

A moment of inflection: Building sustainable intelligence

How AI and sustainability can unlock new levels of performance, efficiency and resilience

“ Together, AI and sustainability can unlock new levels of performance, efficiency and resilience. We explore how IT leaders can turn sustainability into a strategic advantage through data-driven insights, responsible innovation, and technologies like the ICT Carbon Calculator and Innovative Optical and Wireless Network (IOWN) that make intelligent systems sustainable by design.”

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The future of AI and the future of sustainability must converge

For years, business leaders treated growth and sustainability as a trade-off — a choice between performance and principle. Investing in sustainability was seen as a moral obligation or a compliance cost, rarely as a driver of advantage. That mindset is outdated.

Today, sustainability has become a performance lever — a source of efficiency, resilience and value creation. From investors to consumers, every market signal shows that organizations integrating sustainability into their strategies consistently outperform those that don't.¹

Artificial intelligence (AI) sits at the center of this shift. Once a niche capability, AI is now the engine of modern growth, accelerating discovery, automation and creativity. Yet its expansion brings a paradox: the technology most capable of addressing climate and resource challenges is also among the world's fastest-growing consumers of energy and materials.

We have entered a moment of inflection, where the future of AI and the future of sustainability must converge. At NTT DATA, we believe intelligent technology must also be responsible technology, and that sustainable AI will define the next era of performance.



¹ T. Whelan, U. Atz, T. Van Holt and C. Clark. Rockefeller Asset Management and NYU Stern Center for Sustainable Business. ESG and Financial Performance: Uncovering the relationship by aggregating evidence from 1,000 plus studies published between 2015 – 2020. 2021.

From compliance to competitiveness

Sustainability has moved from the sidelines to the center of business performance. It is no longer a PR exercise but a management discipline that drives growth and resilience.

In a report that examines the relationship between ESG and financial performance, researchers concluded: "Our analysis of more than 1,000 research papers exploring the linkage between ESG and financial performance since 2015 points to a growing consensus that good corporate management of ESG issues typically results in improved operational metrics such as ROE, ROA, or stock price."

The core reason is that sustainability drives both efficiency and advantage — lowering energy and operating costs, reducing regulatory and supply-chain risk, strengthening customer demand, improving access to capital and accelerating innovation. These factors combine to create resilient, higher-performing businesses that outpace the market.

In the digital era, this shift now means tracking the efficiency of information itself, from the carbon intensity of algorithms to the energy use of data centers. CIOs and CTOs are increasingly judged not only by the performance of their technology, but also by its environmental impact and efficiency.



“ We view sustainability as a design principle: A catalyst for smarter innovation and enduring advantage."

The hidden footprint of intelligence

AI's power comes with a cost

Training large models can consume the same amount of electricity that hundreds of homes use in a year, while data-center cooling can draw millions of liters of water. The chips that fuel AI rely on rare-earth minerals whose extraction carries environmental and geopolitical risks.

If unchecked, AI's energy demand could reach double-digit percentages of global electricity use within two decades.

The solution is not to limit innovation but to redesign intelligence for efficiency, building systems that learn and that scale responsibly, taking into account the finite natural resources we have at our disposal.



Redefining progress

Traditional AI metrics such as accuracy, speed and scale tell only part of the story. Sustainable AI expands that definition to include energy efficiency, lifecycle impact and ethical data use.

Through our partnership with the Green Software Foundation, NTT DATA helped develop the Software Carbon Intensity (SCI) specification, a global standard for measuring emissions from digital workloads. We are now extending this framework to AI, enabling every stage of the lifecycle — from data preparation to inference — to be measured and optimized.

We also collaborate with partners such as EcoLogits, which provides open-source tools to measure the energy use and emissions of AI systems. Together, we help clients translate carbon data into meaningful action by connecting AI efficiency with enterprise-wide sustainability goals.

In doing so, sustainability becomes measurable, manageable and a true driver of competitive advantage.

² T. Whelan, U. Atz, T. Van Holt and C. Clark. Rockefeller Asset Management and NYU Stern Center for Sustainable Business. ESG and Financial Performance: Uncovering the relationship by aggregating evidence from 1,000 plus studies published between 2015 – 2020. 2021.

The digital value chain

Sustainability cannot succeed in silos. Software, hardware and energy are interconnected, and optimizing one while neglecting another only shifts impact downstream.

NTT DATA's sustainable IT Advisory Services take a holistic view of sustainability, across five domains:

1 Applications and data	2 Cloud	3 Data centers	4 Hardware assets	5 Networks
Green software design and data-minimization strategies to reduce compute intensity	Workload placement aligned to renewable energy availability and regional grid intelligence	Power- and water-optimized facilities with predictive cooling and modular capacity	Circular design and reuse programs extending device life and reducing e-waste	Telemetry-driven optimization to limit data-transfer energy and improve routing efficiency

The ICT Carbon Calculator is central to our approach

More than a measurement tool, it's a comprehensive solution that helps IT and sustainability teams measure, analyze and reduce emissions across the digital estate. Covering cloud, data centers, networks, applications and hardware across its full lifecycle, it delivers clear visibility into carbon impact and pinpoints opportunities to optimize performance and accelerate decarbonization.

Yet measurement is only the first step. Real progress comes when organizations turn insight into action — transforming awareness into optimization, and optimization into decarbonization.



Building sustainable intelligence: From baseline to decarbonization

Transforming the promise of AI into sustainable progress requires more than innovation — it requires intention.

We see the path to sustainable intelligence as a three-phase journey:

1. Establishing an accurate baseline
2. Optimizing for efficiency
3. Diving lasting decarbonization

Each phase builds the foundation for the next, moving from measurement to meaningful impact.

Baseline: Measure to understand

Sustainability begins with visibility. Before organizations can improve, they must first understand the full environmental footprint of their digital operations.

The ICT Carbon Calculator provides that foundation. Covering applications, cloud, data centers, networks and hardware, it reveals where emissions are generated and where efficiency gains are possible.

By bringing together financial, operational and environmental data into a single, dynamic view, organizations can identify their highest-impact opportunities and set science-based targets with confidence.

Optimize: Run smarter, not harder

With a baseline in place, the next step is to optimize. This means making digital infrastructure more intelligent, adaptive and carbon-aware.

Through workload orchestration and carbon-intensity forecasting, AI workloads can be shifted to run when there's high availability of renewable energy. Compute utilization can be increased to avoid idle capacity, and applications can be redesigned to reduce software intensity and data redundancy.

Our clients use these insights to run operations more efficiently, aligning cost optimization with carbon reduction and transforming sustainability into a lever of operational performance.

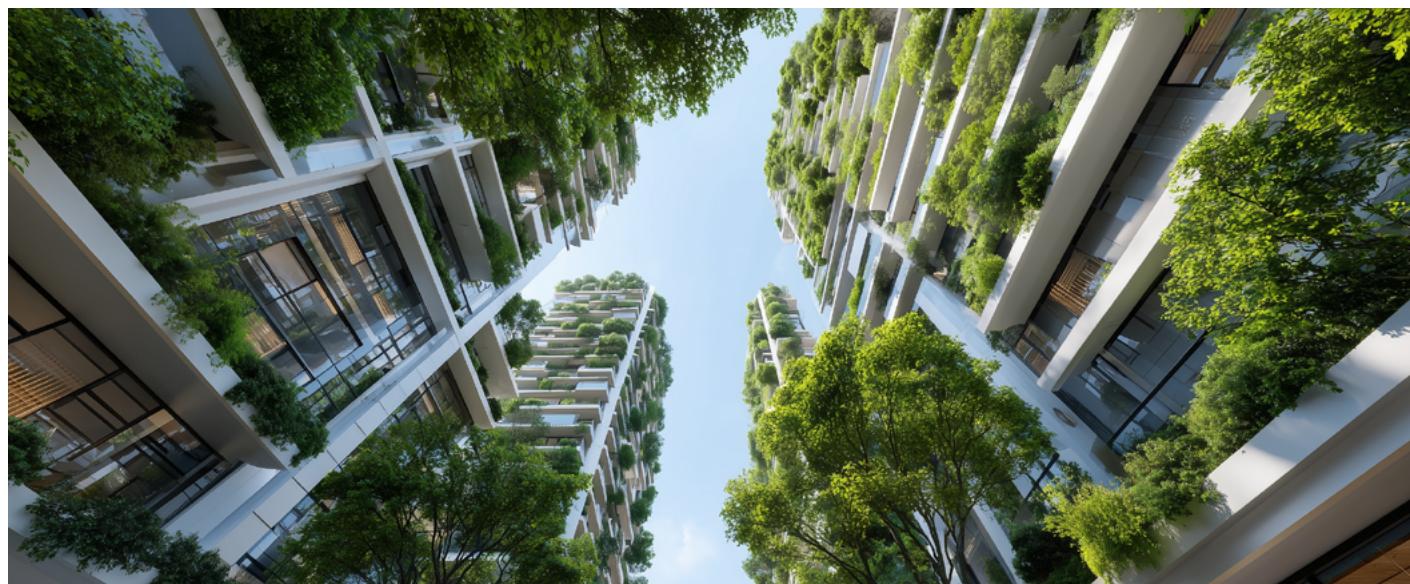
Decarbonize: Redesign for the future

True transformation occurs when sustainability is built into the fabric of technology itself.

This phase focuses on systemic decarbonization — migrating to renewable-powered data centers, leveraging circular hardware programs and embedding sustainability governance into IT operations.

Innovations such as IOWN's All-Photonic Network and NTT Anode Energy's renewable infrastructure make it possible to reimagine digital systems that are not only low-carbon but regenerative. These systems anticipate and adapt to resource availability in real time.

By progressing through these three phases — baseline, optimize, decarbonize — organizations can move from carbon awareness to carbon intelligence. The result is measurable, scalable and enduring impact: technology that performs better because it is built to consume less.



The infrastructure revolution: IOWN and sustainable compute

As organizations advance from measurement to optimization to decarbonization, the next frontier is infrastructure itself — because true transformation happens when the infrastructure itself becomes sustainable.

IOWN is redefining how data moves and energy is consumed

By replacing traditional electrical communication with all-photonics systems that transmit data as light, NTT DATA's IOWN delivers massive capacity, near-zero latency and up to one-hundred-fold greater energy efficiency. For AI, this means energy-intensive data exchanges between GPUs and data centers can occur over ultra-efficient optical links. Workloads can shift seamlessly across global locations, enabling distributed, carbon-aware computing without sacrificing performance.

IOWN also supports digital twins — real-time AI models of cities, factories and energy grids — helping organizations simulate and optimize the physical world more sustainably.

Complementing this innovation, NTT DATA is developing low-carbon AI models such as NTT DATA tsuzumi, a proprietary large language model engineered for efficiency. Delivering accuracy comparable to that of larger systems while using up to 300 times less energy for training and 70 times less for inference, tsuzumi reflects our commitment to making high-performance AI both accessible and environmentally responsible.



Powering AI responsibly

Sustainable technology also depends on sustainable power

NTT Anode Energy, an NTT Group company, is leading the transition to cleaner, smarter energy infrastructure. Through renewable generation, large-scale battery storage and intelligent grid management, NTT Anode Energy helps reduce the carbon footprint of data centers and digital operations. In close collaboration, NTT DATA aligns its infrastructure and services with these innovations so that the power behind AI and IT systems is as efficient and responsible as the technology itself.

This approach treats energy as a dynamic resource that can be optimized through analytics, forecasting and scheduling. AI workloads can run during renewable peaks and draw from stored power at other times, cutting emissions while maintaining stability. Sustainable infrastructure is not only cleaner; it is also more resilient.

Sustainability succeeds only when it is operationalized

From advisory to action

Through our Sustainable IT Advisory Services, we help organizations translate ESG goals into measurable digital transformation. We work with leadership teams to:

- Embed sustainability metrics into IT and business scorecards
- Build governance linking CIO, CFO and CSO accountabilities
- Unite financial, operational and ESG data in real-time dashboards
- Launch pilot programs that demonstrate ROI from low-carbon computing

This approach transforms sustainability from periodic reporting into a continuous optimization cycle — measured, managed and monetized — so it becomes both a performance discipline and a driver of measurable financial return.

Collective progress

No single company can make AI sustainable alone. Developers, hardware manufacturers, energy providers and regulators must act together. NTT DATA collaborates globally with governments, academia and industry alliances to shape open standards and share best practices.

By building interoperability and transparency into sustainability data, we help enterprises contribute to a lower-carbon digital economy.

Performance, responsibility and the future

Sustainability has become the ultimate test of performance. It defines how efficiently organizations use resources, how resiliently they adapt and how credibly they lead.

Sustainable AI unites intelligence with integrity — achieving more while consuming less, and ensuring every innovation strengthens the systems that sustain us.

We are turning that principle into practice by designing, engineering and managing technology that makes growth and responsibility inseparable. Our clients are proving that sustainability is not the opposite of progress; it is progress.

The inflection point is here. Organizations that treat sustainability as a performance lever — not a limitation — will shape the next era of intelligence: one that is not only smarter but sustainable by design.



Get in touch with NTT DATA's sustainability and AI experts to accelerate your journey toward sustainable AI.

We'll help you turn ESG commitments into measurable outcomes through energy-efficient data centers, carbon-intelligent workloads, and responsible innovation practices that make technology perform better by consuming less.

Contact our sustainability experts

Visit [nttdata.com](https://www.nttdata.com) to learn more.

NTT DATA is a \$30+ billion business and technology services leader in AI and digital infrastructure. We accelerate client success and positively impact society through responsible innovation. As a Global Top Employer, we have experts in more than 70 countries.

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