leveraging technological innovation alongside collaborative frameworks to address environmental challenges while meeting growing computational demands. Organisations must embrace diverse strategies and remain agile as they navigate this evolving landscape. "In the last year, the urgency of climate change has driven world leaders and experts to increase collaboration, with AI offering new opportunities to speed up the availability of climate solutions," concludes Mr Zeng.

[21] AI landscapes
[22] bain_report_the_visionary_ceos_guide_to_sustainability-2024.pdf
[23] Alibaba to Invest RMB380 billion in AI and Cloud Infrastructure Over Next Three Years - Alibaba Cloud Community

Key takeaways

Prioritise AI sustainability initiatives

Organisations should recognise the growing importance of balancing AI innovation with environmental concerns and take concrete steps to improve energy efficiency in their AI operations over the next 12 months.

Focus on long-term sustainability over short-term costs

Organisations should prioritise comprehensive assessments such as life cycle analyses and real-time energy monitoring when evaluating AI solutions, rather than solely considering immediate cost implications.

Implement a multi-faceted approach to AI sustainability

Companies should adopt a diverse range of strategies, including energy audits, partnerships with efficiency organisations, and hardware optimisation, to address the complex challenge of AI sustainability.

Develop a global strategy for AI sustainability

Companies should recognise and address regional differences in approaches to AI sustainability, working towards standardised practices and fostering international collaboration to create more effective solutions.

Bridge the gap between AI users and suppliers

AI users should clearly communicate their increasing expectations for sustainability targets to their suppliers, driving the industry towards more sustainable practices and encouraging innovation in this area.

Develop strong partnerships and collaborations to address gaps

Companies should recognise that the best strategy for achieving AI sustainability may not be obvious, partners will play a key role in addressing knowledge, skills and technical gaps to ensure the approach is tailored to individual needs.

Appendix: Survey demographics

Overview

This report is based on a global survey of 608 senior executives conducted between November 2024 and January 2025. All respondents are familiar with their firm's plans for AI adoption and sustainability efforts.

Respondent profiles

- **Work title**
  - Board member/chairperson/chair—7.7%
  - CEO/president—7.6%
  - Chief data officer—7.7%
  - Chief finance officer—7.7%
  - Chief sales officer—2.2%
  - Chief information officer—7.6%
  - MD/EVP/SVP—21.4%
  - VP/director—38.2%
- **Company size (Annual global revenue):**
  - US$10m to less than US$500m: 27.5%
  - US$500m to less than US$1bn: 39.3%
  - US$1bn to less than US$10bn: 25.8%
  - US$10bn or more: 7.4%

Functional role

Respondents come from diverse functions, including:

- Strategy—25.2%
- Technology—25.2%
- Sales—4.4%
- Procurement—20.6%
- Sustainability—24.7%

Supply-chain role

- Supplier—106 respondents
- User—502 respondents

Geographical breakdown

The survey included respondents from around the world:

- Asia-Pacific: 40.6%
- North America: 29.4%
- Europe: 28.5%
- Middle East: 0.7%
- Latin America: 0.8%

Methodology

Desk research

To explore the future of sustainable AI, we reviewed documents and articles. This helped us identify the challenges and opportunities organisations face globally regarding sustainable AI.

Survey

Based on our findings, we created a survey to assess the opportunities and challenges in current AI development. We targeted AI suppliers and users at director level and above, focusing on sustainability, strategy, technology, and procurement or sales.

The survey included 15 questions—ten on content and five on demographics. We received responses from 608 participants worldwide, all familiar with their companies' AI plans or services. There were three questions specifically targeted to AI suppliers, while four questions targeted AI users.

Expert interviews

We conducted six expert interviews in February and March 2025 with business leaders and AI sustainability experts. These interviews added depth to our findings and validated our survey results. We then combined insights from the literature review, survey and interviews into this report.

ECONOMIST IMPACT

LONDON

The Adelphi
1-11 John Adam Street
London WC2N 6HT
United Kingdom
Tel: (44) 20 7830 7000
Email: london@economist.com

GENEVA

Rue de l'Athénée 32
1206 Geneva
Switzerland
Tel: (41) 22 566 2470
Fax: (41) 22 346 93 47
Email: geneva@economist.com

SÃO PAULO

Rua Joaquim Floriano,
1052, Conjunto 81
Itaim Bibi, São Paulo - SP
04534-004
Brasil
Tel: +5511 3073-1186
Email: americas@economist.com

NEW YORK

900 Third Avenue
16th floor
New York, NY 10022
United States
Tel: (1.212) 554 0600
Fax: (1.212) 586 1181/2
Email: americas@economist.com

DUBAI

Office 1301a
Aurora Tower
Dubai Media City
Dubai
Tel: (971) 4 433 4202
Fax: (971) 4 438 0224
Email: dubai@economist.com

HONG KONG

1301
12 Taikoo Wan Road
Taikoo Shing
Hong Kong
Tel: (852) 2585 3888
Fax: (852) 2802 7638
Email: asia@economist.com

SINGAPORE

8 Cross Street
#23-01 Manulife Tower
Singapore
048424
Tel: (65) 6534 5177
Fax: (65) 6534 5077
Email: asia@economist.com