



The results of the studies carried out as part of the Low-Carbon Industrial Zones (ZIBaC) program reflect above all the collective vision of the involved industrial stakeholders. These pathways provide a structuring contribution to the development of national decarbonisation strategies, but do not constitute an established or official vision of those strategies.

The DECLYC project aims to define decarbonisation strategies to reduce CO₂ emissions and the environmental footprint of the Chemistry Valley and neighbouring areas, to establish governance models for potential shared solutions that may emerge, and thereby to maintain the competitiveness and long-term sustainability of industrial and R&D centers.



Work Package 8

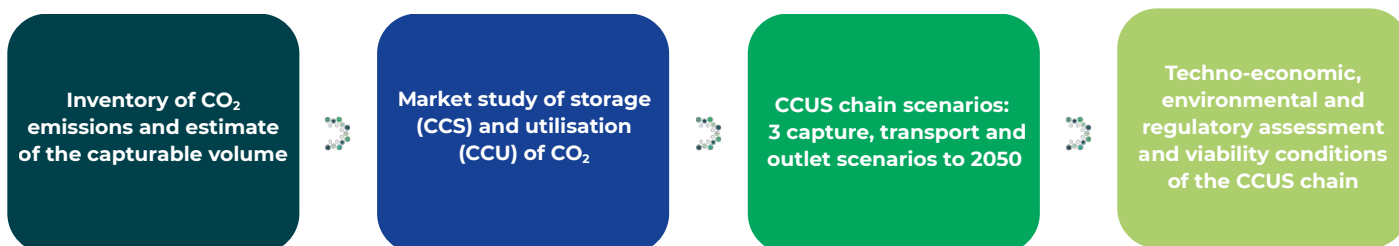
CCUS

Context and Objectives

This work package assesses the potential of CO₂ capture, storage (CCS) and utilisation (CCU) to abate the residual emissions of industrial sites in the Vallée de la Chimie and neighbouring areas. The objective is to define regional CCUS chain scenarios, co-developed with the industrial players, then to assess their technical, economic, environmental and regulatory feasibility, along with the conditions for viability, governance and phasing to 2050.

Methodology

Starting from an **inventory of fossil and biogenic CO₂ emissions** for the study area (41 sites, 4.6 Mt/yr in the reference case), residual emissions after application of the decarbonisation levers were projected to 2030, 2040 and 2050, and the technically capturable volume was derived from them. A study of CCUS markets then identified the relevant outlets, in both geological storage and utilisation. **Three CCUS chain scenarios were then modelled**, with sizing of the transport infrastructure and associated electricity needs, then assessed on techno-economic, environmental (life cycle assessment) and regulatory grounds. More than **25 interviews and two workshops** were held with the co-funding industrial players, as well as with third-party stakeholders in the local and national ecosystem (infrastructure operators, outlet project developers, public institutions).



Lead



Co-financing partners



Engineering consultancy



Co-lead



Contacts & More Information

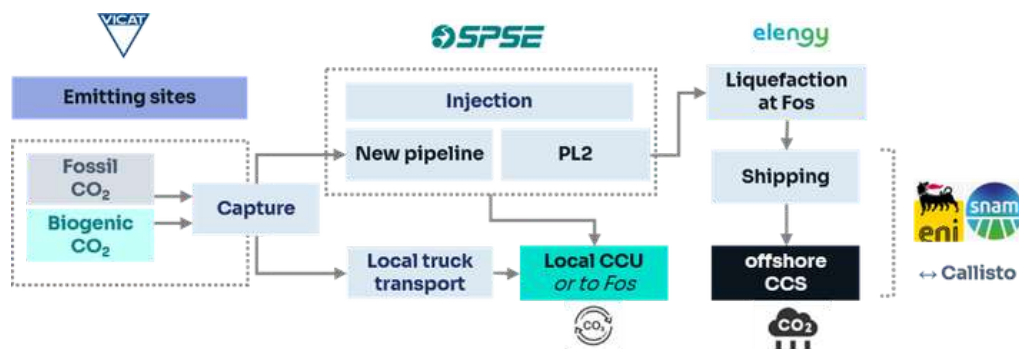
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● Results

Despite implementation of the decarbonisation levers, the area would retain 3.3 to 4.2 Mt/yr of residual CO₂ emissions in 2050, with a growing biogenic share. The technically capturable volume is estimated at 2.7 to 3.3 Mt/yr, spread across 32 sites and concentrated notably in cement plants, chemicals and waste management.

The market study confirms that by 2030, **exporting CO₂ to storage sites in the North Sea and the Mediterranean** is the preferred option, in the absence of mature French storage. Utilisation potential will be driven by **synthetic fuels (e-methanol, e-kerosene)**.

Three CCUS chain scenarios were modelled, from **7 sites and 1.5 Mt/yr captured** (low scenario) to **20 sites and 2.5 Mt/yr** (high scenario) in 2050. The sites are organised into three clusters (Centre, East, South), connected by new pipelines to the repurposed PL2 backbone (Rhône Décarbonation project), towards liquefaction at Fos-sur-Mer and then storage in the Mediterranean, as well as towards local utilisation outlets.



Pipeline transport is the required solution for large, steady flows, with trucking reserved for the small volumes destined for utilisation. The chain's electricity needs would reach 1.4 to 5.7 TWh/yr, of which 50 to 80% for the utilisation of CO₂ alone (CCU).

Under the reference assumptions (EU ETS allowance at €176/t in 2050 and 30% subsidy on CAPEX), **the chain is not economically self-sustaining**. Under a high price trajectory for CO₂ (300 €/t in 2050) most sites become profitable or close to break even. The Vicat cement plant is the starting point of the chain from 2030 (~1.1 Mt/yr), backed by the Rhône Décarbonation project. No site is viable on its own, which underlines the logic of a shared hub at regional scale. **The life cycle assessment** confirms the environmental relevance of the chain: the climate change impact is reduced by around **90% per tonne of CO₂ treated**, and the net overall environmental impact by around 36%.

● Outlook

The three scenarios outline a deployment trajectory sequenced in four waves between 2030 and 2050, rather than alternative futures, with the medium scenario offering the best trade-off between risks and benefits.

Three conditions for success emerge: a sufficient carbon price signal, complemented by public support mechanisms; delivery of the Rhône Décarbonation backbone, the true critical path for deployment; and alignment of stakeholders around shared governance.

The sharing of infrastructure by cluster, combined with tariff equalisation and revenue guarantees, reduces costs and secures the commitment of emitters.

The **timeline** is challenging: final investment decision for the Vicat - Rhône Décarbonation project and launch of a pilot cluster by 2027, then engineering, permitting (3 to 5 years) and contracting of outlets by 2030.

Finally, the industrial players in the area would benefit from the **development of a regional CO₂ hub** and a joint delivery structure, to share investments and the contracting of outlets. Further work will focus on the isolated sites along the Mediterranean-Rhône-Saône corridor; the study will need to be updated as regulations and markets evolve.

