

A NEW PACE OF CHANGE

INDUSTRIAL AI x SUSTAINABILITY

Executive Summary

In cooperation with

SIEMENS

KEY STATISTICS

In the collective race against climate change, 46% of organizations are at **risk of missing interim energy transition targets**

91% of executives said industrial AI would have a 'high' or 'medium' impact on **accelerating the energy transition within their industries** over the next three years

More than two-thirds (69%) **described industrial AI as "essential" in simplifying the complexity of climate change**

The most prevalent challenge holding back the growth of industrial AI is **measuring return on investment**, cited by 38% of total respondents

70% agree that **future innovation in sustainability will be driven by industrial AI applications and solutions**



To win the race against climate change, we are going to need every bit of creativity we can get. Not just human creativity. AI will enable us to do more with less in our industrial world. It's our duty to make sure we use it for good.

CEDRIK NEIKE

Managing Board Member and CEO Digital Industries
Siemens AG



ONE ROAD AHEAD: THE GLOBAL RACE AGAINST CLIMATE CHANGE

Digitalization is helping organizations fast-track their sustainability goals along key impact areas, including decarbonization and energy efficiency, resource efficiency and circularity, and people centricity and societal impact

Yet in a race demanding unity, 46% of survey respondents indicated that their business is at risk of missing interim energy transition targets

The world faces a race against the clock to sufficiently decarbonize and mitigate human-induced environmental impacts. There are the technologies to accelerate sustainability transformations, yet nearly half of survey respondents indicate that their business is at risk of missing interim targets. Now is the time for opportunity to be translated at speed and scale into the required action.

Within this context, Artificial Intelligence holds promise to be a game-changer.



We've never had such powerful tools to solve the challenges we face in sustainability. Artificial Intelligence systems have the potential to help us understand the world in all its complexity and optimise industrial processes not only for strong business outcomes, but also for holistic social and environmental outcomes.

JAMES COLE

Chief Innovation Officer

Cambridge Institute for

Sustainability Leadership (CISL)

HOW (AND WHEN) TO MOVE FASTER: UNPACKING INDUSTRIAL AI'S POTENTIAL

More than two-thirds of survey respondents said industrial AI is “essential” in helping simplify the complexity of climate change

91% expect industrial AI to significantly help accelerate the energy transition of their industries over the next three years

Applying industrial AI to complex tasks, such as creating digital twins of entire factories, can remove the “burden of time” and allow companies to move faster

Industrial AI refers to the application of artificial intelligence within the industrial world. AI that is reliable, secure and trustworthy; designed to meet the requirements of the most demanding professional environments.

There is near unanimous support among our respondents that industrial AI will help accelerate the energy transition over the next three years. There is the intention it will be applied across specific operational and product processes, both in the immediate and mid-term, helping organizations to reduce their carbon footprints and improve their operational efficiency simultaneously.



ZAKIR/ADOBE STOCK



(Industrial AI's) ability to remove complexity, to process and analyse data at speed, can remove 'the burden of time' from tasks, redressing the balance between investment and output, to deliver greater returns.

**PROFESSOR HANNO
GOTTSCHALK**

Professor for Mathematical
Modelling of Industrial Life Cycles
TU Berlin



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NAVIGATING ROADBLOCKS: CHALLENGES AND OPPORTUNITIES

Challenges holding back the adoption of industrial AI can largely be categorized into three distinct areas: financial, partnerships, and internal capabilities and skills

The 'speed' of impact often aligns to levels of digital and cultural maturity

An ecosystem-centric approach to collaboration allows technological and domain knowledge to come together

AI itself is providing opportunity from a skills perspective; enhancing human and machine collaboration

Applying and scaling industrial AI is not without its challenges – complex and significant. But these are far from insurmountable.

Ensuring a robust data strategy and data backbone that AI can leverage; strategically selecting projects and scaling mindfully to help change mindsets; working collaboratively across ecosystems; marrying technical and domain expertise; reskilling employees and leveraging AI itself to address skill gaps: all will be pivotal to unlocking the potential of this technology.



AI is not optional, it's out of the bag, it's going to happen and it has the potential to transform business models.

JAMES COLE

Chief Innovation Officer

**Cambridge Institute for
Sustainability Leadership (CISL)**



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THE 'SUSTAINABILITY' OF AI

It is critical to address one growing concern of AI; its computer processor power usage and the amount of energy that can be consumed by AI itself.

When considering this, it is important to differentiate between the types of AI being deployed and the context of these deployments. The positive impact that the solutions applying AI allow us to realize should be factored into the equation.

It should also be noted that the outlook of AI computing efficiency is increasing drastically, thanks to innovation already underway targeting LLM efficiency, how the infrastructure architecture is designed, the hardware the models run on, and more.

Certain principles can help realize industrial AI's positive sustainability impact:

NET POSITIVE BALANCE:

Energy used to train and run the AI should be more than balanced out by the reduction of environmental impact achieved.

GREEN DATA CENTERS:

Smart, efficient infrastructure and financing for upgrades will help drive sustainable AI development.

GREENER AI:

Transparency in carbon data and energy-saving practices, like using pre-trained models, are also important.



TOMORROW'S OPPORTUNITY COMES WITH SCALE: FUTURE INNOVATION AND INDUSTRIAL AI

70% of respondents said future innovation in sustainability will be driven by industrial AI applications and solutions

Innovations range from more prevalent predictive maintenance to more sophisticated building operation algorithms and environmentally-friendly material and product design

The future of industrial AI will be defined by its scale and how it interacts with numerous technologies and industries, to realize digital ecosystems wherein innovations and improvements are continuously explored

There is strong business confidence in industrial AI driving further innovation in sustainability practices. Applications such as methane emissions monitoring and quantitative reporting of greenhouse gas emissions, breathing intelligence into robotics, wind power generation management control, building performance modelling, increasing reliability of grid operations were all cited.

Tomorrow's opportunity comes with scale



We can think about all the different aspects, parts, products, manufacturing, equipment, machinery that come together in a line but then also include the products that are manufactured on it and bring this together in our AI-enhanced world. So it becomes ever more integrated but also ever more holistic in the perspectives we can take.

PINA SCHLOMBS

Sustainability Lead, DACH

**Siemens Digital Industries
Software**



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UNITED IN THE RACE: A MORE INTEGRATED SYSTEM OF SYSTEMS

An overwhelming majority (95%) of organizations foresee industrial AI as helping them achieve their sustainability goals

Industrial AI can be the trigger to drive not just sustainable action but symbiosis across entire industries

Promoting cross-industry collaboration and fostering better alignment on sustainability goals will accelerate climate action further

There is near unanimous support for the notion that industrial AI will help organizations achieve their sustainability goals. By facilitating the better sharing and processing of data across industrial systems, its impact could also be more holistic in nature. It can simultaneously, for example, optimize both design and operation phases, while supporting organizations with their integrations into the wider ecosystems in which they play. This, in turn, stands to foster better alignment across industries to help accelerate climate action towards a more sustainable future.



Via big data and AI, there's the opportunity to not just optimize operations but drive symbiosis across entire industries where there's historically been a disconnect, to align increasingly digital systems and make sense of a broader 'system of systems'.

JAMES COLE

Chief Innovation Officer

**Cambridge Institute for
Sustainability Leadership (CISL)**

ACTIONABLE INSIGHTS

- In the race against climate change, businesses must accelerate their sustainability transformations with urgency and precision. This necessitates aligning commercial goals with critical pillars such as decarbonization and energy efficiency, resource efficiency and circularity, and people centricity and societal impact.

- Within this context, industrial AI is already considered pivotal by organizations:

69%

see it as “essential” in
simplifying climate change
complexity

91%

believe it will significantly
accelerate their energy transition
within 3 years

70%

agree it will drive future
innovation in sustainability

- To leverage the full potential of industrial AI and scale its impact, removing the “burden of time” from sustainability transformations, redressing the balance between investment and output, businesses should consider the following:

Scale strategically to change mindsets

- Establish or progress a robust data strategy and data backbone that AI can leverage
- Prioritize early pilots, smaller data evaluations, that easily demonstrate value
- Have broader implementations “grow with the task”, to engage more stakeholders
- Incentivize: impact demands a growth mindset of curiosity and adoption

Partnerships: embrace an ecosystem-centric approach

- Industrial AI’s adoption, implementation and scale is rarely a one-company show
- Clarify essentials upfront: definitions, expectations, skill gaps, industry knowhow
- Combine technological and domain knowledge to apply innovative solutions across multiple scenarios

Reskill and upskill capabilities

- Impactful use cases don’t stem from isolation. Different skillsets must collaborate
- There’s no silver bullet: ensure ongoing training around key issues like data awareness
- Leaders: pursue new skills to integrate AI into business models and product deployments
- Embrace AI’s opportunity: enhanced human-machine collaboration, supporting the demand for specialist skills

A mixed-methodology research approach was used to inform the contents of this study. Qualitative interviews with senior executives and thought leaders have supported quantitative analysis of survey data. In total, more than 200 senior company executives participated in the survey, with respondents screened to ensure sufficient seniority and relevance to their organization’s AI and/or sustainability strategies.

**DOWNLOAD
THE FULL
REPORT HERE**





It comes back to the 'why of AI'. In our world, so full of complexity, it can make the complicated simple. Its convergence with other powerful technologies – like digital twins, edge computing and software-defined automation - is helping optimize critical systems across industries. Those that cannot afford to fail. Those crucial to advancing sustainability.

Yet, while we discuss artificial intelligence, the opportunity before us is also deeply human. It requires our willingness to collaborate in open ecosystems: to put innovation into everyone's hands, learn from one another, and work together. Winning the race against climate change is our collective mission, and industrial AI is a key tool to helping us achieve it - but we must unite in purpose and action.

Peter Koerte

Managing Board Member, Chief Technology Officer and Chief Strategy Officer
Siemens AG

