Optimizing output, minimizing footprint

An integrated AI and sustainability strategy offers complementary—rather than competing—outcomes

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In boardrooms and stockholder meetings, AI is celebrated for its profound influence on process optimization, financial efficiency, and innovation. Yet, beneath the surface of this technological marvel lies a pressing concern: As AI use increases, so do electricity usage, water consumption, and greenhouse gas (GHG) emissions.[1] For businesses that have long prioritized responsible environmental stewardship, the irony is palpable—the intelligent algorithms designed to propel us into the future currently depend on the resources of the past.

Is there a path forward for businesses keen to maximize AI sustainably? KPMG believes the answer is yes. A Harvard University study led by a KPMG US Leaders 2050 co-chair gathered data from 242 respondents around their AI usage patterns and productivity gains. Participants quantified the time spent on creating a brief report manually and with AI chatbot assistance, focusing on activities like summarization, writing, and research. Carbon emissions were calculated using survey data, conversion rates, and emission factors. Two sensitivity analyses assessed changes in time spent, the effect of query quantity on emissions, geographical differences in energy production, and the overall carbon footprint of AI technologies.

Unsurprisingly, the study confirmed consensus thinking by finding that the transformative impact of AI is too significant to dismiss. We also learned that most AI users who understand the resource impact of intelligent tools would not quit using them because of environmental concerns.[2] However, we also discovered that AI's environmental impact isn't intrinsic to the technology itself but is instead heavily influenced by the energy source fueling its operation.[3] We even found that some AI-driven processes running on grids with a large percentage of renewables produce significantly fewer emissions than manual processes running on high-emissions grids,[4] disrupting the narrative that AI and sustainability are incompatible.

> The future isn't about choosing between innovation and sustainability; it's about redefining how we achieve both, leveraging AI not just as a tool for business growth, but also as an enabler of improved environmental outcomes and responsibility.

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Based on these findings, we can realistically design a world where dynamic management of AI workloads is tailored to specific use case requirements and latency. For example, real-time applications like fraud detection, autonomous systems, or conversational AI with low-latency expectations need proximity to end users. In contrast, non-latency-sensitive workloads, such as model training, copilot content generation, or batch analytics, can be flexibly routed to regions with abundant renewable energy. Therefore, sustainable AI deployment must be context-aware, balancing environmental impact with performance needs.

In this paper, we present the findings from our survey and help businesses harmonize technological advancement with ecological stewardship. The future isn't about choosing between innovation and sustainability; it's about redefining how we achieve both, leveraging AI not just as a tool for business growth, but also as an enabler of improved environmental outcomes and responsibility.

[1] Adam Zewe, "Explained: Generative AI's environmental impact," MIT News, January 17, 2025.

[2] Maya Elia, Optimizing Output, Minimizing Footprint, Harvard University: Harvard Extension School, May 7, 2025.

[3,4] Ibid.

Quantifying AI's environmental impact

To explore the intersection of AI and workplace sustainability, the research adopted a structured yet practical approach—one that mirrored the everyday experiences of knowledge workers.

A custom survey was designed to gather data from nearly 250 respondents across a range of industries (Exhibits 1 and 2). Participants were asked to complete a common workplace task—creating a two-slide industry report—first manually, then with the assistance of an AI chatbot. This task involved summarization, writing, and research. Participants recorded the time spent and number of queries used in each scenario.

Carbon emissions were then calculated using survey data, conversion rates, and emission factors, following the GHG Protocol Scope 2 Standard. Conversion rates for Microsoft Office tools, web searches, and AI chatbots were sourced from industry research, while emissions factors were based on the 2023 US eGRID national average.

Exhibit 1. Survey respondent organization size

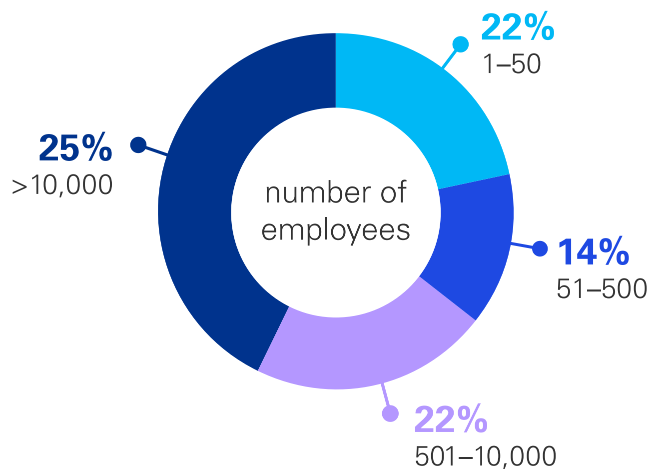
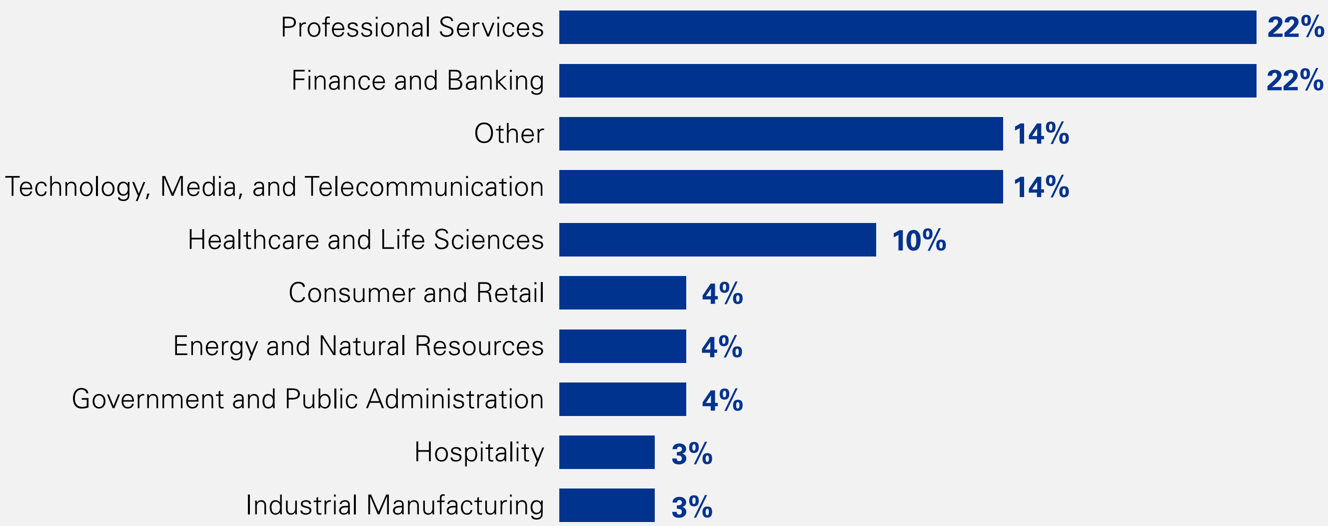


Exhibit 2. Survey respondent organization sector



Source: Maya Elia, Optimizing Output, Minimizing Footprint, Harvard University: Harvard Extension School, May 7, 2025.

To account for variability, the study included two sensitivity analyses. The first modeled 20 percent increases and decreases in time and query volume to assess how user behavior might influence emissions. The second applied regional eGRID factors—comparing the highest and lowest emissions intensity areas—to highlight the impact of local energy sources on AI's carbon footprint.

This approach provided a grounded view of how AI tools affect both productivity and environmental impact, offering insights for organizations aiming to balance innovation with sustainability.

Key insights

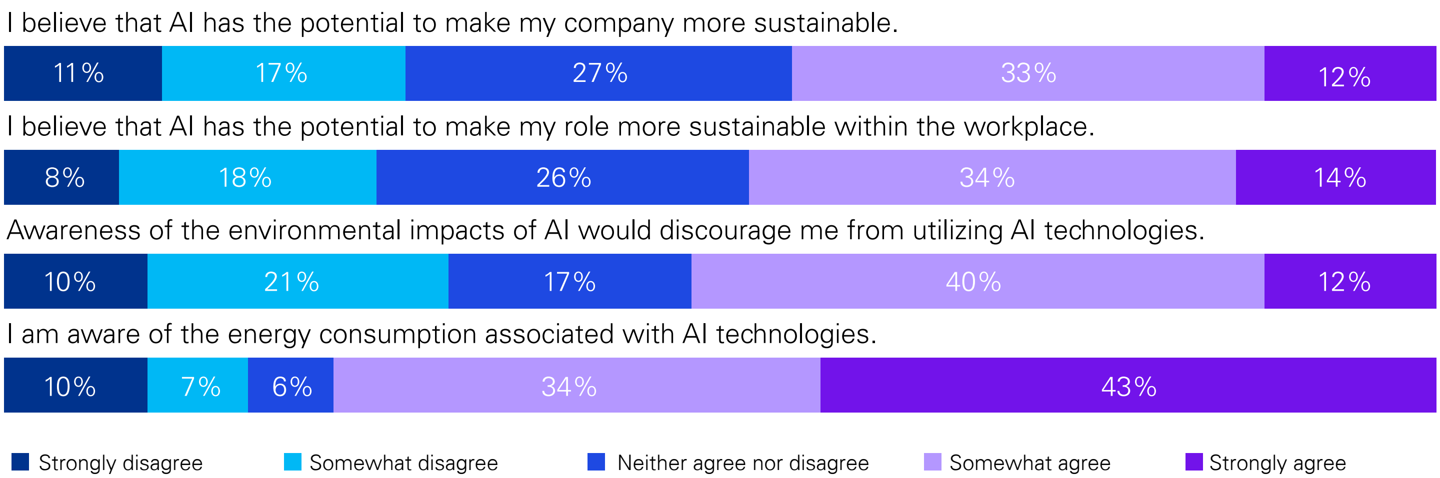
- AI's environmental impact isn't fixed—it depends on where and how it's powered. Clean energy can make AI more sustainable than traditional manual processes, and regional differences in energy sources dramatically affect AI's carbon footprint.
- Awareness of AI's energy use is growing, but it rarely deters adoption—underscoring the urgency for sustainable solutions.
- AI isn't just a sustainability challenge—it's also a powerful sustainability enabler. When deployed thoughtfully, it can accelerate decarbonization, streamline sustainability reporting, and unlock new efficiencies in energy and resource management.

The paradox of progress

AI is hailed as a productivity powerhouse. It accelerates research and writing and distills complex information into actionable insights. By reducing the time spent on routine tasks and enabling quicker decision-making, AI allows professionals to focus on more strategic, value-added activities. In fact, the research found that AI chatbots can reduce task completion time by up to 66 percent—a staggering gain in efficiency.

AI chatbots can reduce task completion time by up to **66%**

Exhibit 3. Agreement with questions on the intersection of AI and sustainability



But this leap forward comes with a hidden cost. While AI-driven workflows offer remarkable efficiency, the energy demands of AI chatbots are notably higher compared to traditional web searches. Each AI query consumes nearly ten times more energy than a traditional web search, and multiply that by the 2.5 billion queries ChatGPT users send each day and the environmental impact becomes impossible to ignore.[5] The irony is clear: The very tool designed to streamline our future risks undermining our sustainability goals.

Despite growing awareness of AI's energy demands, few are willing to give it up. While 43 percent of survey respondents acknowledged AI's environmental impact, only 12 percent said that this knowledge would discourage their use of it (Exhibit 3). This gap between awareness and action highlights a critical tension: although sustainability is gaining traction as a corporate and personal priority, the convenience and productivity gains offered by AI often outweigh environmental concerns in day-to-day decision-making.

This finding underscores a broader challenge for organizations: how to align digital innovation with environmental responsibility. It suggests that simply raising awareness of AI's energy demands may not be enough. Instead, companies may need to embed sustainability into the design and deployment of AI tools—making low-carbon choices the default, not the exception.

[5] Fabio Duarte, "Number of ChatGPT Users (July 2025)," ExplodingTopics.com, July 22, 2025.

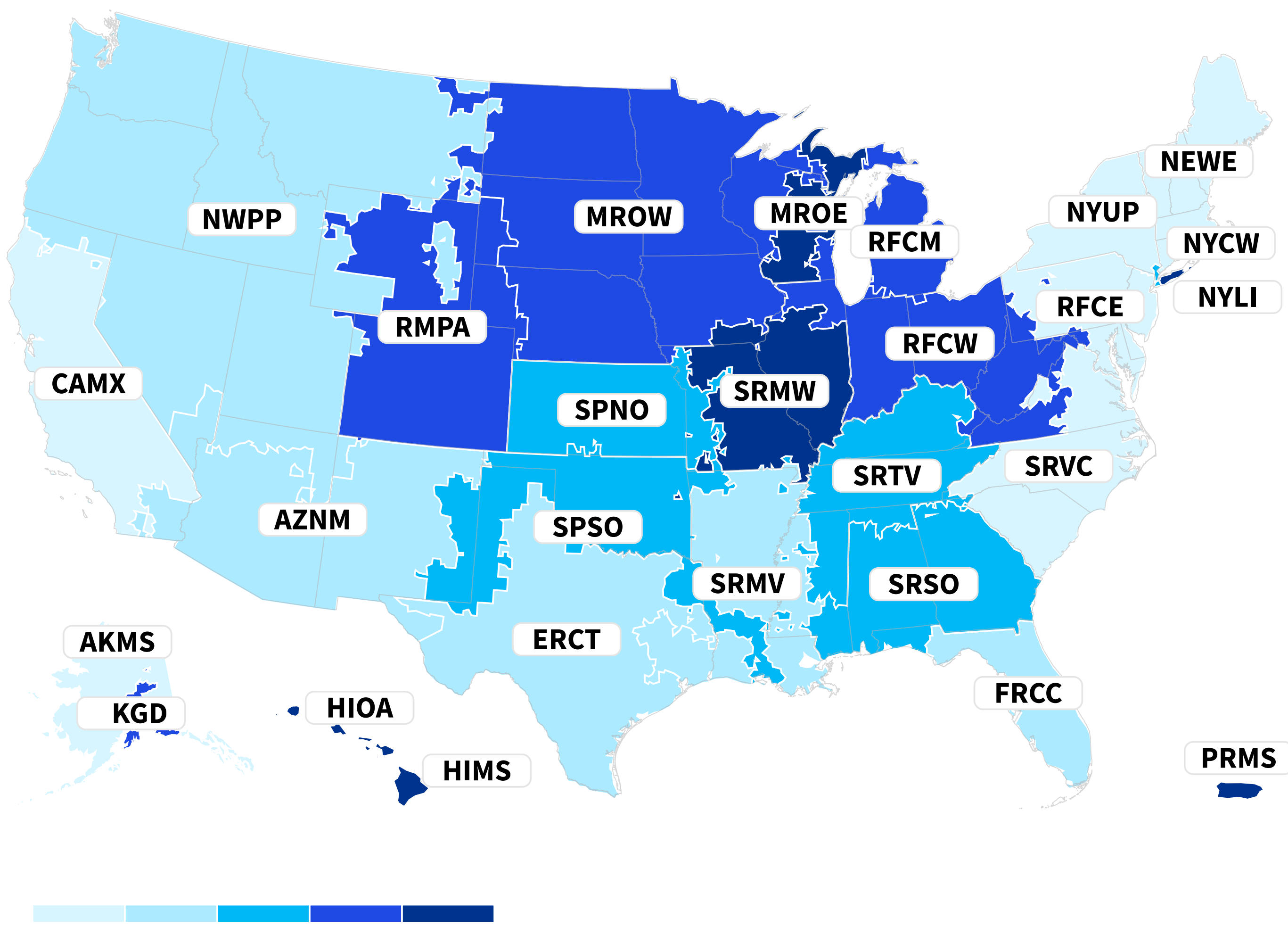
The power behind the process

A deeper dive into regional energy grids underscores this point. The research compared emissions across three scenarios: the US national average, the most carbon-intensive grid (PRMS), and the cleanest (NYUP) (Exhibit 4). The results were unequivocal. AI workloads performed on grids with a high percentage of renewables, such as those in upstate New York, generate significantly lower emissions than those performed on high-emission grids.

> When deployed strategically, AI can be cleaner than the status quo.

In some cases, AI workloads even outperformed manual workflows in terms of sustainability.

Exhibit 4. USEPA map of United States by eGRID subregions, 2023



Source: US EPA (epa.gov/egrid/data-explorer)

Key recommendations

To translate insight into action, organizations must adopt a holistic strategy that integrates infrastructure, policy, operational design, and technology deployment. These recommendations are not only about reducing emissions but also about unlocking value, mitigating cost, and future-proofing AI deployment in a carbon-constrained world.

1. Demand optimization and incentives

AI's rapid growth is making it increasingly important for organizations to optimize when and where AI workloads run. By aligning AI processing with periods of low-carbon energy availability, companies can meaningfully reduce their GHG emissions and overall environmental footprint. Yet, the approach must go beyond energy scheduling—evaluating AI or cloud provider decisions should holistically account for renewable energy access, network latency, financial viability, and evolving regulatory constraints. Proactively engaging with available policy mechanisms, such as tax incentives and clean energy grants, can create financial headroom for sustainability investments. This strategic alignment not only supports decarbonization but also helps companies mitigate regulatory risks and demonstrate sustainability leadership to investors and employees.

Priority actions

- Strategically schedule AI workloads (e.g., training) during periods of low-carbon electricity availability.
- Leverage tax incentives, CPRD credits, and clean energy grants to offset infrastructure and operational costs.
- Evaluate data center siting not only by renewable energy availability but also by latency needs, financial viability, water and biodiversity impacts, and US policy constraints.

2. Alternative fuels and PPAs

As organizations face volatile energy markets and rising scrutiny of energy sources, securing power purchase agreements (PPAs) and renewable energy credits (RECs) is emerging as a foundational strategy for de-risking AI operations. PPAs and RECs allow companies to directly support the expansion of renewable generation, demonstrate additionality, and actively hedge against fossil fuel price shocks. Transitional fuels such as nuclear may serve as a pragmatic interim solution where renewables are not yet sufficient, ensuring grid stability while organizations scale up their green procurement. These actions are increasingly expected by stakeholders, as regulatory frameworks and investor preferences shift toward low-carbon operations.

Priority actions

- Secure PPAs and RECs to support clean energy procurement and reduce exposure to volatile energy markets.
- Explore transitional alternates (nuclear) for AI infrastructure.

3. Circularity and resource efficiency

The environmental impact of AI extends well beyond electricity use. For data center owners, designing AI infrastructure for circularity—including modular construction, water reuse, and sourcing hardware from sustainability-committed suppliers—can reduce pressure on scarce materials and local water resources. Such approaches are especially crucial in high-density computing environments, where demand for rare earth elements and cooling water is significant. Circular design not only mitigates supply chain risks and cost volatility but also aligns with the growing regulatory push for lifecycle accountability in IT. By embedding these principles, organizations can drive long-term operational efficiencies and resilience while building trust with regulators and customers who increasingly value transparency in resource stewardship.

Priority actions

- Apply circular design principles to reduce water and material use in AI infrastructure.
- Highlight how circularity can reduce costs associated with water, rare materials, and construction inputs—especially in high-density data environments.

4. AI as a sustainability enabler

AI itself is a catalyst for environmental progress, unlocking new capabilities in sustainability management, reporting, and innovation. Advanced analytics and automation can dramatically increase the accuracy and timeliness of data, streamline GHG accounting, and enable real-time carbon tracking. AI-powered insights help identify inefficiencies across supply chains, forecast extreme weather risks, and optimize energy and water use. Investing in energy-efficient AI models, such as those that minimize unnecessary compute cycles, further reduces the technology's own footprint. Embedding sustainability as a core design principle in AI platforms ensures that as organizations scale their use of AI, they do so responsibly—meeting emerging regulations and strengthening their license to operate in a climate-conscious marketplace.

Priority actions

- Deploy AI for high-value sustainability tasks—e.g., sustainability reporting, decarbonization modeling, performance insights, and biodiversity monitoring.
- Invest in energy-efficient AI models and improve prompt engineering to reduce unnecessary compute cycles.
- Embed real-time emissions tracking in AI platforms to promote transparency and responsible usage.

How KPMG can help

KPMG delivers tailored, wide-ranging support to help organizations navigate the complexities of sustainable infrastructure, energy strategy, and technology modernization. Drawing on deep sector experience and a multidisciplinary team, we guide clients through every phase—from site selection and regulatory strategy to AI-driven sustainability enablement and cloud modernization—helping to unlock value, manage risk, and accelerate progress toward environmental and business goals.

01 Infrastructure and energy strategy

- **Site and location analysis:** Identify optimal regions for data center placement based on renewable energy availability, latency needs, and regulatory feasibility.
- **Energy and carbon capture procurement and implementation:** Support clean energy sourcing, on-site generation, and carbon mitigation strategies.
- **PPA structuring:** Assist in negotiating PPAs and RECs to reduce emissions and stabilize energy costs.

02 Policy and incentive advisory

- **Tax incentive and climate policy and regulation advisory:** Navigate US policy frameworks and leverage available credits and grants to offset infrastructure and operational costs.
- **Regulatory strategy for AI infrastructure:** Provide guidance on cross-border data center constraints and compliance with emerging sustainability regulations.

03 Circularity and resource efficiency

- **Circular infrastructure design:** Apply circular principles to reduce water, material, and construction inputs in AI and cloud environments.
- **Lifecycle assessments:** Evaluate environmental and financial trade-offs across infrastructure investments.

04 AI-driven sustainability enablement

- **AI-driven transformation:** Use AI to accelerate sustainability reporting, decarbonization modeling, and enterprise performance insights.
- **AI solution design, implementation, and optimization:** Build and refine AI models for energy efficiency and sustainability impact.
- **Carbon intelligence and emissions transparency:** Embed real-time carbon tracking into AI platforms to promote responsible usage and reporting to support scalable, low-carbon AI deployment.

05 Technology modernization

- **Data and cloud modernization:** Modernize enterprise infrastructure to support scalable, low-carbon AI deployment.

Walking the walk

KPMG is not only embracing AI to accelerate sustainability outcomes but also holding ourselves accountable for its environmental footprint. We're developing AI-powered tools to enhance how we measure the value of sustainability projects and refine how we classify emissions-intensive spend categories like purchased goods and services. At the same time, we're taking a hard look at AI's own impact: measuring emissions from our data centers, building a strategy to assess third-party AI emissions, and working closely with our Trusted AI team to help ensure responsible, energy-conscious deployment across the firm. From an energy and infrastructure standpoint, we've invested in two renewable PPAs with NextEra Energy to generate energy from two new solar projects in Texas. These projects will commence in FY 2026, not only supporting our commitment to 100 percent renewable energy, but also increasing the availability of clean electricity on the grid.

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Maura Hodge is the US Sustainability Leader for KPMG based in the Boston office. In this role, Maura is focused on helping clients create long-term value while building a more sustainable, resilient future for all. She brings the best of the firm's integrated, cross-functional expertise, industry-specific insights, and global reach with localized knowledge to offer thorough solutions that drive both environmental and economic value. She has more than a decade of experience providing sustainability reporting and assurance services coupled with nearly 20 years of experience providing audit and internal control opinions on financial information. Because of this background, she sits at the nexus of sustainability strategy and reporting and regularly speaks with the media and clients to educate and advise on practical next steps.

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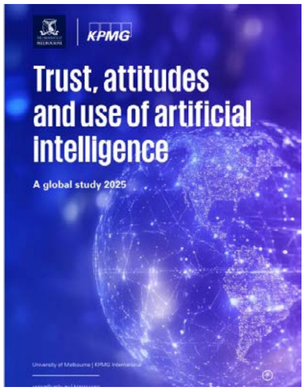

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