



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 CO<sub>2</sub> 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 6

### Energy performance of R&D centers

#### Context and Objectives

The first step in any decarbonisation approach is to reduce current energy consumption. The objective of work package 6 is therefore “the study of energy performance in R&D centres”.

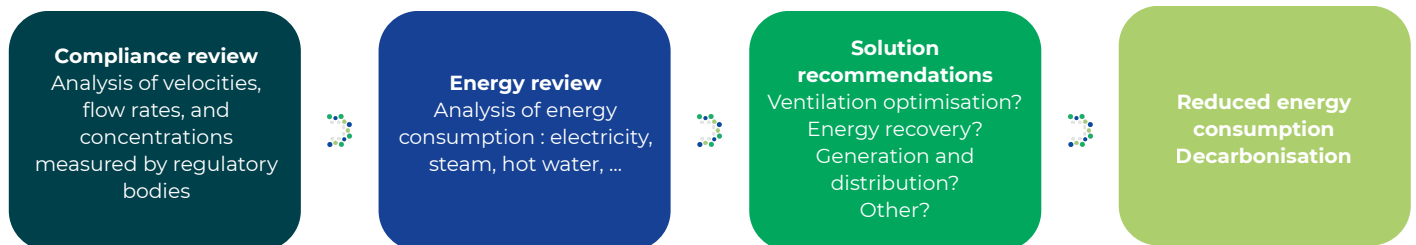
Regulatory requirements on pollutant exposure levels often lead to the implementation of high ventilation rates. The resulting energy consumption (heating and cooling) is all the more detrimental to budgets as energy supply pressures increase worldwide. The main heating source (hot water or steam) is produced exclusively from natural gas.

The objective is therefore to study the conditions required for R&D centres to optimise ventilation, thermal integration and waste heat recovery, to ultimately reduce net energy consumption and carbon footprint.

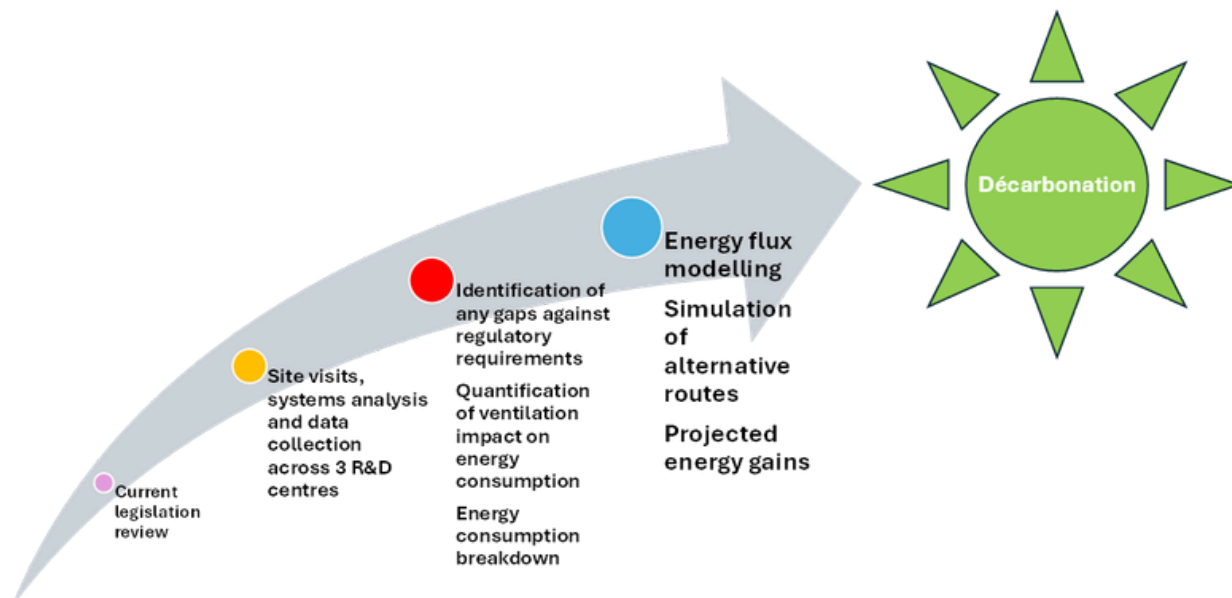
In this context, 2 to 3 buildings from each of the 3 industrial partners were analysed. They were selected as representative of R&D pilot activities in the chemical valley.

#### Methodology

The study was conducted as a series of audits including site visits, discussions with production staff, requirement analysis and review of inspection body reports.



#### Key stages



## ● Results

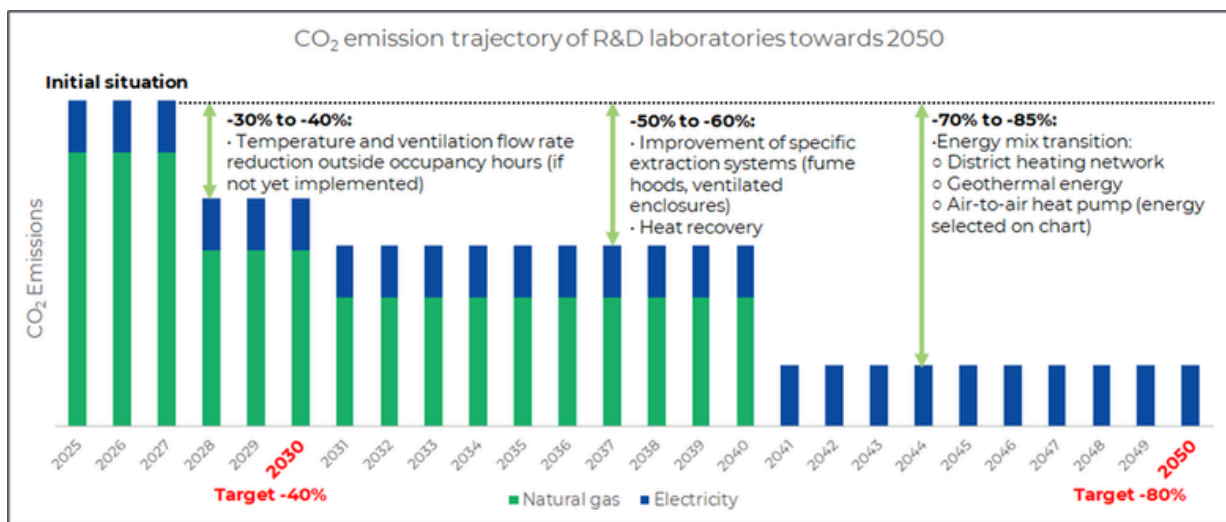
No systematic deviation from regulatory requirements was found in the laboratories studied. On the contrary, a voluntary “over-ventilation” approach was observed, with the aim to reduce risks, particularly ATEX.

On average, 70% of energy losses are attributable to air renewal, and 30% to losses through the building envelope. Thermal renovation of the building fabric is therefore not the only solution to reduce energy consumption, particularly as it can be costly and offers a poor return on investment. Reducing ventilation flow rates, meanwhile, may conflict with health and safety requirements for staff.

In the short term, it is recommended to progressively, and in a controlled manner, concentrate ventilation around occupancy periods, for example from 6 am to 8 pm. The study showed that this approach could lead to a 30% to 40% reduction in energy expenditure, with limited investment.

In the medium term, it is recommended to recover energy from extracted air and to favour laboratory equipment that makes direct use of auxiliary air, whether partially heated or not. This latter point does, however, require that processes are not thermally sensitive.

Finally, to achieve an 80% reduction in emissions by 2050, replacing heat generation systems with decarbonised energy sources is essential. This could be achieved through connection to the district heating network, geothermal energy systems, the installation of air-to-water heat pumps, biomass heat production, or the installation of electric boilers.



## ● Perspectives

An initial review of auxiliary air equipment revealed a limited offering from the usual suppliers. Despite the technical complexity of developing such solutions, the potential energy savings and the convergence of needs among different industrial players should not be overlooked. Research and development actions are therefore required, combining expertise, numerical simulations, and prototype testing.

The main barrier to overcome remains the dependence of some stakeholders on steam networks, which are inefficient systems (with estimated distribution losses of around 30%) and carbon-intensive. However, all current steam needs could be met using hot water, which is easier to produce and less energy-intensive, particularly through the use of biomass inputs. Although requiring significant investment and offering more challenging profitability, a conventional low-temperature hot water network is more easily decarbonized.

A shift in the energy carrier, necessary to achieve full decarbonization, involves substantial investment. Despite available subsidies that can reduce the payback period to around three years, the total investment still amounts to several hundred thousand euros.

Lead



Co-lead



Co-financing partners



ARKEMA



Engineering consultancy



Contacts & More Information

declyc@axelera.org  
<https://www.axelera.org/fr/pages/declyc>

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