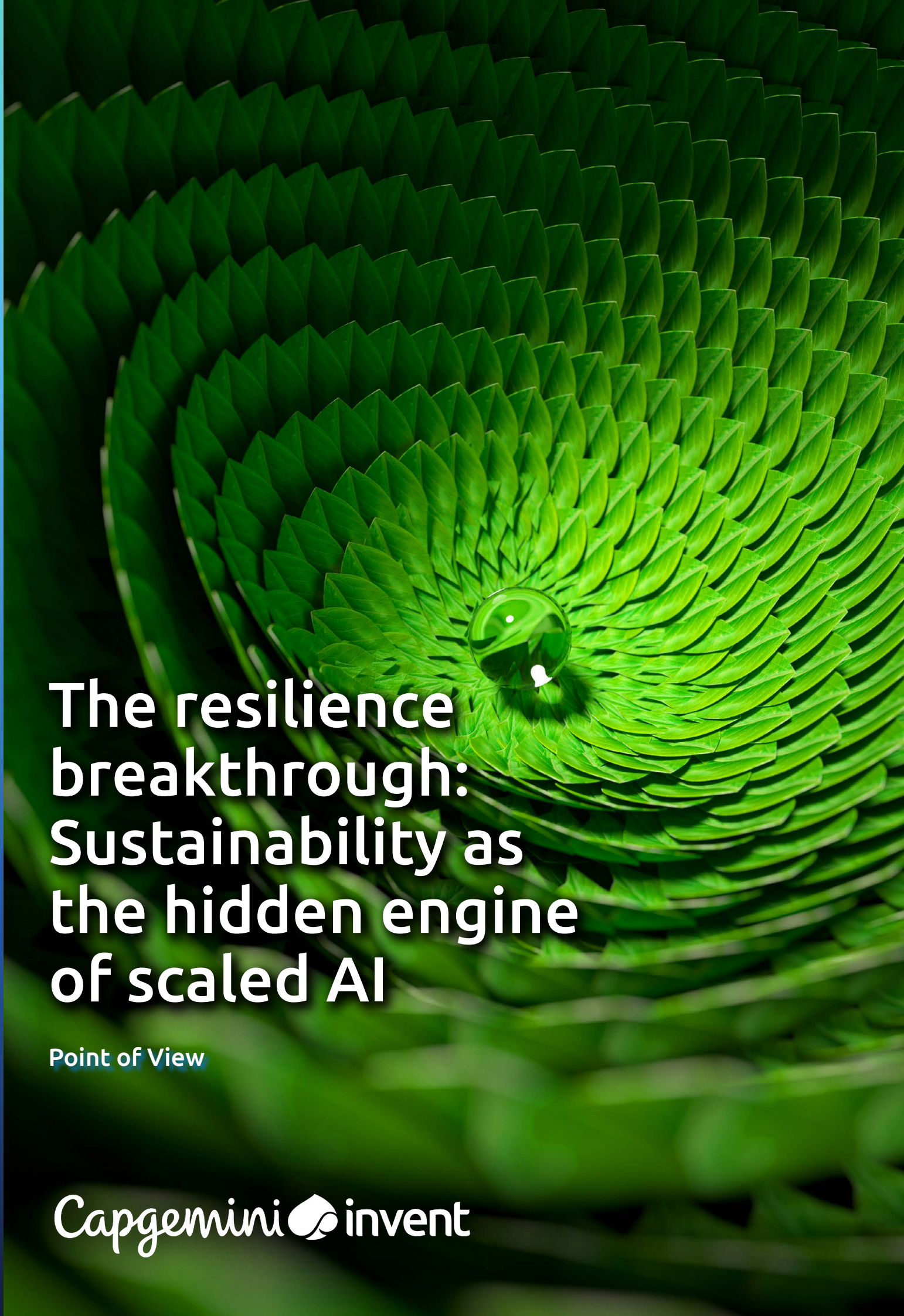


The resilience breakthrough: Sustainability as the hidden engine of scaled AI

Point of View

Capgemini invent

Executive summary:

The hidden engine of scaled AI

In a nutshell: Sustainability has quietly built the data foundations AI needs - and is becoming the hidden engine that finally unlocks AI driven supply chain resilience at scale.

Artificial Intelligence (AI) is reshaping how organizations operate – yet across most corporate functions, the leap from promising pilots to enterprise-wide impact remains elusive. Nowhere is this gap more visible, and more consequential, than in the supply chain. Supply chains capture one of the broadest and most heterogeneous data landscapes in the enterprise – spanning procurement, production, logistics, suppliers across multiple tiers and partners far beyond company borders. This makes supply chains both the most fertile and the most challenging environment for scaled AI.

At the same time, global volatility has fundamentally shifted priorities. Resilience has become the defining requirement for modern supply chains – not replacing efficiency, but enabling it. And it reveals an unexpected truth: The real breakthrough for AI-enabled resilience does not stem from more advanced algorithms or higher compute. It comes from structural conditions that sustainability regulation has forced into existence.

Frameworks such as CSRD[1] , CSDDD[2], EUDR[3] and GSCDDA[4] require companies to harmonize fragmented datasets, establish auditable information flows and connect functions that historically operated in isolation. What began as a compliance obligation has quietly created something far more valuable: the data discipline, transparency and integrated governance that AI at scale fundamentally depends on.

Sustainability offensives have already done the hardest part of the work – aggregating key data, connecting operational and risk information, and building cross-functional structures that break silos. This is precisely why the supply chain is now uniquely positioned: it benefits early and disproportionately from this sustainability driven data backbone, accelerating the shift from isolated analytics to predictive and adaptive intelligence across the entire network.

As a result, many organizations have already built the essential foundations for AI-enabled resilience – often without realizing it. Companies that now activate this backbone will be the first to scale AI across their supply chain ecosystems, and the first to build networks that sense earlier, decide smarter and adapt continuously in an increasingly volatile world.

1. Corporate Sustainability Reporting Directive (CSRD)
2. Corporate Sustainability Due Diligence Directive (CSDDD)
3. EU Deforestation Regulation (EUDR)
4. German Supply Chain Due Diligence Act (GSCDDA)

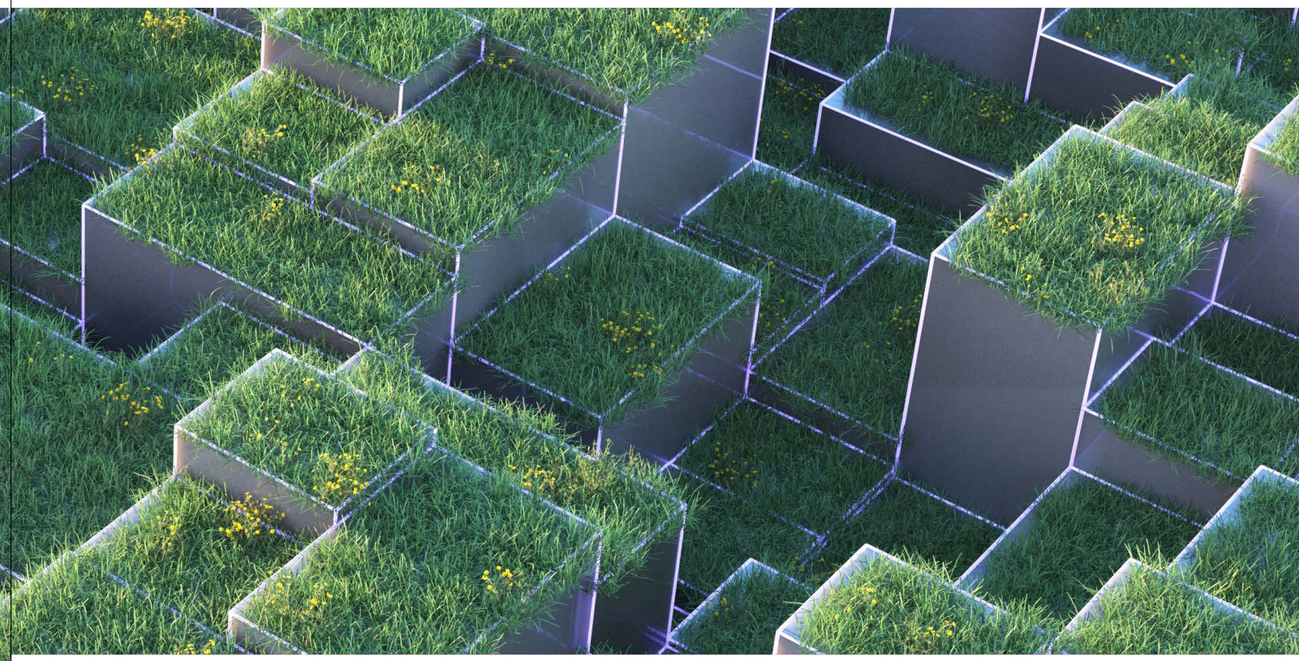
Context:

Why resilience, AI and sustainability are converging now

In a nutshell: Volatility is rising, AI is the only tool capable of mastering complexity, and sustainability has created the data foundations AI depends on - pushing all three forces into inevitable convergence.

Global supply chains are undergoing a fundamental transformation as they navigate overlapping disruptions. The lingering consequences of the pandemic, renewed geopolitical tension, shifting trade corridors, rising tariff regimes, and accelerating climate-related events have made volatility a structural feature of the global economy. Traditional cost optimized models, once reliable in stable conditions, can no longer cope with this reality. Organizations now require supply chains that can sense weak signals, interpret risk in real-time, and respond with precision.

AI is emerging as the infrastructure that enables exactly this. By simulating scenarios, identifying early warnings and orchestrating decisions across complex networks, AI offers the operational backbone for resilience. Yet AI can only be as effective as the data that powers it - and in many organizations this data remains fragmented, inconsistent and siloed, designed for transactional efficiency rather than strategic insight.

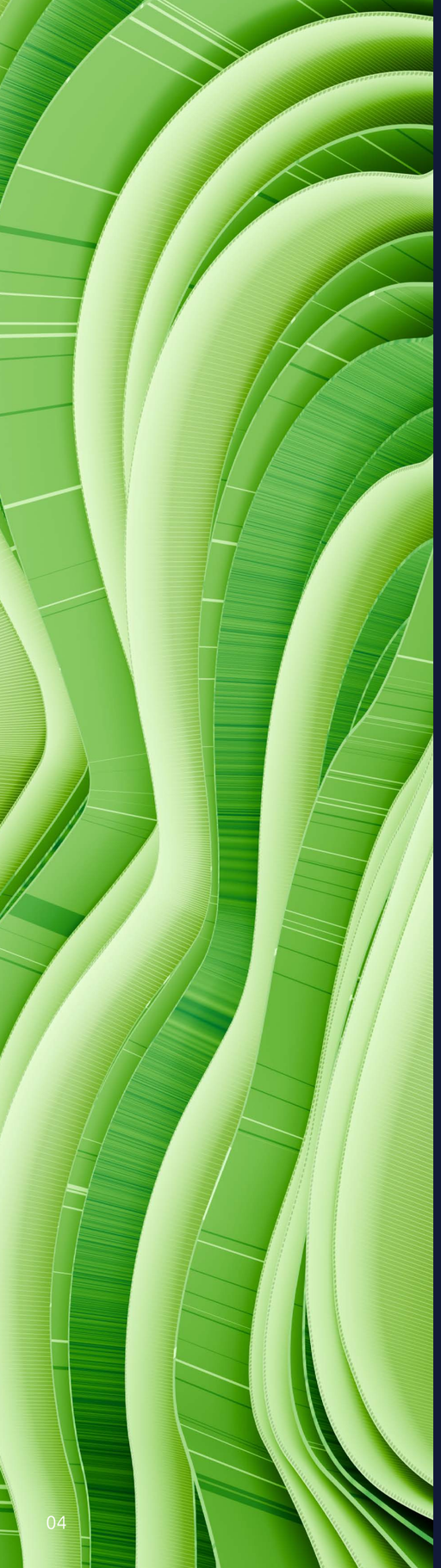


This is where sustainability becomes the decisive accelerator. Regulations such as CSRD and EUDR require companies not only to bring together sustainability, financial, operational and supply chain data, but also to establish the transparency and governance structures that supply chains have historically lacked. This dissolves silos across procurement, risk, sustainability, finance and IT and elevates reporting platforms into unified information architectures – the very architectures AI depends on for enterprise-wide, reliable intelligence.

But sustainability does more than create data readiness. It also sharpens organizational focus. By defining material topics, long-term risk areas and transformation critical value chain hotspots, sustainability frameworks naturally push companies toward the “big levers” rather than small, isolated Proofs of Concept. Instead of scattering AI experiments across minor use cases, sustainability directs attention to the areas where structural impact is possible – and where multi-year transformation is required. In doing so, it shifts organizations away from quarter-to-quarter optimization toward a mid to long-term horizon – exactly the time scale on which scaled AI transformations can realistically succeed.

What begins as compliance becomes a transformation ready data foundation. Organizations that recognize this convergence will move from defensive compliance toward proactive, intelligence driven supply chain design. In this new landscape, resilience is not a cost center, AI is not an experiment, and sustainability is not merely a reporting process. Together, they form the operating system of next generation supply chains.

In the following chapters, we outline the core barriers that have prevented AI from scaling in supply chains, the structural shifts through which AI now redefines resilience, and the strategic decisions leaders must make to activate this convergence. Together, these perspectives provide a clear path toward intelligence driven, future proof supply chains.



The core problem:

AI has not scaled in supply chains

In a nutshell: AI has failed to scale in supply chains not because the technology falls short, but because fragmented data, low interoperability, and siloed operating models confine AI to pilots and efficiency gains - leaving the structural drivers of true supply chain resilience largely untouched.

Despite significant investment and widespread experimentation, AI has yet to deliver transformational impact across supply chains. Most organizations can point to successful pilots, proof of concepts, or niche applications. Very few, however, have managed to scale AI into a core capability that systematically strengthens supply chain resilience.

Fragmented data and low interoperability block AI at scale

The most fundamental barrier to AI at scale is the lack of end-to-end data connectivity. Supply chain information sits across ERPs, APS tools, TMS platforms, supplier portals and external risk data – each with its own structures, formats and workflows. Visibility typically ends at tier 1 suppliers, leaving deeper tiers opaque and creating digitally rich but structurally disconnected supply chains.

AI, however, depends on end-to-end , cross-functional data connectivity to understand constraints, simulate scenarios, and recommend actions across the entire network. When systems are not interoperable, AI models face fundamental limitations: they are trained on partial pictures of the supply chain, unable to link upstream and downstream signals, and struggle to move from insight to execution.

The result is predictable: AI works well in pilots – where data is manually stitched together – but collapses at scale, where real-time system-to-system connectivity is essential. In this environment, AI becomes an “overlay” on a fragmented architecture rather than a capability embedded into how decisions, workflows, and responses actually run.

AI treated as a “tech tool”, not an operating-model enabler

Another structural issue is how AI is framed internally. In many organizations, AI is still treated as a technology initiative, owned by IT or innovation teams, rather than as a lever to redesign the supply chain operating model. Use cases are developed bottom up, disconnected from strategic objectives, governance structures, and performance management.

This leads to a proliferation of isolated solutions that do not scale, compete for data and attention, and fail to influence how decisions are actually made. AI insights remain advisory, not authoritative. Without clear integration into planning cycles, sourcing strategies, and risk governance, AI cannot shape outcomes.

Efficiency bias over structural resilience

Finally, current AI use cases in supply chains are disproportionately focused on efficiency gains: cost reduction, inventory optimization, forecast accuracy, or productivity improvements. While valuable, these applications address symptoms rather than root causes.

Supply chain resilience is the capability of a supply network to absorb shocks, adapt to disruption, and continue to deliver value over time. Resilience requires structural change - supplier diversification, network redesign, strategic buffers, and long-term trade offs between cost, risk, and sustainability. These decisions are inherently complex and cross-functional, yet AI is rarely applied at this level. As a result, organizations optimize fragile systems instead of redesigning them.

AI and sustainability are not yet approached holistically

Taken together, these blockers reveal a common root cause: both AI and sustainability are still treated as isolated initiatives, rather than as enterprise-wide capabilities that shape how supply chains are designed and operated. AI is frequently layered onto existing processes instead of reshaping them, applied locally instead of systemically, and optimized for short term efficiency rather than long-term resilience.

The same issue is visible in sustainability. Most firms still treat it as a separate track – managed through parallel reporting structures and small teams that sit outside core operations. This keeps sustainability disconnected from planning, sourcing, risk, and supply chain design.

The consequence is structural: without sustainability embedded at the center, the data discipline and traceability it creates never feed into the operating model. And without that foundation, AI cannot scale beyond pilots or deliver real resilience impact.

Overcoming this requires a shift in perspective: away from siloed technology and sustainability programs, and toward a unified enterprise strategy where data governance, AI, resilience, and sustainability reinforce one another. Sustainability can act as the catalyst for this shift – not as a reporting obligation, but as a system level enabler. Without such an integrated framework, AI will continue to underdeliver, and supply chain resilience will remain reactive rather than structural.

How AI redefines resilience:

From technology shifts to tangible use cases

In a nutshell: AI is redefining supply chain resilience through three fundamental shifts – enabling companies to move from static forecasting to real-time foresight, from manual monitoring to autonomous execution, and from isolated control to networked collaboration – with sustainability data acting as the catalyst that makes these capabilities scalable and actionable.

Resilience today means more than reacting to disruption. It is about building supply chains that can sense risks early, respond fast, and adapt continuously across the entire network. This requires four core capabilities: visibility, collaboration, responsiveness, and agility. AI is the first technology that can activate all four – not as a single solution, but as a set of evolving capabilities that reshape how supply chains operate. However, these capabilities only become possible when the blockers outlined in the previous chapter are addressed. Once these structural barriers begin to dissolve, the conditions for AI-enabled resilience start to fall into place. Once this foundation is established, AI can shift from isolated pilots to a scalable capability that elevates resilience across the entire supply chain. Below, we explore three major shifts in how AI is transforming resilience and show how they come to life through potential use cases.

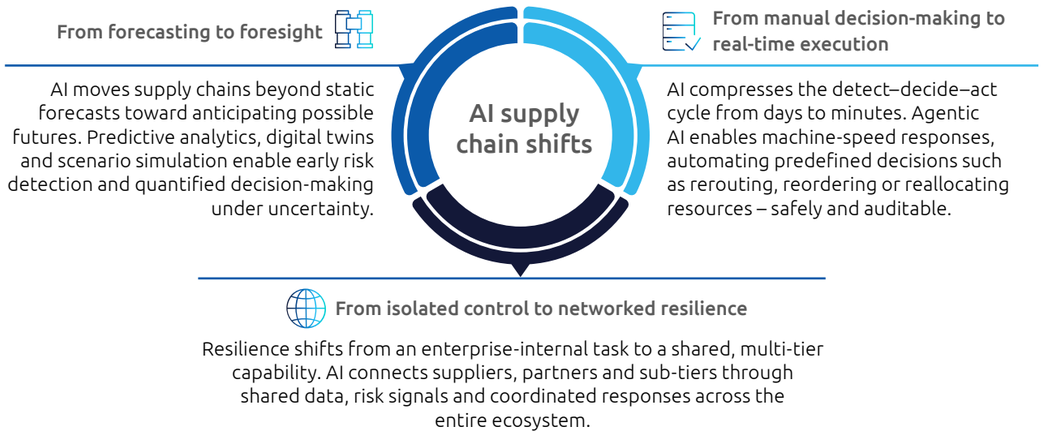


Figure 1: Tangible AI use cases for supply chain resilience

AI shift #1: From forecasting to foresight

Supply chain planning is undergoing a fundamental transformation. Where traditional approaches relied on static forecasts and historical data, AI enables a shift toward foresight, the ability to anticipate disruptions and opportunities before they materialize. AI-powered predictive analytics now integrate a wide range of data sources, from internal operations and market trends to external signals like weather, geopolitical developments, and social sentiment (see figure 1 for use case “Predictive Risk Sensing & Supplier Transparency”). These systems detect early indicators of change and provide a more nuanced understanding of potential risks and shifts in demand.

But prediction alone is no longer sufficient. In modern supply chains, predictive intelligence means much more than generating a more accurate forecast – it means the ability to simulate whole ranges of possible futures. AI-driven digital twins and generative simulation engines allow planners to explore what-if scenarios, compare mitigation options, and understand how disruptions propagate across the network. This is the core capability supply chains now need: making decisions under uncertainty, based on a quantified view of how different choices play out across multiple future scenarios. Instead of asking, “What do we think will happen?”, leaders can finally ask, “What could happen - and are we prepared for all relevant outcomes?”.

Sustainability data plays a critical role in this shift. ESG metrics, climate models, and regulatory developments are being integrated into planning models, enabling organizations to anticipate not just operational risks, but also sustainability-related disruptions. This makes planning more holistic and aligned with long-term resilience goals.

For supply chain leaders, this shift means fewer surprises and more control. Planning becomes a continuous, adaptive process, one that is capable of responding to volatility, aligning production with real-world demand, and reducing the need for reactive firefighting. It also supports more efficient resource use, better service levels, and stronger alignment with sustainability objectives.

AI shift #2: Real-time decision making

While many organizations have invested in dashboards and analytics to monitor their supply chains, the real bottleneck often lies in execution. When disruptions occur, whether it’s a delayed shipment, a sudden demand spike, or a quality issue, the response still depends on manual intervention, approvals, and fragmented communication. This slows down decision-making and increases the risk of escalation.

AI is now enabling a leap to machine-speed response. Through agentic AI, organizations can automate operational decisions and actions in real-time (see figure 1 for use case “Demand & Supply Forecasting”). These agents continuously monitor supply chain conditions, interpret signals, and execute predefined actions such as reordering materials, rerouting shipments, or reallocating inventory. They operate within clearly defined rules and escalation paths, ensuring that automation is both safe and auditable.

This shift is made possible by the convergence of real-time data integration, cloud-native platforms, and advanced AI models. When AI agents have access to a unified view of supply chain data, including supplier performance, logistics status, and external risk indicators, they can orchestrate responses that are both fast and context-aware.

For organizations, this means compressing the detect–decide–act cycle from days or hours to minutes or seconds. It reduces the burden on human teams, improves consistency in execution, and enhances the ability to maintain service levels even under pressure. It also ensures that sustainability and risk criteria are applied consistently, even in high-speed decision environments.

AI shift #3: Reaching networked resilience

Historically, supply chain resilience was managed within the boundaries of the enterprise, focused on internal operations and Tier 1 suppliers. But today’s disruptions often originate deeper in the supply chain, and their impacts ripple across entire ecosystems. As a result, resilience is becoming a shared responsibility, one that requires collaboration, transparency, and data sharing across multiple tiers and partners.

AI is enabling this shift toward networked resilience. Multi-enterprise platforms and AI-powered collaboration tools allow companies to share forecasts, risk signals, and sustainability data across organizational boundaries. AI acts as the connective tissue, aggregating data from diverse sources, identifying patterns, and enabling coordinated responses. For example, if a sub-tier supplier faces a disruption, AI can alert upstream partners and help orchestrate a joint mitigation strategy.

This shift is reinforced by growing regulatory and stakeholder expectations around supply chain transparency. Companies are increasingly expected to monitor and manage ESG risks across their entire value chain, not just for compliance, but as a foundation for trust and long-term value creation.

For organizations, this means rethinking supply chain relationships as part of a broader resilience network. By aligning shared data, standards, and response protocols, organizations can distribute risk more evenly, improve traceability, and unlock new opportunities for innovation, from circular sourcing to collaborative planning. Networked resilience enables the entire supply chain to learn, adapt, and respond as one.

	Predictive Risk Sensing & Supplier Transparency	Dynamic Logistics & Route Optimization	Demand & Supply Forecasting	End-to-End Visibility & Intelligent Control Towers
Description	This cluster includes AI systems that continuously scan structured and unstructured data (e.g., supplier performance, ESG scores, news, weather, social media) to detect early warning signs of supplier risk. AI enhances traditional supplier monitoring by automating signal detection, correlating risk factors, and generating predictive insights across multiple tiers.	AI improves traditional logistics planning by dynamically adjusting routes, delivery schedules, and cargo loads in real-time. It uses live data (traffic, weather, fuel prices, port congestion) and machine learning to continuously optimize transport decisions. This cluster includes AI-powered fleet management, last-mile optimization, and multimodal logistics planning.	AI transforms traditional forecasting by ingesting vast internal and external datasets and applying machine learning to detect patterns and predict demand shifts. It integrates perspectives from across the business to create a more holistic and aligned view of future demand. This cluster includes AI-enhanced demand sensing, inventory planning, and adaptive supply planning	AI-powered control towers unify data from across the supply chain and apply analytics to provide real-time visibility, alerts, and prescriptive recommendations. This cluster includes digital twins, anomaly detection, and AI-driven dashboards that support cross-functional coordination.
Relevance for supply chain	• Improves early warning capabilities • Enhances visibility into sub-tier suppliers • Enables proactive mitigation strategies	• Increases agility in transport planning • Enables rapid rerouting during disruptions • Maintains delivery continuity	• Stabilizes supply-demand balance • Reduces planning uncertainty • Improves responsiveness to market shifts	• Enables faster disruption response • Improves coordination across functions • Supports scenario-based planning
Impact / Benefits	• Strengthens supplier relationships • Reduces compliance exposure • Supports ESG transparency	• Efficient resource use: improved fleet and cargo utilization • Cuts fuel and transport costs • Reduces CO_2 emissions • Improves delivery speed and reliability	• Minimizes waste and overproduction • Optimizes inventory levels • Enhances service levels	• Reduces inefficiencies and manual effort in operations • Improves ESG tracking and reporting • Shared responsibility for sustainability goals by generating insights for all stakeholders

Description Relevance for supply chain Impact / Benefits

Figure 2: Tangible AI use cases for supply chain resilience

Your transformation:

The decisions that define your future resilience

In a nutshell: Leaders must focus on three transformative questions that determine whether AI scales, sustainability data becomes a strategic backbone, and the supply chain shifts from reactive to resilient.

The shift toward resilient, AI-enabled supply chains begins with a series of fundamental questions every leadership team must face. These questions reveal whether AI will become a scalable capability or remain confined to isolated pilots; whether sustainability data already functions as a strategic backbone or still sits fragmented across reporting streams; and whether the supply chain will face the next disruption from a position of strength or continue reacting one shock at a time.

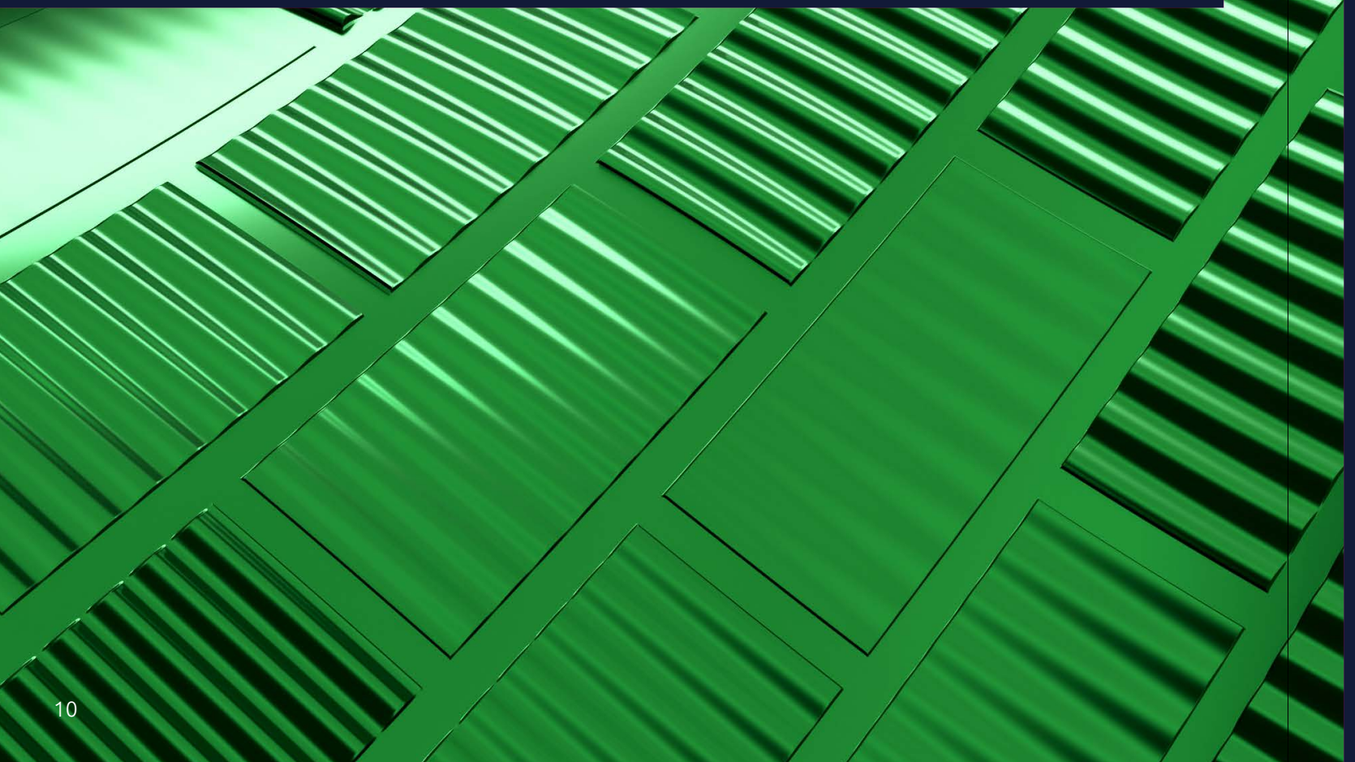
The questions you should be asking are deceptively simple yet deeply transformative:

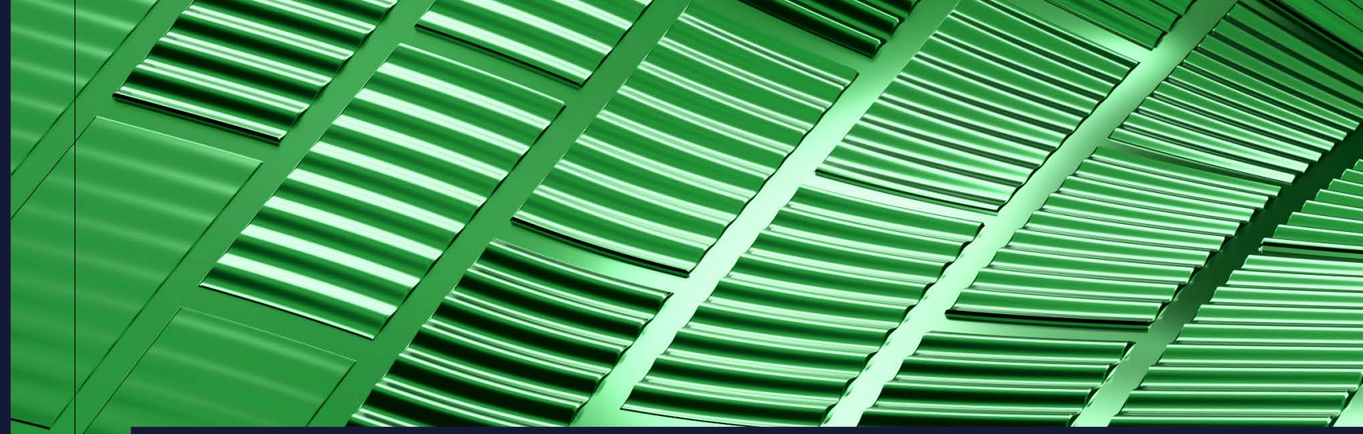
1. Do you have a clear and honest view of your current resilience and AI maturity — and where the most critical structural gaps sit?

2. Is your sustainability, operational and supplier data connected, governed and trustworthy enough for AI to rely on?

3. Where in your network can AI deliver measurable value within the next 90 days — and what stands in the way of scaling those opportunities today?

Leaders who engage with these questions now create the clarity required for decisive action. The objective is not another strategy document, but the capability to make the decisions that determine whether your supply chain becomes adaptive, intelligent and future-proof in a world where volatility is no longer the exception but the norm.





Our differentiation:

Why we unlock what others can’t

In a nutshell: We turn fragmented AI efforts into real enterprise impact by combining deep sustainability, data and industry expertise - building the foundations, operating models and cross-functional alignment needed for AI to scale and strengthen supply chain resilience.

Capgemini Invent helps organizations turn these guiding questions into clear, actionable paths toward resilience and scalable AI. We bring together deep expertise in sustainability, data and industrial supply chains and translate it into transformations that work in practice, not only on paper. Because we have spent years shaping ESG data architectures across industries, we understand how to turn fragmented information into the kind of structured, high quality and traceable foundation that AI needs to deliver reliable, enterprise-wide impact.

Our work goes far beyond technology enablement. We take a holistic approach to AI, leveraging the breadth of expertise across Invent, Sustainable Futures and Intelligent Industry. This allows us to redesign operating models end-to-end, ensuring that AI becomes an integral part of daily decision making, supported by clear governance, cross-functional collaboration and transparent data flows. Because today’s challenge is not the lack of promising AI pilots, but the fragmented way in which AI is often approached. By bringing together experts in strategy, data, sustainability, operations and technology, we ensure that new capabilities do not remain isolated experiments but become embedded in how the supply chain operates. In parallel, our access to proprietary insights enables us to identify emerging patterns early and to guide clients toward the levers that will shape the next generation of resilience.

This integrated approach is precisely how we help organizations answer the questions that define their future resilience. We reveal where their true maturity stands and where hidden barriers slow down scale. We identify the AI opportunities that create fast, credible value in their specific context and design the blueprint that connects data, processes, governance and people in a coherent system. We accompany clients from alignment to implementation, ensuring that new routines, decisions and behaviors take hold and that resilience becomes structural rather than situational.

The result is a supply chain that anticipates rather than reacts, that adapts rather than absorbs and that grows stronger with every challenge. AI finally scales because it is rooted in sustainability grade data, and resilience becomes a competitive engine rather than a defensive response. Capgemini Invent makes this journey tangible and achievable – with the clarity, depth and foresight required to lead in a world defined by constant change.

Closing argument:

The moment before the acceleration

The supply chains of the coming decade will not evolve steadily - they will shift in punctuated leaps. Industries are entering a phase where resilience, intelligence and sustainability reinforce each other in ways that fundamentally reshape how value is created. The organizations that recognize this inflection point will not simply optimize the systems they already have, they will build the systems they will need. This is the decisive difference between those that continue managing volatility and those that turn complexity into advantage.

The opportunity now is to step ahead of the curve while the window is still open. Market conditions, regulatory momentum and technological maturity have aligned to make transformation not only possible but disproportionately rewarding for early movers. Companies that take this moment seriously can design supply chains that learn, adapt and strengthen with every disruption, creating a performance gap that competitors will struggle to close. Those that wait, risk locking themselves into structures that become increasingly brittle as the rate of change accelerates.

What comes next will belong to the organizations that treat resilience not as a response to instability but as a platform for growth. The path is clear, the capabilities exist and the timing could not be more decisive. Transformation will happen – the only real choice is whether to lead it or be reshaped by it.

Feel free to contact us

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About Capgemini Invent

As the digital innovation, design and transformation brand of the Capgemini Group, at Capgemini Invent we enable CxOs to envision and shape what's next for businesses. Located in over 40 studios and more than 70 offices around the world, we are a 13,500 strong team of strategists, data scientists, product and experience designers, brand experts and technologists who develop new digital services, products, experiences and business models for sustainable growth.

Capgemini Invent is an integral part of Capgemini, an AI-powered global business and technology transformation partner, delivering tangible business value. We imagine the future of organizations and make it real with AI, technology and people. With our strong heritage of nearly 60 years, we are a responsible and diverse group of over 420,000 team members in more than 50 countries. We deliver end-to-end services and solutions with our deep industry expertise and strong partner ecosystem, leveraging our capabilities across strategy, technology, design, engineering and business operations. The Group reported 2025 global revenues of €22.5 billion.

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