



# The AI and sustainability paradox

Maximizing value,  
managing risk



# Contents

01

Social sustainability: Quality of life, inclusion, and trust

Economic sustainability: Productivity, resilience, and trust

02

03

Environmental sustainability: Optimization benefits and trade-offs

04

Reflections on the AI and sustainability equation

The pace of technological change is transforming the way we live, work, and do business. AI is at the forefront of this transformation, offering unprecedented opportunities to drive efficiency, innovation, and sustainable outcomes across industries. From optimizing energy use and streamlining supply chains to enhancing agricultural productivity and energy forecasting, AI is driving scalable solutions to some of the most complex sustainability challenges organizations face.

At the same time, AI introduces significant considerations including the energy demands of data centers, ethical implications of automation, and potential unintended consequences, highlighting the need for careful governance and strategic planning. Balancing these opportunities and risks is critical to ensuring AI contributes positively to business performance, society, and the environment.

By understanding and managing these dynamics, organizations can harness AI not only as a tool for growth but as a catalyst for a more sustainable future. This paper examines how AI can drive social, economic, and environmental value by enhancing quality of life, supporting inclusion, and building trust in society. It also examines the trade-offs and challenges of AI adoption, including infrastructure demands, governance and ethical considerations, and the long-term implications for sustainable growth.



# Social sustainability: Quality of life, inclusion, and trust

## Enhancing quality of life

With evolving lifestyles and rapid societal changes, AI has played an increasingly important role in enhancing quality of life by improving access to information, services, and opportunities, while reducing friction in everyday interactions. Advances in AI capabilities, including data analytics, machine learning, and generative systems, have been enabling more scalable, responsive, and personalized service delivery across education, healthcare, and public and private service environments.

1. The role of artificial intelligence in achieving the Sustainable Development Goals - PMC.

2. Using AI-ML to Augment the Capabilities of Social Media for Telehealth and Remote Patient Monitoring - PMC.

3. AI's Impacts on Society: A Look into the Crystal Ball.












In education, AI-enabled personalization and remote learning models support more inclusive access to learning and skills development, particularly for underserved or constrained populations.<sup>1</sup>

While in healthcare, AI-enhanced telehealth and remote patient monitoring systems improve continuity of care, early detection, and access to essential health services beyond traditional clinical settings.<sup>2</sup>

More broadly, AI-enabled customer service tools and digital interfaces contribute to quality of life by improving convenience, responsiveness, and availability of services. Automated assistants and chatbots reduce waiting times, support 24/7 access, and allow organizations to reallocate human resources toward complex or high-value interactions.<sup>3</sup>



## AI service domains and corresponding SDG alignment

Service domain	AI applications	Social sustainability contribution	SDG alignment
<b>Education</b> 	AI-enabled personalization, adaptive learning systems, remote learning platforms	Expands access to learning and skills development; supports underserved and geographically constrained populations; strengthens lifelong learning pathways	 
<b>Healthcare</b> 	Telehealth, remote patient monitoring, AI-assisted diagnostics and early detection	Improves continuity of care; enhances preventive health models; increases access to essential services for remote or mobility-constrained populations	 
<b>Public and private services</b> 	Automated customer service tools, digital interfaces, AI-enabled chatbots	Improves responsiveness and service availability; reduces waiting times; enhances institutional efficiency and digital service infrastructure	 

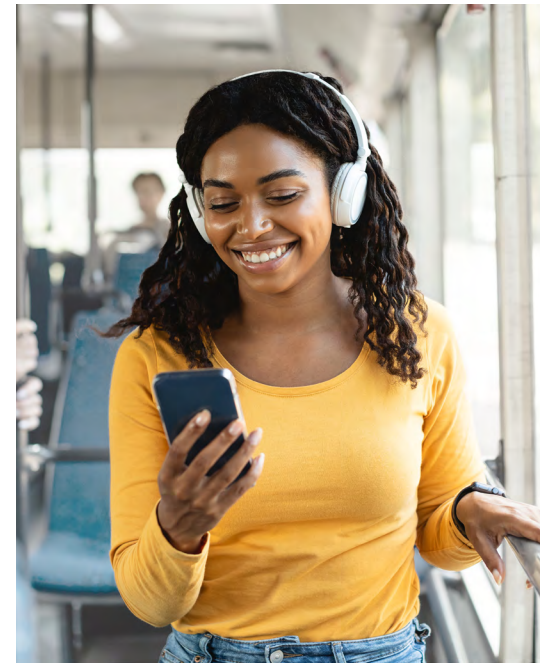
Taken together, these applications illustrate how AI can act as an enabler of social sustainability by improving access, inclusion, and service quality, contributing to overall quality of life.

4. The carbon and water footprints of data centers and what this could mean for artificial intelligence - ScienceDirect.

5. Beyond the algorithm: AI's societal impact | MIT Sloan.

## Social infrastructure implications

At the same time, the social implications of AI extend beyond service-level improvements to the underlying infrastructure required to support AI at scale. The growing energy and water demand of data centers powering AI systems may place pressure on local resources, particularly in regions where energy and water are already constrained. Such impacts can affect communities' access to essential services and influence perceptions of fairness and sustainability, with implications for public trust in AI-enabled systems. These considerations highlight that improvements in quality of life enabled by AI must be assessed alongside the broader societal and resource implications of the digital infrastructure on which AI depends.<sup>4</sup>



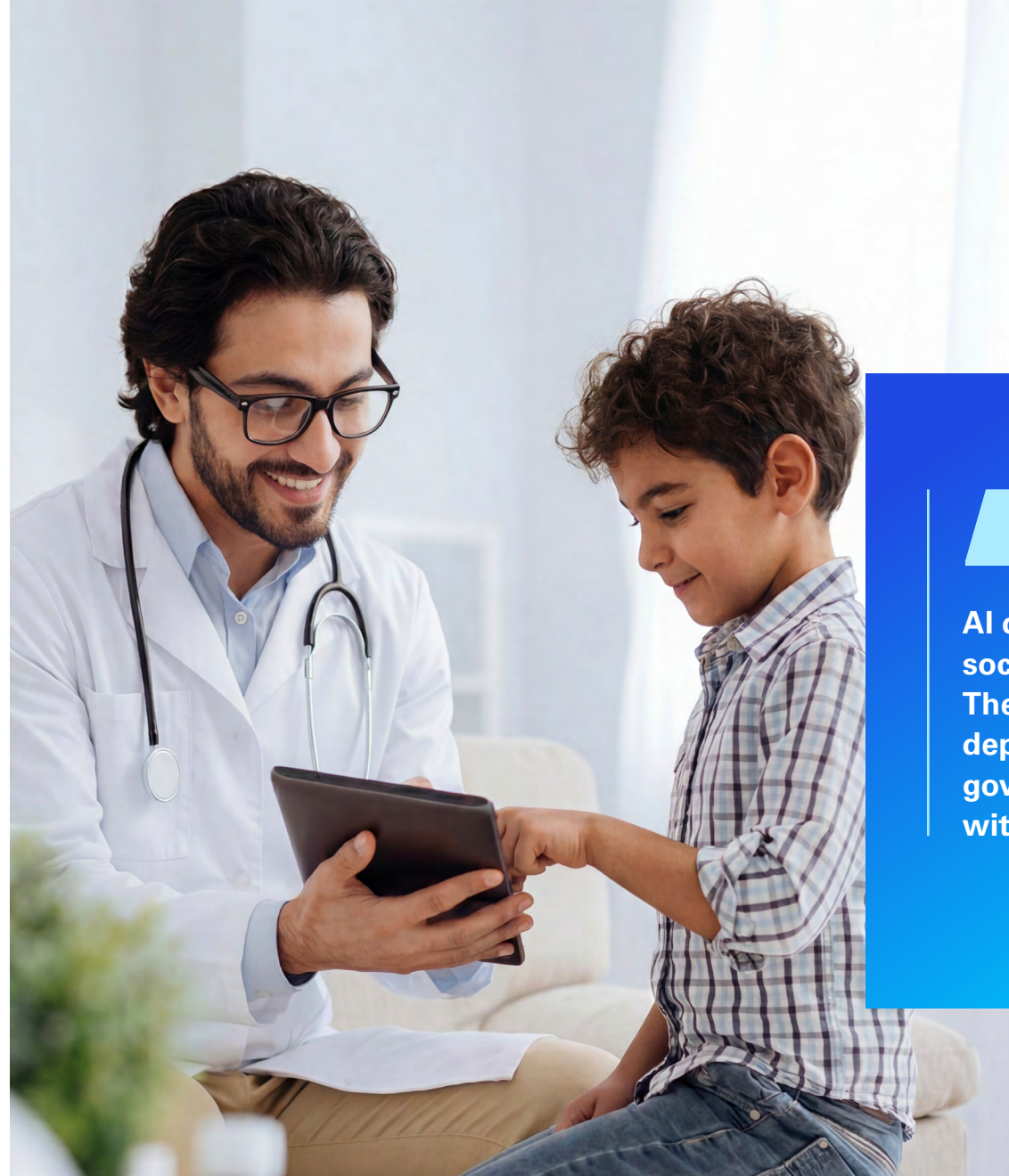
## Risks and governance considerations

Although AI has shown to generate substantial improvements across a wide range of domains, its adoption also entails significant risks and challenges. Risks include algorithmic bias, lack of transparency, privacy concerns, and unequal access to digital infrastructure and skills. AI's effects also vary significantly by domain, underscoring that the benefits observed in one context do not automatically translate across all social systems. Research shows that in areas such as healthcare, hiring, and creative work, AI can improve decision support and operational efficiency, but achieving positive outcomes requires the integration of domain expertise with algorithmic insights. Without such integration, AI systems may make decisions that differ from human judgment in ways that are inappropriate for the setting or that fail to capture the full complexity of social interactions and human values. These findings reinforce the importance of human-centered design, cross-disciplinary governance, and contextual understanding in deploying AI sustainably across social domains.<sup>5</sup>

Without appropriate safeguards, AI systems may reinforce existing socioeconomic inequalities by disproportionately benefiting individuals and communities with greater access to data, technology, and digital literacy.

In addition, increased reliance on AI-mediated interactions, such as automated customer service or decision support, may alter patterns of human interaction and working norms. While automation can improve efficiency, over-reliance on AI may reduce human connection or undermine trust if systems are perceived as opaque, unaccountable, or misaligned with social values. Moreover, their effectiveness is constrained by the scope and quality of data to which these systems have access, limiting their ability to address highly specific, complex, or unforeseen situations.

Leading practice increasingly recognizes that social sustainability should not be treated solely as an outcome of AI adoption, but as a design and governance constraint that shapes how AI systems are built, deployed, and scaled. To ensure positive social outcomes, AI must be embedded within human-centered, inclusive, and accountable frameworks.



**AI does not automatically generate social sustainability; it reshapes it. The quality of life gains it enables depend on how systems are governed, designed, and embedded within social institutions.**

# Economic sustainability: Productivity, resilience, and trust

## Productivity and growth

AI is increasingly viewed as a catalyst for long-term productivity growth, economic resilience, and value creation, and has already contributed as many have embraced GenAI in the workplace aside from broader applications. Improvements in AI capabilities, particularly in data analytics, automation, and decision support, enable firms and governments to use capital, labor, and resources more efficiently, supporting higher economic output with potentially lower marginal costs.<sup>6</sup>

At a macroeconomic level, AI adoption is associated with productivity gains and GDP growth through improved efficiency, innovation, and the creation of new products and services. By augmenting human decision-making and automating routine activities, AI can free up labor and capital for higher-value economic activities, supporting sustainable economic growth rather than short-term cost cutting alone.

The influence of AI on economic output is increasingly quantified in global projections, although its effects vary significantly across regions and depend on structural readiness.

	Projection	Insights
Global GDP impact (WEF)	<b>+14%</b> by 2030 (~US\$15.7 trillion)	Gains depend on widespread integration of AI into productive activity
Advanced economies	Larger productivity gains	Higher AI readiness and institutional capacity
Emerging and low-income economies	More variable outcomes	Exposure and preparedness determine impact

6. Gen-AI: Artificial Intelligence and the Future of Work.

According to analysis highlighted by the World Economic Forum, AI could increase global GDP by up to 14 percent by 2030, equivalent to roughly US\$15.7 trillion in additional output if AI tools are widely adopted and integrated into productive activities.<sup>7</sup> At the same time, macroeconomic modeling from the International Monetary Fund further indicates that productivity gains from AI are not uniformly distributed, with economic impact shaped by institutional capacity, technological access, and exposure to AI-enabled sectors.<sup>8</sup> These findings underscore that AI's macroeconomic impact is shaped less by technological availability alone and more by institutional capacity and integration into productive systems.<sup>9</sup>

## Economic resilience and system stability

AI also supports more resilient and transparent economic systems by improving forecasting, risk management, and planning across sectors such as energy, logistics, finance, and infrastructure. These capabilities are increasingly relevant for managing economic volatility, climate-related risks, and supply-chain disruptions, essential for long-term economic sustainability.

Trust is increasingly framed as a core economic asset and even a form of currency in the digital and AI-driven economy, because it underpins growth, innovation, and market access. Multiple analyses argue that as value shifts from tangible assets to data and digital interactions, digital trust becomes the critical enabler of transactions, partnerships, and the adoption of emerging technologies such as AI. In this view, organizations that embed trust, through transparency, accountability, security, and responsible data use, gain competitive advantage by strengthening customer loyalty, investor confidence, and stakeholder collaboration, while those that fail to do so face higher regulatory, reputational, and financial risks.<sup>10</sup>

## Infrastructure costs and distributional risks

At the same time, the economic implications of AI extend beyond productivity and trust to the underlying infrastructure required to support AI at scale. The rapid growth of AI workloads is increasing demand for energy- and water-intensive data-center infrastructure, creating cost pressures and economic externalities that may affect energy systems, utilities, and local economies. As AI scales, these resource requirements can influence operating costs, infrastructure investment needs, and long-term economic efficiency, particularly in regions facing energy or water constraints. These dynamics highlight that realizing sustainable economic value from AI depends not only on efficiency gains and trust, but also on how infrastructure-level costs and externalities are managed over time.<sup>11</sup>



**Scaling AI is not costless; its economic footprint extends beyond software to the physical systems that sustain it.**







**In the AI-driven economy, trust is not a soft variable – it is economic infrastructure.**



7. AI's \$15 trillion prize will be won by learning, not just technology | World Economic Forum.  
8. The Global Impact of AI – Mind the Gap in: IMF Working Papers Volume 2025 Issue 076 (2025).  
9. The global impact of AI: Mind the gap | CEPR.  
10. Why trust will define the \$20 trillion AI opportunity | World Economic Forum and why trust is the most valuable currency in the digital economy.  
11. The carbon and water footprints of data centers and what this could mean for artificial intelligence - ScienceDirect.

**Sustainable economic value from AI rests on four interdependent drivers**

Driver	Economic role	Risk if weak
 <p><b>Productivity and innovation</b></p>	Drives efficiency gains, new products, and higher output	Limited or short-lived growth impact
 <p><b>Institutional capacity</b></p>	Ensures readiness, sector integration, and alignment with policy	Uneven regional outcomes
 <p><b>Infrastructure management</b></p>	Manages energy, water, and digital backbone requirements	Rising operating costs and externalities
 <p><b>Trust and governance</b></p>	Builds investor confidence, regulatory stability, and market participation	Slower adoption and increased financial risk

At the same time, AI adoption introduces economic risks that may undermine long-term sustainability if not managed carefully. High upfront investment costs for data infrastructure, cloud services, and specialized talent can create barriers to entry, potentially concentrating economic benefits among large firms and advanced economies.

AI may also contribute to labor market disruptions, particularly through the automation of routine and middle-skill tasks. While AI can create new economic opportunities, uneven reskilling and workforce transition efforts may lead productivity gaps across sectors and regions.

In addition, insufficient trust in AI systems, stemming from concerns around transparency, bias, and accountability, can slow adoption and reduce realized economic value. Where AI systems are perceived as unreliable or poorly governed, organizations may face reputational risk, regulatory friction, and reduced investor confidence, limiting AI's contribution to sustainable growth.

Sustainable economic value from AI is not achieved through technology adoption alone, but through alignment with broader economic, social, and governance objectives. From a sustainability perspective, AI strategies should prioritize inclusive growth, long-term productivity, and trust-based economic systems, rather than short-term efficiency gains.



**Technology alone does not generate sustainable growth; governance determines whether productivity gains translate into durable economic value.**

# Environmental sustainability: Optimization benefits and trade-offs

## Environmental optimization benefits

As sustainability challenges intensify, organizations are increasingly turning to AI as a tool to reduce environmental impact while maintaining efficiency and growth. AI's ability to process vast datasets, identify patterns, and optimize complex systems makes it especially powerful in addressing environmental issues that were previously difficult to manage at scale.



This improved accuracy enables organizations to forecast resource needs, anticipate market and environmental trends, and plan business strategies with greater precision. From reducing energy consumption to transforming agriculture and enabling circular economy models, AI is emerging as a key enabler of environmental sustainability.

One of AI's most immediate environmental benefits is its ability to optimize energy use across facilities. By integrating real-time readings from sensors, equipment, and weather forecasts, AI predicts energy demand and dynamically adjusts heating, cooling, lighting, and production schedules to minimize consumption without compromising performance. The benefit of this feature is especially prominent for establishments that generate their own power. In these cases, AI can align generation and dispatch with forecasted loads to reduce peaks, maximize self-consumption, and reduce reliance on the grid.



**By shifting energy management from reactive to predictive, AI enables organizations to cut costs while directly reducing their carbon footprint.**

Similarly, in data centers – where all the power needed for AI is sourced from – AI optimizes cooling systems, server loads, and power usage, significantly improving energy efficiency.

These capabilities are scalable to microgrids and city-level operations, where AI coordinates various energy resources to balance supply and demand as well as inform peak shaving decisions – contributing to enhanced overall stability of the grid. This is enabled by AI, helping to build predictive controls models that optimize energy systems.

Comparable to how AI can transform energy generation and consumption, it is also playing a critical role in water management. This is particularly impactful in water-scarce regions and in water-intensive sectors such as agriculture, where efficient water use is both an environmental and economic imperative.

In agriculture, AI analyzes soil data, satellite imagery, weather patterns, and crop health indicators to generate actionable insights.<sup>12</sup> By processing vast and diverse datasets far beyond human analytical capacity, AI models can detect patterns, correlations, and early signals of stress that would otherwise go unnoticed. These insights can be tailored to specific and individual plants. By enabling data-driven decision-making at such a granular level, AI supports a shift from reactive to predictive farm management.

This is transformative for the agriculture sector specifically as it is enabling more precise and sustainable use of natural resources such as water, fertilizers, and pesticides. For example, AI-powered precision irrigation systems operate only when and where crops actually require water, reducing waste and minimizing stress on local water supplies. At the same time, AI-driven recommendations optimize fertilizer and pesticide application, improving yields while reducing chemical runoff, soil degradation, and broader ecosystem harm.

### Infrastructure trade-offs and measurement gaps

While the benefits of AI for broader environmental management are significant, it is equally important to acknowledge the environmental trade-offs with utilizing AI at scale; in particular the energy demands of data centers servicing AI workloads.

Data centers underpin virtually all modern AI applications, from satellite image analysis to predictive irrigation. However, they also consume large amounts of electricity and water.



**By making farming more data-driven and resource-efficient, AI supports both environmental protection and long-term agricultural productivity.**



12. IBM AI and Cloud Technology Helps Agriculture Industry Improve the World's Food and Crop Supply - Global Brands Magazine.

Not only that, but data center development is accompanied with significant land and resource implications. Data centers can span hundreds of acres, sometimes replacing farmland, wetlands, and natural habitats, with consequent losses in local biodiversity and ecosystem disruptions. Once established, these centers become major draws on local electricity grids and water sources – which intensify competition for finite local environmental resources, especially in areas experiencing drought or infrastructure constraints.

Looking at the resource needs to power AI highlights a fundamental tension: while AI can drive efficiencies and sustainability gains, it also necessitates substantial computing infrastructure that – if powered by energy and water-intensive sources – can undermine those environmental gains.

A definitive answer may not yet be possible at this stage. A study has found that among eleven data center operators, none clearly disclosed the electricity and water consumption or Scope 2 emissions (both location and market-based), and the data that is disclosed does not provide a distinction between AI and non-AI workloads, noting that data centers operators do disclose significant increases in overall electricity consumption and attributing those increases to AI.<sup>14</sup>



## Energy and water consumption of data centers globally



### Energy

Data centers accounted for  
**1.5%** of the world's electricity consumption

Data centers consumed  
**415** terawatt-hours globally

Set to more than double by 2030, reaching around  
**945** terawatt-hours



### Water

Data centers consume around  
**560** billion liters of water annually

Set to multiply by 2030, reaching around  
**1,200** billion liters annually

Values for 2024, provided by International Energy Agency (IEA)<sup>13</sup>

13. IEA - Energy and AI

14. The carbon and water footprints of data centers and what this could mean for artificial intelligence - ScienceDirect.

# Reflections on the AI and sustainability equation

Importantly, one must first establish a baseline by adopting clear data transparency policies for data centers, distinguishing between AI and non-AI workloads. This requires agreement on scope, definitions, and methodology, as well as the development of standardized measurement frameworks. Such information is essential to accurately assess the carbon and water intensity of the electricity sources powering data center hardware.



In addition, stronger international cooperation is needed through shared protocols and legal frameworks governing the development and use of AI. Clear global standards can help mitigate risks related to safety, ethics, security, and environmental impact, while increasing transparency and public awareness about how AI systems are deployed. At the same time, governments and industry should accelerate investment in renewable energy to power digital infrastructure more sustainably. Continued research and innovation to improve AI algorithms, making them more energy-efficient, less resource-intensive, and more optimized, will also be critical to reducing the overall environmental footprint of AI systems.

Without transparent and reliable data, the greatest opportunities to mitigate the climate impacts of AI and data centers remain hidden, limiting accountability and slowing progress toward sustainable digital infrastructure. By addressing these challenges, organizations can harness AI not only to drive efficiency and innovation, but also to enhance quality of life, strengthen inclusion and trust, and generate sustainable economic and environmental value, supporting long-term, responsible, and equitable growth.

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KPMG serves the diverse needs of businesses, governments, public-sector agencies, not-for-profit organizations, and the capital markets.

Our commitment to quality and service excellence underpins everything we do. We strive to deliver to the highest standards for our stakeholders, building trust through our actions and behavior, both professionally and personally.

Our values guide our day-to-day behavior, informing how we act, the decisions we make, and how we work with each other, our clients, and all our stakeholders.



### **Integrity**

We do what is right



### **Excellence**

We never stop learning and improving



### **Courage**

We think and act boldly



### **Together**

We respect each other and draw strength from our differences



### **For Better**

We do what matters.

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KPMG's Our Impact Plan guides our commitments to serving our clients, people and communities across four categories: Planet, People, Prosperity, and Governance. These four priority areas assist us in defining and managing our environmental, social, economic and governance impacts to create a more sustainable future. We aim to deliver growth with purpose. We unite the best of KPMG to help our clients fulfil their purpose and deliver against the United Nations Sustainable Development Goals, so all our communities can thrive and prosper.

We are dedicated to delivering growth with purpose, helping our clients achieve their goals, and advancing sustainable progress to ensure that all our communities thrive. Empowered by our values, and committed to our purpose, our people are our greatest strength. Together, we are building a values-led organization of the future. For better.

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