Deloitte.

Supply chain innovation and sustainable value creation

A roadmap for responding to a new business imperative

Introduction

Supply chains were historically built to achieve cost-effectiveness and time efficiency. In the oil and gas industry, as in many others, the goal was to find the shortest, least expensive path from raw materials to product and then to market while maintaining safety and reliability standards. But today, stakeholder expectations and legislation are changing the paradigm.

As consumers increasingly demand climate-friendly solutions, companies are taking on greater social responsibilities, frequently driven by regulation that continuously promotes sustainable transformations. These stakeholder and legislative pressures are forcing supply chain managers to adapt to a new normal. Businesses and organizations are being challenged to consider new operating models for supply chains as their responsibilities—and opportunities for sustainable value creation—now extend further upstream beyond their own operations.

As the energy transition accelerates, oil and gas companies are being faced with how to strike a balance between increasing investment in sustainable solutions and continued capital discipline. Is it possible to balance short-term gains and long-term prosperity? Can a company invest some of today's profits to build greater resilience for future downturns and to position themselves for long-term growth in a cleaner, more circular economy? Deloitte contends that it is not only possible but also plausible since resilience and sustainability often go hand-in-hand.

While there are likely many factors to take into account—some of which are sector-driven—there are three key enablers that companies should consider when embarking on a journey towards a more sustainable—and ultimately more resilient—supply chain:

- **Operational excellence** has been the backbone of supply chain management and will remain so. Cost-efficient supply chain solutions do not preclude sustainable supply chain solutions. An efficient physical footprint design, better asset utilization, and strict quality management are considered key drivers towards a more sustainable supply chain.
- **Industry collaboration** is key to sustainable supply chain design. To drive this, businesses should expand their perceptions of the ecosystems in which they operate and embrace wider collaboration on data, information, and asset sharing. Collaboration does not need to compromise competitive advantages, but instead can create mutual benefits through better insights, less waste, and more accuracy.
- **Traceability and insight** can present significant barriers to effective sustainable supply chains but also potential opportunities. As a company's responsibilities extend beyond their direct suppliers, tighter control is required for managing the wider ecosystem. To ensure compliance with social responsibilities, emissions control, and climate footprint—as well as to enable economically and environmentally sustainable improvements—businesses need technology that can improve traceability and insights.

According to a recent Deloitte survey of 2,082 C-level executives around the world, companies are feeling a moderate-to-large degree of pressure to act on climate change from many different stakeholder groups, including regulators/government, board members/management, consumers/clients, civil society, shareholders/investors, competitors/peers, employees, and banks and lenders. Given the ubiquity of the call to action, achieving a more sustainable supply chain is not merely a "should do"; it has become a business imperative.[1]

Supply chain risks: Recognizing the business imperative

The impacts of climate change are being felt physically and financially. In response, governments are setting new policies; investors are seeking clarity on risk and opportunity; technology costs are declining; and community expectations are evolving[2,3]. Such shifting behaviors among stakeholders are resulting in product and service alterations, lost asset values, and market dislocation[4]. Against this backdrop, the risk profile for oil and gas businesses is changing, even as new opportunities emerge in developing industries. Today's oil and gas companies are being challenged to manage the following types of risks, both with respect to their overall businesses as well as their supply chains.

Policy risk

Government rhetoric in response to climate-related economic impacts points to the increasing probability of new policies that will alter the relative competitiveness of carbon-intensive products. If enacted, such policies will likely force companies to internalize the externalities, effectively pricing in the damages from CO2 emissions into the costs of their products through carbon taxes, subsidies, etc. Clear policy signals will be needed to help shift the expectations of the private sector so that capital can be mobilized and investments redistributed in an orderly manner. Timing is essential, with companies being challenged to sense where policymakers and other stakeholders are heading. Acting too early could increase both costs and risks to the business. Late action, on the other hand, could necessitate a more dramatic shift to reach the stated goals, consequently coming at a higher price. This in turn could lead to disruption and the potential stranding of assets[5]. Cap-and-trade policies or carbon taxes will likely need to come sooner, rather than later, in jurisdictions that have been slow to act, in order to facilitate orderly, long-term investments in abatement and diversification.

Disclosure and compliance risk

Companies are being tasked with complying with a complex array of mandatory as well as voluntary disclosure requirements, set by a number of bodies such as the Task Force on Climate-related Financial Disclosure (TCFD), Taskforce on Nature-related Financial Disclosures (TNFD), and the International Sustainability Standards Board (ISSB). The ISSB launched its inaugural standards, IFRS S1 and IFRS S2, in June 2023.[6] (See Deloitte firm guides to Making Sense of ISSB; Getting Prepared for TNFD; and What is the TCFD and Why Does it Matter?)

From a supply chain perspective, the legislative landscape is quickly changing. Already, mandatory value-chain due diligence legislation is emerging and further regulatory requirements are anticipated around transparency, traceability, and due diligence.

As part of the European Green Deal, the European Commission has outlined European Sustainability Reporting Standards (ESRS), which are intended to help embed sustainability factors at various levels of the economy including supply chains.[7] Companies in scope of the EU Corporate Sustainability Reporting Directive (CSRD), which entered into force in January 2023, are required to prepare annual sustainability reporting according to ESRS.

Technology risk

The cost-competitiveness of some clean technologies today is vastly different than a few years ago. Technological improvements reduce the cost of competing energy production methods and drive increased adoption. For instance, prices of large-scale solar photovoltaics decreased by 89% between 2009 and 2019, according to the latest edition of the United Nations Human Development

Report.[8] The report also notes that lithium-ion batteries are 97% cheaper than they were in 1991.[9] It is increasingly more economic to increase renewable power generation as these costs decline, hastening the speed of transition.

The economic benefits of decarbonizing electricity supply are becoming clearer in these mature technologies, as well as in others such as wind power and microgrids. Although there are capital costs to setting up the infrastructure to integrate distributed generation, the marginal production costs associated with mature renewable energy technologies are negligible. This price dynamic has the potential to radically alter the cost basis and business models of some electricity-intensive industries. For instance, in traditional mining operations, energy is generally the first or second most significant spend, accounting for 15% to 40% of operating expenses.[10] Cheap electrons are starting to replace both stationary and liquid fuel solutions. In a world where energy has no marginal cost, the industry stands to unlock a huge wave of opportunity. This can be parlayed into the oil and gas sector where companies can pursue a similar path of electrifying production and refining with low-cost renewable energy. However, declining cost curves for emerging technologies necessary for decarbonizing some hard-to-abate sectors, such as clean hydrogen and carbon capture, utilization, and storage (CCUS), are a long way off. These technologies will require significant investments to help build out the infrastructure and establish the markets. (See Innovation in action: Low-carbon hubs, pg 21.)

Reputation risk

Poor human rights due diligence, along with failure to manage environmental risk in the supply chain, can lead to reputational damage with customers, employees, and other stakeholders. Furthermore, as the environmental, social, and governance (ESG) landscape transforms to meet current and future regulatory requirements, organizations have an elevated need to enhance visibility into their extended value chains. This can also boost resilience against potential risks such as outsized emission footprints, poor labor practices, failure to include Indigenous stakeholders, and the use of conflict minerals.

Financial risk

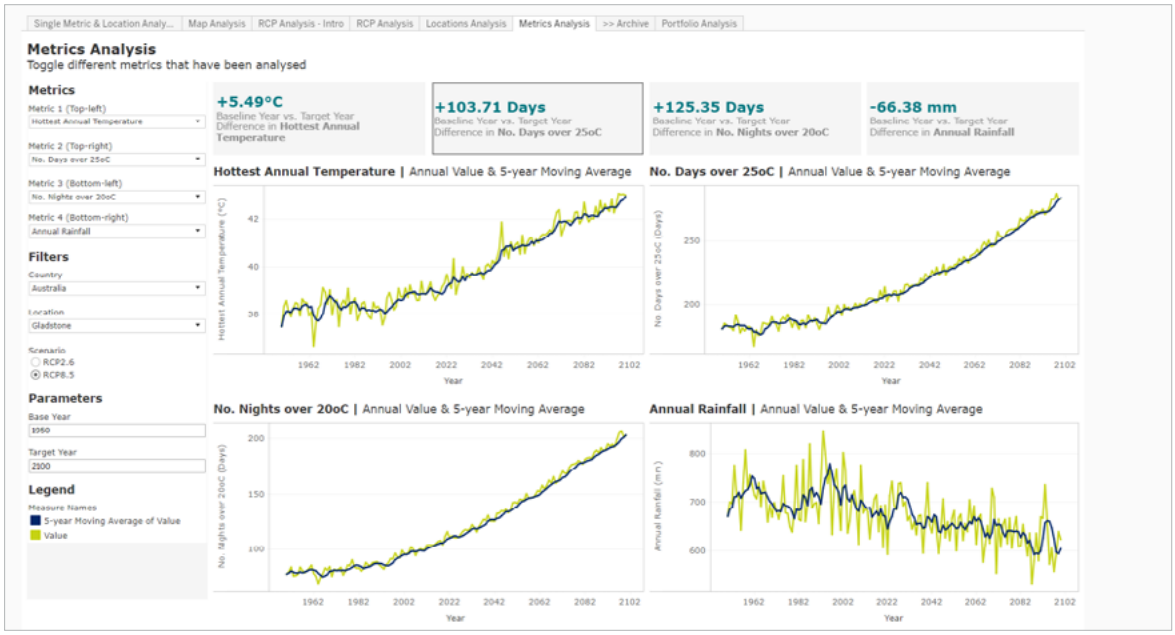
Organizations failing to provide accurate ESG disclosure across risk dimensions and commitments may be subject to costly legal action. Plus, failing to progress in their sustainability journeys could lead to low ESG ratings, which can translate into higher insurance risk premiums and an increased cost of capital. Furthermore, following the COVID-19 pandemic and changes in the geopolitical landscape, investors are increasingly interested in ensuring their investments are secure against social and environmental shocks.

Physical risk

Many companies are presently focused on transition risks in terms of how climate-driven changes to markets, regulations, and finance can impact their operations. Physical risk, however, is growing as the frequency of extreme weather events increases. Physical risks can be event-driven (acute) or longer-term (chronic) and come in a variety of forms for oil and gas companies. For instance, water shortages/disputes may cause production issues; increased storms could disrupt shipping, thus delaying both receipt of parts and delivery of products such as diesel fuel and liquefied natural gas; or increased fires, floods, and extreme heat could shutdown facilities. Regardless, companies should consider both adaptation and mitigation strategies.

Adaptation is acting to minimize the impact of the changing climate on a business, including operational or supply chain disruptions caused by extreme weather events. Climate resilience means using forward-looking tools, such as scenario analysis, to adapt operations and business models before a crisis occurs. The likelihood of heatwaves, droughts, hurricanes and floods occurring under different emissions scenarios can be examined using global climate models. Understanding what the future might look like is critical to effectively design ongoing and future assets and operations. This can be accomplished by using a variety of scenario modeling tools on the market today, many of which are powered by artificial intelligence (AI) and machine learning (ML) (See Figure 1.)

Figure 1 – Deloitte physical risk scenario analysis



Source: GreenLight Solution by Deloitte

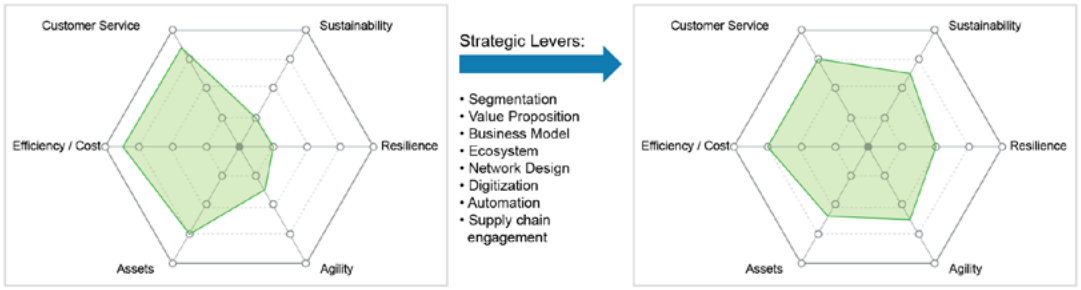
Recognizing the business imperative, many companies are already working to decarbonize their products, supply chains, and strategies. As of July 2023, the Science Based Targets initiative (SBTi) reports that 3,205 companies around the world have adopted science-based targets; and 2,257 have made net-zero commitments under the SBTi's Corporate Net-Zero Standard.[11] Among other guidelines, the Corporate Net-Zero Standard requires companies to set long-term science-based targets to cut all possible emissions before 2050, typically reducing value chain emissions by more than 90% of their current levels, and then to use permanent carbon removal and storage to counterbalance a maximum of 10% of residual emissions that cannot be eliminated.[12]

These actions are not altruistic. Businesses are largely seeking to remain strong, yet agile, as the world changes. Sustainable and resilient supply chains are key to long-term survival, being critical for managing the a fore mentioned risks, now and in the future.

Supply chain evolution: Finding a new balance

Many supply chain leaders have historically focused on gaining a competitive advantage by achieving top-quartile performance in cost, service, and asset management, and most recently, agility, which became more prominent during the COVID-19 pandemic. Today, sustainability and resilience are also widely perceived to be essential performance measures. As illustrated in Figure 2, strategic trade-offs will need to be made to find a new balance.

Figure 2 – Achieving a new balance among performance measures



Source: © Deloitte

The geopolitical, regulatory, and social pressures of recent years have undoubtedly constituted paradigm-shifting challenges for supply chain professionals. However, while it is widely accepted that supply chain sustainability and resilience have become "must-haves," many organizations are in the early stages of combining the initiatives. The pace of change is simply too slow to facilitate the degree of impact that many companies are committing to, and that some stakeholders are demanding.

In practice, there is an opportunity to embed sustainability into the supply chain while also considering the wider impact it might have on resilience and vice versa. Taking advantage of the synergies between these two goals can offer immense potential for long-term optimization. Ignoring this opportunity can become costly, jeopardizing long-term prospects for the company. This may be particularly true in the oil and gas sector.

In designing a roadmap, three principles form the basis for constructing a future-fit supply chain. These principles, if well-adopted, can help enable a simultaneous and seamless integration of sustainability and resilience into supply chain operations, while maintaining the classic performance attributes of cost-efficiency, customer service, asset management, and agility.

1. **Look beyond the obvious: Use strategic, long-term, and multi-dimensional thinking that goes beyond immediate trends to avoid implementing reactive and costly tactics.**

The pace of change in today's world demands that organizations respond to a number of developments at once. While it is sensible to react to events and adjust to trends, organizations tend to swing dramatically between efforts to optimize supply chain sustainability and supply chain resilience. To use a simple example, stakeholder demands to reduce Scope 3 emissions—or those

associated not with direct operations of the company, but with the other entities it interacts with up and down the value chain—can quickly be superseded by having to resort to air freight to get parts, equipment, or products where they need to be on a tight timeline.

As a result, having to deal with competing pressures, organizations often find themselves stuck in an endless game of "whack-a-mole," scrambling to strike down whatever demand pops up first and forgetting about it as soon as a new one emerges. At times, organizations may backtrack on their sustainability commitments and brush aside long-term strategy to help address the latest challenge. For instance, in the current climate of economic uncertainty, some companies may try to control costs by purchasing products from low-cost providers who have lax pollution controls. Such a myopic view of resiliency, however, can be reactive and counterproductive. While addressing the immediate issue at stake, short-term operational tactics can take organizations two steps back in their pursuit of longer-term strategic objectives.

This echoes the findings in Deloitte's Global Resilience Report that suggests true organizational resilience must be built across capitals other than operational, including financial, reputational, social, and natural.[13] Organizations may think they are being resilient by letting sustainability take the backseat in a challenging economic climate, but to consumers, such inconsistency can signal a shallow commitment to sustainability and "greenwashing," which consequently can lead to brand damage and even climate litigation. Using long-term, multi-dimensional, and strategic thinking can protect against this type of reaction that may result in net detrimental impacts.

To be truly ahead of the curve, organizations should also look beyond the immediate trends to their longer-term implications. For instance, while the current shift to "near-shoring" facilities is a proactive response to various disruptions, it can also influence business conduct and legislation, carrying potential long-term implications for open trade and protectionist attitudes. While it is likely impossible to foresee every outcome, organizations should make long-term thinking the heart of their supply chain strategy.

2. **Think partnership: Adopt an integrated approach to supply chain sustainability and resilience, with a focus on leveraging synergies and mitigating trade-offs.**

Supply chain optimization is increasingly becoming contingent on understanding the relationship between resilience and sustainability. However, some consider resilience to be a by-product of sustainability, while others are convinced the inverse is true. A study by Maastricht University that examined how supply chain managers perceive the relationship between sustainability and resilience practices showed that some practitioners see the relationship as conflicting, others synergistic, and some as completely separate issues.[14] Regardless of one's views, simultaneously attaining the goals of sustainability and resilience can be complicated, necessitating trade-offs. For example, the choice to keep a supply chain lean, with minimal waste and emissions, may come at the price of reduced resilience, making the organization more susceptible to sudden shocks from extreme weather events, which are increasing in frequency.

While sometimes perceived as being in conflict, sustainability and resilience can exist as equally important attributes in a partnership. As such, the prioritization and implementation of sustainability improvements should be guided by resilience considerations, and organizations should feed sustainability priorities into resilience strategy selection. As an example, a chemicals company that is committed to reducing emissions and moving toward a circular economy could identify environmentally friendly ways to turn waste CO2 into useful products, such as carbon nanotubes that can be mixed into cement and metals to strengthen them. Such an integrated approach could help the company to bolster both supply chain sustainability and resilience.

Considering the ongoing risk of disruption to oil and gas supply chains from geopolitical conditions and extreme weather events, sustainable business practices, such as investing in risk-visualization and monitoring technologies, can give supply chain leaders the data-driven insights needed to plan ahead, thus improving resilience. For instance, by using predictive analytics and other advanced AI-powered technologies to inform decisions, supply chain leaders could allocate resources to shore up facilities in advance of flooding, fires, or storms, or they could make logistical adjustments to re-route the transport of raw materials and/or refined products around high-risk areas. Making decisions based on data-driven insights can not only help companies reduce the impacts of supply chain disruptions but also help prevent leaks, spills, and other environmental and human harms, thus enhancing both sustainability and resilience.

A key step toward making sustainability and resilience work together is to dismantle organizational silos between the various teams involved in supply chain activities. For example, the Deloitte Global Third-party Risk Management Survey 2022 identified functional separation as an obstacle to efficient third-party management.[15] With numerous functions underpinning supply chain operations, this finding indicates the need for a holistic reassessment of how various departments interact with each other. Through integrating processes, pooling data into master systems, and encouraging regular communication between the teams and governance channels, organizations can promote strategic alignment and avoid disjointed efforts.

Nevertheless, even internally optimized organizations may face instances that necessitate trade-offs. In the face of conflicting priorities, it is crucial to work towards reaching a satisfactory compromise between supply chain resilience and sustainability. The acceptance of trade-offs, in such cases, should be intentional and underpinned by thorough impact analyses and compensating mitigation actions to offset any negative effects on either attribute.

More importantly though, the need for trade-offs, both planned but especially sudden, should facilitate a deeper look into the root cause of the misalignment to identify any possible transformative opportunities for improvement. For instance, if a gas production plant is forced to resort to air freight to deliver essential components, despite making the commitment to minimize its carbon footprint, it needs to assess whether there are more balanced supply or stock options that might avoid this recurrence.

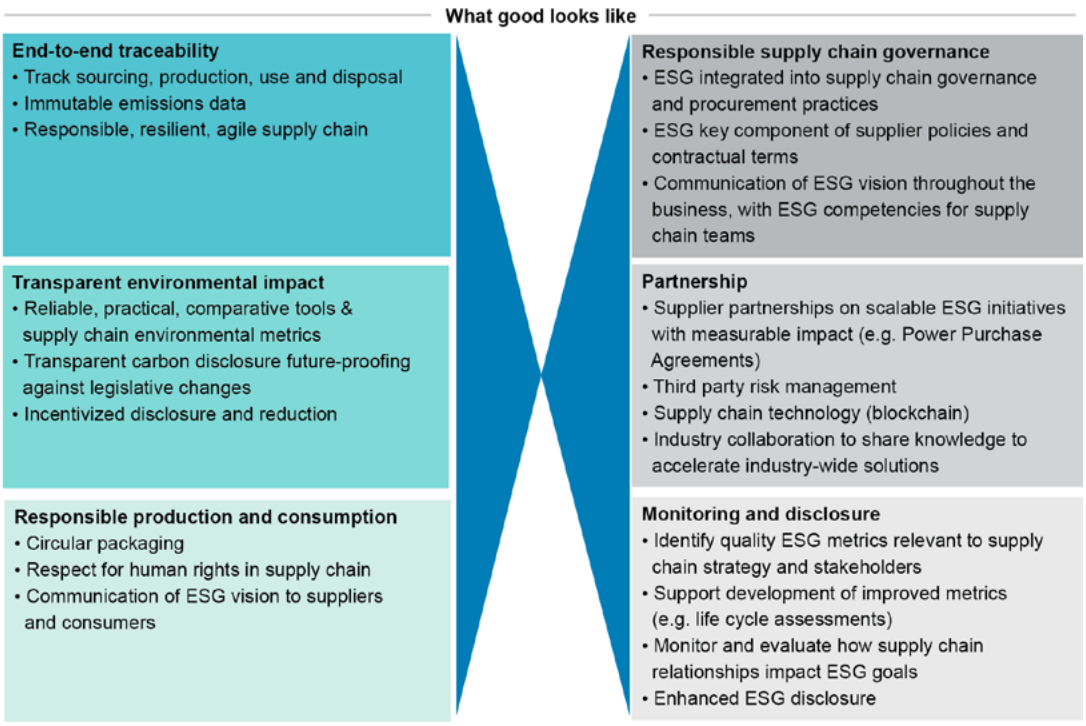
Some of the most mature organizations are those that perceive the need for trade-offs not as a manifestation of a fundamental conflict between resilience and sustainability, but as an opportunity for radical optimization of their integration.

3. **Emphasize technology: Invest in and improve existing digital technology and data capabilities, particularly around transparency, traceability, and trackability.**

While there is no silver bullet that can deliver sustainability and resilience to supply chain operations, optimized visibility underpinned by reliable and comprehensive data may be as close as it gets to one. In the absence of a mapped-out network—or, in other words, of transparency—organizations do not have enough information to make sense of the existing relationships and the corresponding risks, concentrations, or improvement opportunities related to sustainability or resilience. An analysis of the interdependencies can be a starting point for further activities. Yet, although foundational for visualization, a static mapping of the network may not be sufficient to ensure supply chain sustainability or resilience. Complexity demands real-time and accurate data and insights on product location, touchpoints, and transformations provided by traceability and trackability technologies that keep tabs on the provenance and geographic production path of a product.

Getting "the Three Ts" (i.e., transparency, traceability, and trackability) right should be a priority for organizations—not just because comprehensive, reliable, and real-time visibility is essential for informed decision-making and targeted response, but also because visibility constitutes a key complementary value that underpins the relationship between supply chain sustainability and resilience. A transparent network, from the wellhead through transport to refining and distribution, can enable organizations to simultaneously identify suppliers that present a social risk due to the historic human rights or safety abuses in their jurisdictions, as well as geographic concentrations that constitute supply chain vulnerabilities. Similarly, a trackability solution can warn supply chain managers of a likely disruption to the standard transport route and account for possible damage to the shipment or breach of contract with the off-taker. In most cases, the two lenses can inform each other, making the insights more impactful.

Figure 3 – Attributes of a sustainable and resilient supply chain

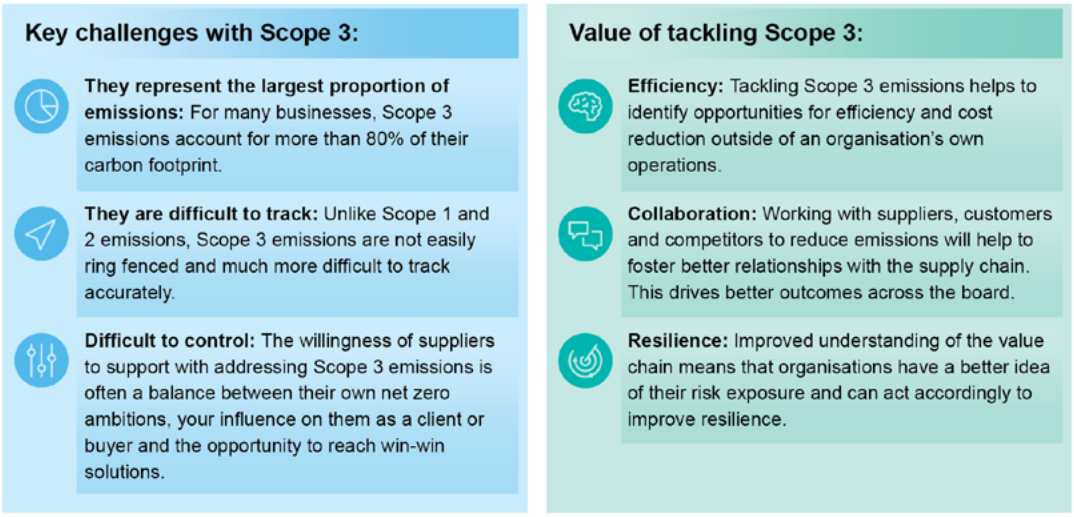


Source: © Deloitte

Supply chain innovation: Resolving the Scope 3 conundrum

Tackling Scope 3 emissions—or those not directly from the company's operations, but rather with the other entities it interacts with up and down the value chain—is a critical component of an organization's efforts to enhance supply chain sustainability and resilience, and reduce environmental impact, manage risks, meet stakeholder expectations, and gain a competitive advantage.

Figure 4 – Scope 3 challenges and value



Source: © Deloitte

Scope 3 emissions are pervasive, often accounting for 80%+ of an organization's emissions inventory.[16] Even more, reducing them can be challenging as it requires buy-in from the entire supply chain. A comprehensive approach to resolving the Scope 3 emissions challenge involves identifying sources of emissions, setting meaningful reduction targets, engaging and collaborating with suppliers on their path to decarbonization, and tracking progress. This involves implementing sustainable procurement practices, such as selecting suppliers based on their environmental performance, promoting energy-efficient practices, encouraging the use of renewable energy sources, and working with suppliers to improve and innovate their current supply chain practices, such as optimizing transportation routes, reducing packaging waste, and implementing circular economy principles.

Developing effective sourcing strategies and understanding the value-creation levers across supply chain operations are critical for reducing emissions. The Deloitte Sustainable Supply Chain Framework is designed to support supply chain leaders and procurement teams with the practical insight needed to enhance operational excellence, industry collaboration, and trackability, traceability and transparency—all of which are necessary to resolve the Scope 3 emissions conundrum.

Figure 5 – Deloitte's Sustainable Supply Chain Framework

Source: © Deloitte

Further, Deloitte experience suggests three critical success factors for designing a roadmap to reduce Scope 3 emissions:

1. Tackle the whole supplier framework

    a. Gather the information needed to understand the opportunities and challenges presented by sustainability and climate-driven shifts.

    b. Maximize circularity in supply chains to minimize resource input, and material and emissions leakages out of the system.

    c. Consider operational impacts, ranging from contractual terms to data capture, to applicable technical standards.

2. Focus on the workforce

    a. Influence both 'what' procurement professionals do in their roles, as well as 'how' they do it by influencing decarbonization across the supplier network.

    b. Uplift climate literacy of the workforce to embed climate change as the 'new normal' for operations. (See Figure 6 for an example of a procurement training program designed to elevate capability.)

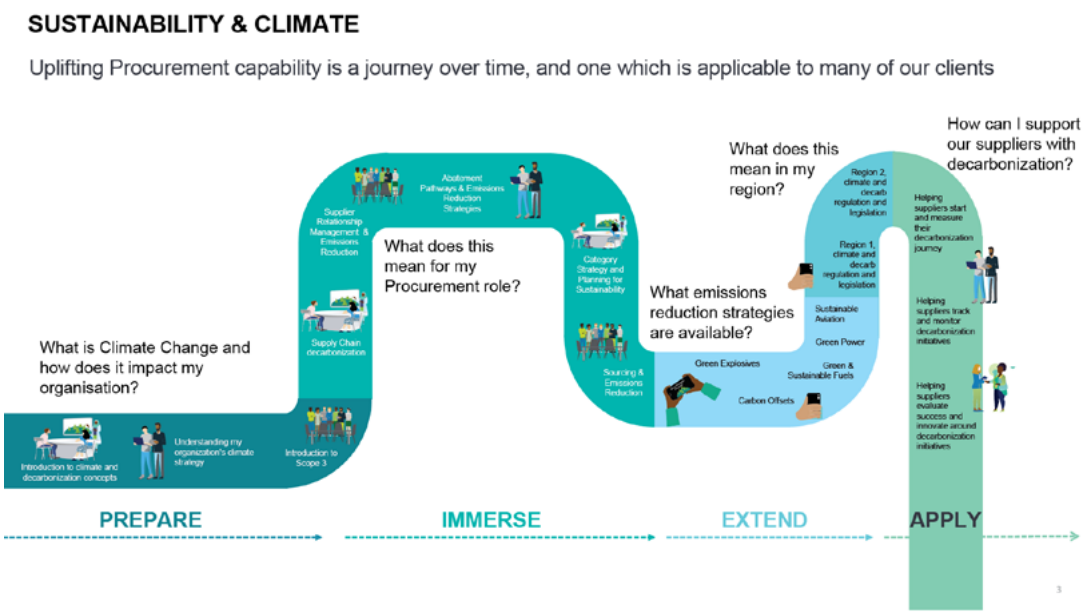
    c. Equip the workforce with the information and tools needed to support suppliers in reducing emissions.

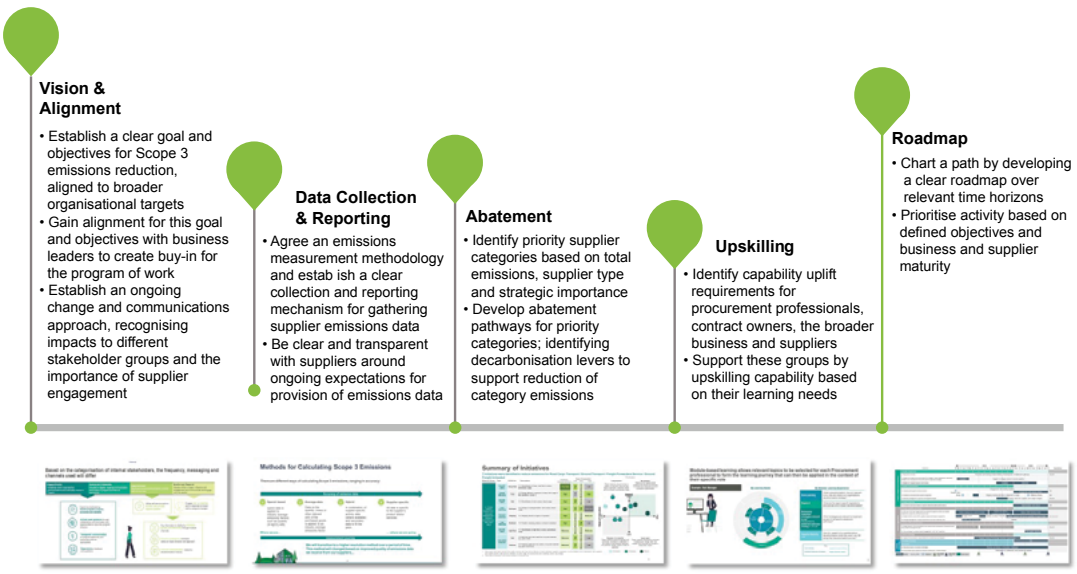
3. Data is key

    a. Use data and analytics to track and report on emissions reductions, providing transparency and accountability to stakeholders.

    b. Leverage data-driven insights by integrating digital solutions as part of the procurement process and supplier emissions monitoring and reporting.

Figure 6 – Roadmap to Scope 3 reduction





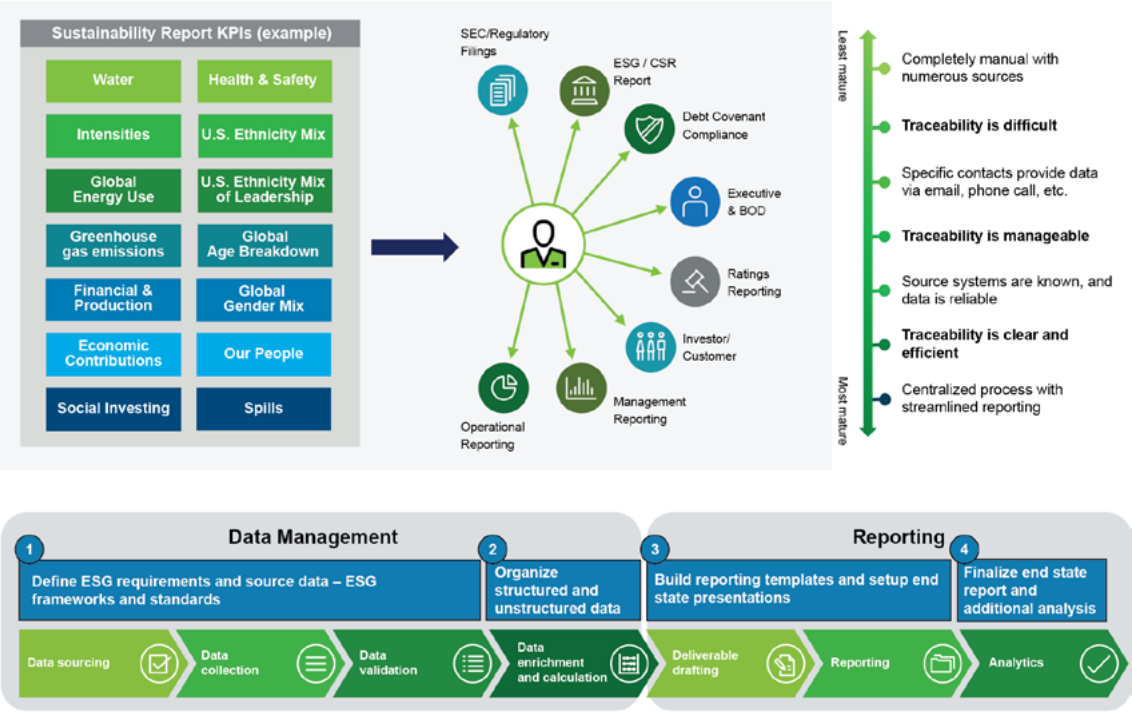
Source: © Deloitte

Supply chain health: Data is king

Greenhouse gas emissions, including Scope 3, are just one component of ESG reporting. As organizations begin to determine their approach, it is important to keep the big picture in mind, since decisions that affect climate-related reporting are likely to affect the other components of ESG reporting as well.

Importantly, the data needed for effective supply chain decarbonization is the same data that is or will be required for sustainability reporting, financial reporting, regulatory filings, and operational decision-making. It is therefore critical for companies to see this data challenge as a whole-of-company initiative and to establish a 'single source of truth' for all ESG data that has the same level of controls and constraints currently applied to financial data. Increasingly, companies are starting to implement whole-of-company solutions, such as shown in Figure 7, which most appropriately fall under the management of the chief financial officer (CFO).

Figure 7 – Sustainability reporting maturity model

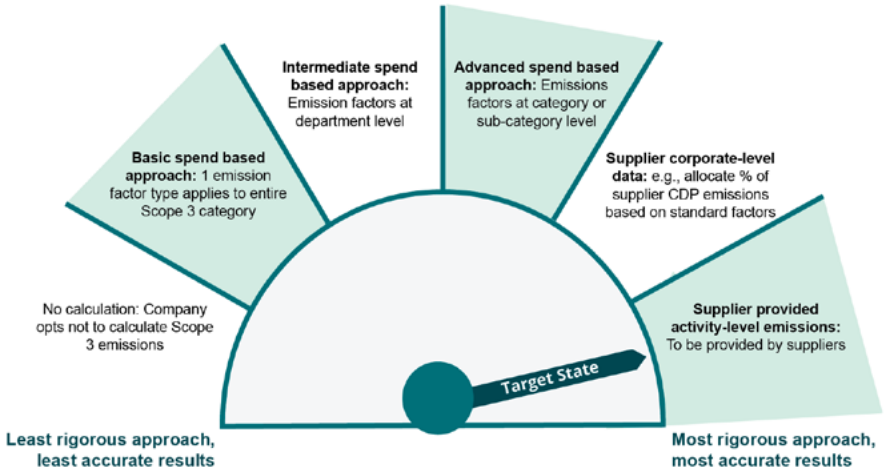


Source: © Deloitte

As organizations become more advanced in their understanding of Scope 3 emissions, they often move from a spend-based to an activity-based approach to reporting them. Currently, almost all Scope 3 data is derived from general emissions factors applied to spend. Instead of relying on these approximations, companies need to work towards accessing and incorporating supplier-provided, activity-level emissions data. (See Figure 8.)

Ultimately, the ability to take a factual, activity-based approach to emissions reporting throughout the supply chain could become a competitive advantage for oil and gas companies. While decision-makers may be uncomfortable with the present uncertainty of data, they cannot let perfection get in the way of progress, amid mounting stakeholder pressures and a rapidly evolving reporting and compliance landscape.

Figure 8 – Degree of rigor: Emissions-reporting approach



Source: © Deloitte

While there is no shortage of emerging technology, such as AI, ML, and blockchain, that can enhance access to real-time data and facilitate ESG reporting, organizations cannot fully reap the benefits if they do not get the basics right first. Without a complete overview of the network and trusted sources of reliable, good-quality, and real-time data, they will only generate fragmented and inaccurate information. Organizations need to make strategic investments to achieve positive results and should avoid piecemeal solutions.

The knowledge of existing touchpoints in the oil and gas production journey, from upstream to downstream, is fundamental, not just for safeguarding commodities from accidents and sabotage, and communities against socio-environmental harm, but also for identifying inefficiencies and enabling more accurate scenario planning and more agile responses. Analyzed from this perspective, investing in real-time visibility is less of an operational, financial, and technological burden, and more of an opportunity to improve the overall health of supply chains.

Indeed, building the information technology (IT) infrastructure needed for accessing and leveraging granular activity-based ESG data can be challenging and costly on a stand-alone basis, which is why leading professional services organizations have developed solutions to help companies establish a path forward. For instance, Deloitte's subscription-based Supplier Sustainability platform leverages cloud and AI/ML to help companies facilitate automated and standardized product-level ESG data capture across an organization's extended, multi-tiered supply base; enhances operations with sustainability-focused decision support tools; and transforms customer experiences and brand identity; all while fostering greater tracking, transparency, and traceability across the extended value chain.

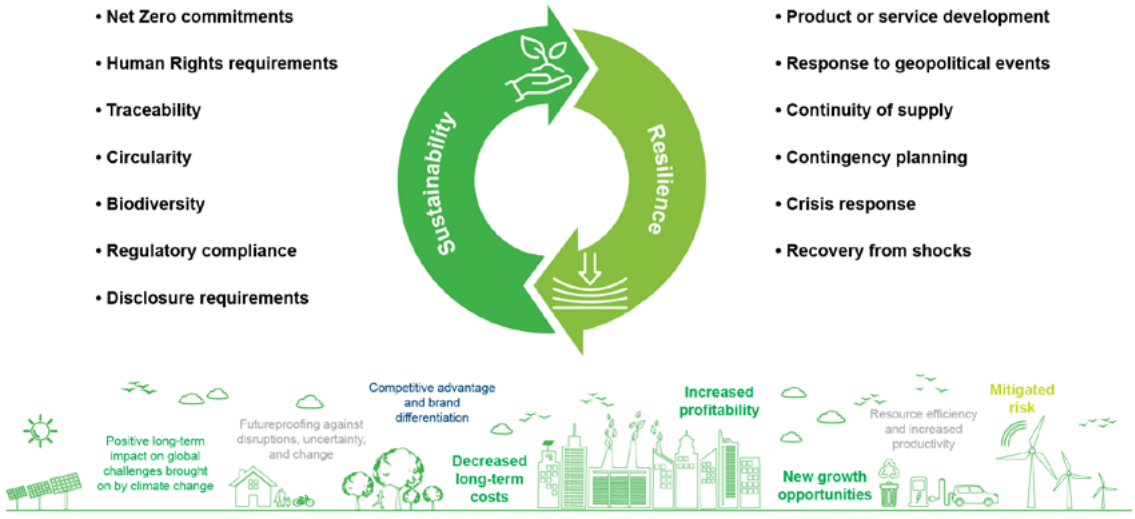
The end-to-end game: Driving sustainable value creation

Improving supply chain resilience and sustainability in the current climate of unpredictability, disruption, and social and regulatory pressure should be a strategic priority. Although navigating the ambiguous relationship between the two may be difficult, organizations can overcome competing priorities. They can do this by using long-term strategic vision as the "North Star," and, more importantly, by recognizing and harnessing the powerful synergies that exist between sustainability and resilience to get the best of both worlds. Organizations don't have to choose between being sustainable and being resilient—or between being cost-efficient, customer-focused, asset-optimized, or agile—they can be all of the above.

The supply chain is often where companies find their biggest risks—and some of the greatest opportunities for sustainable value creation. Achieving a sustainable and resilient supply chain not only can help oil and gas companies to withstand volatility, but also strengthen their ability to achieve growth and profitability. While supply chain transformation initiatives have largely been born out of necessity, today many are being driven by the will to outperform.

Figure 9:

The role of supply chain in achieving resilience and sustainability whilst retaining profitability



Source: © Deloitte

Innovation in action: Blockchain

Expanding beyond cryptocurrency, blockchain has evolved to become a smart contract facilitator. In this role, it is emerging as a vehicle for enhancing supply chain sustainability and resilience in the oil and gas industry. Beyond creating efficiencies by removing the legal and financial intermediary in a contractual agreement, blockchain assumes the role of trusted gatekeeper and transparency purveyor. In the emerging "trust economy" in which a company's assets and reputation are becoming both increasingly valuable and vulnerable, the following use cases illustrate blockchain's potential in the oil and gas industry to empower and protect.[17]

Commodity trading

The current process for trading physical refined products or carbon offsets includes numerous manual steps and requires entering the same information into different systems with layers of data reconciliation. Leveraging blockchain's distributed ledger capabilities can reduce the amount of time spent reconciling price and volume differences among trade participants by making the same data available to all parties at the same time. In addition, the solution can help reduce the transaction security risks associated with emailing documents. Oil and gas companies that leverage blockchain can improve trade accuracy, increase scheduling and back-office (e.g., invoicing and settlements) efficiency, accelerate access to trade data, and shorten the working capital cycle.

Sensor-enabled invoicing

The powerful combination of blockchain technology, processing plant equipment, and pipeline sensors can track output and invoice customers in real-time to modernize invoice processing. In this digitalized process, sensors gather data from multiple points to ensure accurate billing based on executed contracts. Blockchain technology (with a cognitive layer built on top) records, tracks, and executes the contracts, and detects instances of fraud. Equipment sensors confirm fulfillment of contract terms and, once the agreed-upon amount has been produced, the system executes payment. Oil and gas companies and their customers can benefit from increased transaction speed, accuracy, and security. In addition, sensor-enabled invoicing may require fewer staff resources, allowing employees to focus on more value-added activities.

Contract execution

Blockchain can aid contract execution in transactions where the level of counterparty trust may be low or where transaction value or complexity are high. Potential areas of opportunity can include land transactions (by verifying and eliminating fraudulent land dealings), oil and gas sales (facilitating large transactions), complex sourcing (minimizing transaction inconsistencies), capital projects (adhering to contract terms), and joint ventures (improving cost and revenue-sharing audits). The resulting increase in counterparty trust can help reduce costs and improve productivity. Blockchain can also help eliminate the need for clearinghouses, confirmation processing, and other back-office administrative tasks that may be typical of risk management and accounting activities.

Innovation in action: Low-carbon hubs

Technological advances that could help lower emissions for hard-to-abate solutions—such as clean hydrogen and carbon capture, utilization, and storage (CCUS)—are either close to or already viable for commercial use. But for many companies, their cost can be prohibitive. Although they've been around for decades, hydrogen and CCUS technologies have faced investment headwinds because of a persistent chicken-or-egg problem: Many companies are reluctant to invest in low-carbon production or carbon capture technology because they don't have the confidence that there is a market for their product, while downstream customers have not invested in the market infrastructure or technology due to the lack of supply.

Low-carbon industrial hubs can offer an innovative solution. They can make these technologies accessible—and investing in their deployment financially viable—for individual companies by bringing together high-emitting industries and customers in one geographical area to share costs and drive economies of scale. Through ecosystem collaboration, companies that participate in hubs can demonstrably accelerate emissions-lowering technology development and encourage downstream adoption of clean hydrogen or CCUS and other low-carbon technologies in a high-profile project. Hub collaboration can also drive long-term decarbonization for their own organizations and across industrial value chains.

Hubs are typically located in areas that offer regional advantages, such as natural geological storage formations (for capturing carbon and storing hydrogen), existing infrastructure, a skilled workforce, favorable regulatory conditions, and tax incentives. Australia, Europe, China, and the United States have already begun developing hubs.[18]

For instance, in Houston, where 90% of the United States' clean hydrogen is currently produced, there are plans to leverage this production, along with natural underground storage, an extensive pipeline network, and export terminals in rail or shipping, for a hub.[19] Using a supply-led operating model, the hub can also help address emissions in the Houston area from downstream oil and gas companies, including refineries, coal- and gas-fired power plants, and petrochemicals. Already, major partners have made proposals for a Houston hub.

Deloitte estimates that facilities participating in the Houston hub could reduce their emissions by more than 70 million metric tons per year.[20] They could achieve even deeper emissions reductions—up to 80% across the hub—if more partners use CCUS and fuel blending (which includes hydrogen).[21]

Contacts

John England
Global Energy & Chemicals Leader
Deloitte Global
jengland@deloitte.com

John O'Brien
Managing Director – Climate & Sustainability
Deloitte US
johnobrien1@deloitte.com

End Notes

1. Deloitte 2022 CxO Sustainability Report. "The disconnect between ambition and impact." Pg. 9, Available at https://www2.deloitte.com/content/dam/Deloitte/at/Documents/sustainability/at-sustainability-report-2022.pdf.
2. Griffin, P. A., Jaffe, A. M., Lont, D. H., & Dominguez-Faus, R. (2015). Science and the stock market: Investors' recognition of unburnable carbon. Energy Economics, 52, 1-12. Available at https://doi.org/10.1016/j.eneco.2015.08.028
3. S. Batten, R. Sowerbutts, M. Tanaka (2016). "Let's Talk about the Weather: The Impact of Climate Change on Central Banks". Bank of England Staff Working Paper. Available at https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2016/lets-talk-about-the-weather-the-impact-of-climate-change-on-central-banks.pdf?la=en&hash=C49212AE5F68EC6F9E5AA71AC404B72CDC4D7574
4. Sen, S., & von Schickfus, M.-T. (2020). Climate policy, stranded assets, and investors' expectations. Journal of Environmental Economics and Management, 100, 102277. Available at https://doi.org/10.1016/j.jeem.2019.102277
5. McGlade, Christophe, and Paul Ekins. 2015. "The Geographical Distribution of Fossil Fuels Unused When Limiting Global Warming to 2 [Deg]C." Nature 517 (7533): 187–90. Available at http://dx.doi.org/10.1038/nature14016.
6. IFRS web site. "ISSB issues inaugural global sustainability disclosure standards." Available at https://www.ifrs.org/news-and-events/news/2023/06/issb-issues-ifrs-s1-ifrs-s2/
7. Deloitte web site. "European Sustainability Reporting Standards Unpacking the Commission's first draft Delegated Act," June 9, 2023, Available at https://emearegulatorystrategy.deloitte.com/post/102iglu/european-sustainability-reporting-standards-unpacking-the-commissions-first-dr
8. Conceição, Pedro, et al. Copyright 2022. "Uncertain Times, Unsettled Lives: Shaping our Future in a Transforming World." Human Development Report 2021/2022. United Nations Development Programme. New York, NY USA
9. Ibid.
10. Deloitte analysis.
11. Science-based Targets Initiative web site. "Companies taking action." Available at https://sciencebasedtargets.org/companies-taking-action.
12. Science-based Targets Initiative web site, "The corporate net-zero standard." Available at https://sciencebasedtargets.org/net-zero.
13. Spitse, Nathan, et. al. "Deloitte's Global Resilience Report: Toward true organizational resilience." Deloitte. Copyright October 2022. Available at https://www2.deloitte.com/us/en/pages/risk/articles/global-resilience-report.html.
14. D. Cotta, L. Klink, T. Alten, B. Al Madhoon. "How do supply chain managers perceive the relationship between resilience and sustainability practices? An exploratory study." Maastrich University, December 1, 2022. Available at https://cris.maastrichtuniversity.nl/en/publications/how-do-supply-chain-managers-perceive-the-relationship-between-re.
15. Griffiths, Danny; Park, Kristian; and Sen, Dr. Sanjoy. "Emerging stronger: The rise of sustainable and resilient supply chains." Copyright 2022. Available at https://www2.deloitte.com/content/dam/Deloitte/us/Documents/TPRM_Survey_Report_Interactive.pdf.
16. Deloitte analysis.
17. Deloitte web site. "Blockchain in Oil & Gas." Available at https://www2.deloitte.com/us/en/pages/consulting/articles/blockchain-digital-oil-and-gas.html.
18. Tuff, Geoff, and Hardin, Kate. "Deloitte, Low-carbon industrial hubs: Driving deep decarbonization for industry." Deloitte. Copyright 2022. Available at https://www2.deloitte.com/content/dam/Deloitte/us/Documents/consulting/us-low-carbon-industrial-hubs.pdf
19. Ibid.
20. Ibid.
21. Ibid.

Deloitte.