Expediting Sectoral Decarbonisation Strategic Implications for the Insurance Industry

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Maryam Golnaraghi, Director Climate Change & Environment, Geneva Association

1. Introduction

Sectoral decarbonisation is entering a more decisive phase. What was once a long-term ambition is now a strategic imperative, and it is being shaped by geopolitical volatility, energy security concerns, and intensifying climate risks. Governments are recalibrating transition strategies to prioritise resilience, industrial competitiveness, and secure access to critical materials, alongside emissions reduction.

Recent geopolitical disruption in the Middle East has underscored a fundamental reality: energy security and the energy transition are inseparable. Systems built on diversified, domestic, low-carbon energy, supported by long-duration storage, robust infrastructure, and efficiency, are inherently more resilient to external shocks. At the same time, these same shocks can disrupt critical mineral supply chains and delay the deployment of clean technologies, highlighting the fragility of current transition pathways and the need for robust supply chains.

The challenge is particularly acute in hard-to-abate sectors – including energy, transport, heavy industry, data centres and buildings – which together account for a significant share of global emissions. These sectors are characterised by high energy intensity, long-lived assets, system dependencies, and limited near-term alternatives for deep decarbonisation.

Despite these structural constraints, momentum is building. Global investment in low-carbon energy systems has reached record levels, supported by public-private partnerships to secure access to critical minerals and rare earth, maturing carbon markets, and sectoral collaboration platforms. However, progress remains uneven, and the scale of transformation required far exceeds current deployment rates.

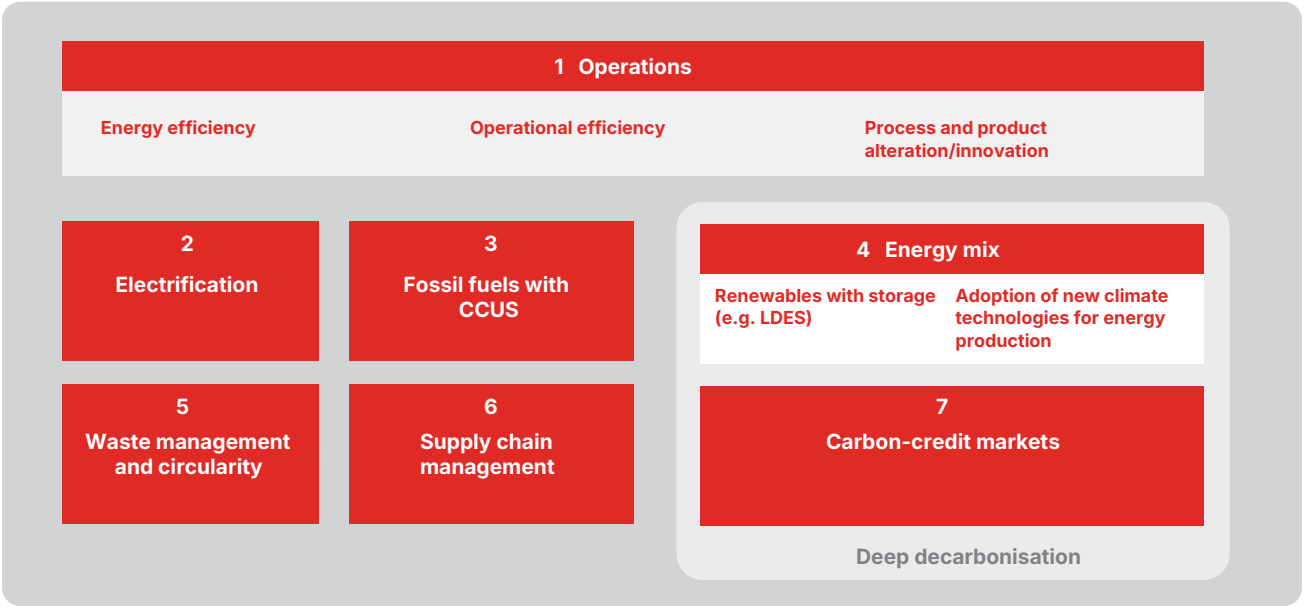
The central question is no longer whether decarbonisation will occur, but whether it can be accelerated and scaled in a way that is economically viable, resilient, and insurable.

For the insurance industry, this transition will redefine risk landscapes across sectors, reshape demand for insurance products and services, and position insurers as critical enablers of risk management and capital deployment. Understanding sector-specific pathways and systemic constraints is therefore essential to supporting clients while capturing emerging opportunities.

2. Sector-specific decarbonisation approaches and priorities

Decarbonisation across sectors is not uniform. Roundtable discussions and interviews with experts and platforms, representing the oil and gas, steel, cement, aviation, data-centre, and building industries, reveal a portfolio of strategies, deployed at different speeds depending on technological maturity, cost, and sector-specific constraints. These exchanges reveal seven strategic focus areas: operations (e.g. operational and energy efficiency, process alteration/innovation), electrification, fossil fuels with CCUS, evolving energy mixes, waste management and circularity, supply-chain management, and carbon market mechanisms (Figure 1).

FIGURE 1: PORTFOLIO OF STRATEGIES USED FOR SECTORAL CORE BUSINESS DECARBONISATION



Source: Geneva Association

In the near term, efficiency remains the primary driver. Measures to enhance **energy and operational efficiency** – through waste-heat recovery, digital optimisation, and improved maintenance, for example – deliver immediate emissions reductions while enhancing productivity and cost performance. These foundational actions across all sectors will continue to play a critical role.

Beyond efficiency, sectors are beginning to address process emissions through **innovation**. In steel, the shift toward electric arc furnaces and hydrogen-based production represents a structural transformation. In cement, clinker substitution and alternative materials are central to reducing embedded emissions. In aviation, sustainable aviation fuels and operational measures such as contrail avoidance are emerging as key levers. These developments signal a transition from incremental improvements to changes in core production systems.

Electrification is advancing, particularly in sectors where processes can be powered by low-carbon electricity. Buildings and parts of industry are expected to see significant gains. However, electrification alone cannot address high-temperature industrial processes or inherent process emissions, limiting its applicability.

This gap is driving increased reliance on **CCUS**, renewables with long-duration energy storage (LDES) and emerging low- or zero-carbon technologies for energy production. CCUS is particularly critical for sectors such as oil and gas, cement and steel, where process emissions are difficult to eliminate. At the same time, new energy technologies, such as green hydrogen, small modular reactors (SMRs), and industrial geothermal are expected to play a transformative role over the medium to long term, although most remain at early stages of deployment.

A defining trend is the shift toward more diversified and resilient **energy systems**. Data centres, for example, are rapidly increasing their reliance on renewables combined with storing and reducing water, while industrial sectors are exploring a mix of energy solutions. However, scaling these approaches requires significant infrastructure investment and coordinated development of supply chains.

Waste management and circularity along with **supply chain management** are increasingly strategic. Material efficiency, recycling, and circular business models offer substantial emissions reductions, particularly in materials-intensive sectors. At the same time, addressing Scope 3 emissions requires greater transparency and coordination across value chains.

Technology-based **carbon-credit markets** need to evolve as complementary mechanisms to mobilise capital and support early-stage technologies. High-integrity credits and sector-specific approaches, such as book-and-claim models are gaining traction, although their effectiveness depends on robust standards and governance.

Overall, sectoral decarbonisation pathways reflect a combination of evolutionary improvements and transformative shifts in core business models using a wide range of new technologies. While efficiency gains deliver near-term progress, deep decarbonisation will depend on scaling new technologies and reconfiguring entire systems, introducing new risks that must be managed. Understanding sectoral priorities and approaches will have significant implications for re/insurers' capacity to support their clients across these sectors in their decarbonisation journey.

3. Common decarbonisation challenges among sectors

Across sectors, four structural challenges are constraining the pace and scale of decarbonisation.

I. Climate resilience is an emerging consideration for decarbonisation strategies.

As sectors invest in new low-carbon assets and infrastructure, exposure to physical climate risks is increasing. Extreme weather events, rising temperatures, and water stress are already disrupting operations, damaging assets, and affecting workforce productivity. These risks directly influence site selection, asset design, and long-term investment decisions.

Importantly, resilience considerations are beginning to reshape decarbonisation strategies themselves. Companies are reassessing where and how to build, prioritising resilient, modular, and distributed systems over centralised and exposed assets. Failure to incorporate resilience at the design stage increases the risk of stranded or uninsurable assets.

II. Cross-sectoral policy and regulatory fragmentation remain a major barrier.

Clear, stable, and aligned policy frameworks are critical to enabling investment and scaling decarbonisation. However, across sectors, regulatory fragmentation persists. Divergent standards, inconsistent incentives, and unclear liability regimes create uncertainty for developers, investors, and insurers.

This is particularly evident in areas such as land-use planning, permitting, building codes, and cross-border projects. Misaligned regulatory and capital frameworks can result in unclear allocation of risks and liabilities, constraining risk-sharing mechanisms and limiting insurability. Without greater coordination across energy, environmental, financial, and insurance regulators, progress will remain constrained.

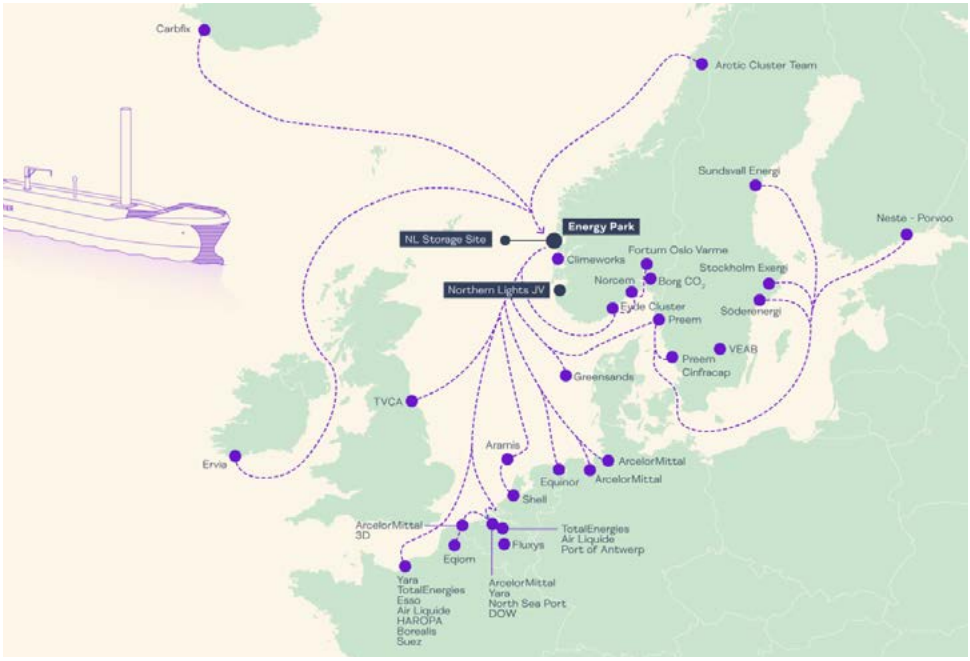
III. Expediting deep decarbonisation requires new models of cross-sectoral collaboration.

Many of the emerging technologies required for deep decarbonisation, such as CCUS and green hydrogen, depend on complex projects with multi-stakeholder ecosystems. These projects span sectors, value chains, and jurisdictions, creating interdependencies that amplify risk. A failure in one component of a system can trigger cascading impacts across the entire value chain (Figure 2).

Expediting scaled deployment of such projects would require new ways of cross-sectoral engagement to:

- Apply a project life-cycle approach to map risks, roles, liabilities, and mitigation early.
- Strengthen cross-sector regulatory coordination to align policies and liabilities and develop innovative risk-sharing mechanisms.
- Reform project finance to embed risk mitigation from early design stages.
- Integrate climate resilience into design and investment decisions.
- Accelerate supply chains for emerging technologies.
- Develop system-wide standards for scalable, transparent, and safe deployment.

FIGURE 2: EXAMPLE OF A COMPLEX CCS PROJECT IN EUROPE



Northern Lights – an open and flexible CCS infrastructure that aims to transport CO_2 by ship from capture sites across Europe (purple dots) to a terminal in Norway for intermediate storage, before transporting it for permanent storage in a reservoir under the seabed (operational in 2025).

Source: Northern Lights 2022

IV. Credible and standardised technology-driven carbon markets are needed.

Carbon markets for low- or zero-carbon technologies need to be developed. However, divergent methodologies, inconsistent accounting rules, and varying credibility standards create uncertainty for market participants. While demand for high-quality credits is increasing, a lack of harmonised frameworks limits their ability to mobilise capital at scale. Strengthening monitoring, reporting, and verification (MRV) systems and aligning governance frameworks will be essential to unlocking their full potential.

4. Strategic implications for re/insurers

The transition to sectoral decarbonisation is reshaping risk landscapes and redefining the role of the insurance industry. As sectors adopt new technologies and business models, they are exposed to a broader and more complex set of risks: technology risks, construction and operational risks, supply chain disruptions, regulatory uncertainty, stranded asset risk, and long-tail environmental liabilities.

This has created opportunities for re/insurers – as risk managers, strategic partners, and catalysts for investment – to play a central role in enabling a resilient and insurable transition to a low-carbon economy. Some companies are already taking steps to move beyond traditional underwriting by engaging earlier in projects to support the scaled deployment of emerging technologies such as CCUS. Through risk engineering, they assess risks across the full project lifecycle, improve project design, strengthen mitigation strategies, and enhance insurability and bankability.

Innovative risk-sharing mechanisms are critical. Blended-finance structures, guarantees, and multi-stakeholder risk-sharing models can help crowd in private capital and support the deployment of capital-intensive, pre-commercial technologies. At the same time, as investors, re/insurers can play a catalytic role in financing resilient, low-carbon infrastructure.

To capture these opportunities, re/insurers will need to scale up investments in advanced technical capabilities. This includes forward-looking stochastic climate risk analytics, technology risk assessment, and multidisciplinary expertise to meet the emerging needs of clients in different sectors. Organisational models will need to evolve to support earlier and more integrated engagement with clients.

Finally, collaboration with policymakers and regulators will be essential to develop enabling frameworks. This includes aligning liability regimes, capital requirements, and regulatory incentives to support scalable risk-sharing solutions.

Reference

Northern Lights. 2022. Northern Lights Designated a Project of Common Interest by the European Union.