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A Market Model towards Insetting the Decarbonisation of the Chemical Sector

Executive Summary

White Paper 2

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This White Paper is the start of a conversation

Value chains are complex things, and none more so than for chemicals. Of all the hard-to-abate sectors, the products that the chemical industry creates have the most diverse uses and global footprints—woven into everything from agriculture to aerospace.

Rethinking a complex value chain requires equally complex collaboration: engineers, economists, chemists, policymakers, and business strategists working in concert to reimagine processes, technologies, and incentives. It's not just a technical transition—it's a multidisciplinary transformation.

This programme of work is led by the Leonardo Centre on Business for Society at Imperial Business School, it began with a convergence of scientific expertise from across Imperial College London to examine this full spectrum of emissions challenges.

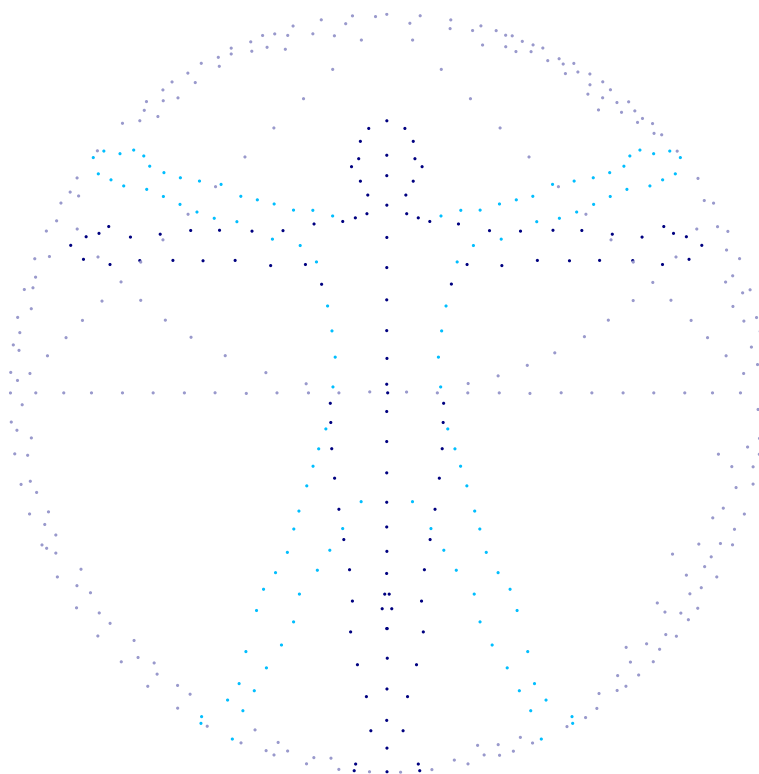
But we can't take it further alone. Decarbonising the chemical value chain demands a coalition of the willing: innovators, regulators, investors, academics, associations, and industry leaders all pulling in the same direction.

This second White Paper serves as an open invitation—to build on the science, co-create solutions, share insights, and build the trust and momentum needed to shift the system. Whether you're deep in process engineering or shaping policy frameworks, your expertise could contribute to making this happen.

Join us and let's connect the dots



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Executive summary

The chemical sector accounts for around 5% of global greenhouse gas (GHG) emissions and faces intensifying pressure to decarbonise, particularly across Scope 3 value chains. These emissions are diffuse, capital-intensive, and difficult to address through conventional mitigation approaches. This report introduces a novel, sector-specific roadmap for operationalising **market-based insetting** through **Environmental Attribute Certificates (EACs)**, a mechanism to generate, verify, and allocate emissions reductions within value chains, independent of physical product flows.

This insetting model retains climate value inside the supply chain, linking upstream innovation (e.g., bio or circular feedstocks, carbon capture and storage (CCS), electrification) to downstream Scope 3 decarbonisation needs via **Book & Claim (B&C) Chain of Custody (CoC) model and digital infrastructure**. The framework transforms verified carbon savings into tradable, traceable instruments—making Scope 3 reductions **visible, valuable, and verifiable**.

Novel Contributions:

This framework introduces several first-of-its-kind features.

- **Sector-first design:** This is the first comprehensive market model tailored to the chemical sector's unique complexity, scale, and fragmentation.
- **Digital evolution roadmap:** Tracks the shift from spreadsheet-based internal tools (2026–2027), to pilot-scale federated platforms (2027–2029), to full digital market orchestration with smart contracts and AI-enabled optimisation post-2030.
- **Parallel activation model:** Rejects linear phase approaches in favour of a dynamic roadmap across three co-existing states: validation, market formation, and system integration—each with distinct enablers and maturity indicators.
- **Cross-sector integration:** Embeds chemical EACs into adjacent value chains (e.g., FMCG, logistics, finance), enabling multi-sector Scope 3 impact and systemic alignment.

Market Potential

The B&C CoC model creates a measurable and investable market opportunity with limited upstream and downstream cost impacts:

- **CCS economics:** \$70–150 per tCO₂ abated (aligned with international abatement benchmarks).
- **EAC pricing:** \$56–240 per t of low-carbon chemicals (for high-abatement tech, e.g., CCS; dependent on allocation choice).
- **Scale potential:** \$20B market by 2035 with >200 MtCO₂e verified reductions annually.

- **Downstream case:** plastics = 7% of corporate emissions; full upstream plastic decarbonisation adds <0.3% to final product prices across industries.
- **Commercial upside:** low-carbon products grow faster and sustain durable price premiums.
- **European TAM:** \$124.8B across FMCG, apparel, electronics, and automotive; constrained by CCS capacity (<2% of potential demand).

Strategic Enablers for buyer confidence

Successful implementation depends on enabling systems, investment, and governance structures to create a trustworthy ecosystem for buyers.

- **Digital infrastructure:** Requires interoperable registries, automated transactions, and real-time monitoring through IoT and blockchain.
- **Investment architecture:** Calls for blended finance, securitised portfolios, and sustainability-linked instruments to mobilise capital.
- **Governance model:** Establishes a multi-stakeholder authority to oversee issuance, verification, and dispute resolution.
- **Policy alignment:** Demands integration with EU and global regulatory frameworks, including Corporate Sustainability Reporting Directive (CSRD), Carbon Border Adjustment Mechanism (CBAM), International Sustainability Standards Board (ISSB), and national finance schemes.

Key Implications

The roadmap highlights practical consequences for both industry leaders and policymakers.

- **Viable across all phases:** EAC prices are projected to remain above marginal abatement costs, ensuring commercial feasibility and return on investment.
- **Shared cost structure:** Distributes costs and risks between upstream producers and downstream buyers across the value chain.
- **Integrity depends on digital MRV:** Market credibility hinges on scalable, transparent, and tamper-proof monitoring and reporting systems.
- **Cross-sector traction is essential:** First movers in packaging, transport, and finance will unlock scale and signal demand.

Although this white paper focuses primarily on CCS, the proposed market design and certification framework can be readily extended to other decarbonisation routes, such as electrified cracking, bio- and e-feedstocks, or circular carbon pathways. The same principles apply irrespective of the underlying technology. This roadmap positions the chemical sector to move from aspirational commitments to actionable decarbonisation. It constitutes an **investable and executable strategy** to monetise Scope 3 reductions, strengthen supply chain resilience, and establish a global market mechanism for climate alignment.

The next 24 months are decisive: actors that mobilise now will shape market rules, capture first-mover value, and define the architecture of the low-carbon chemical economy.

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