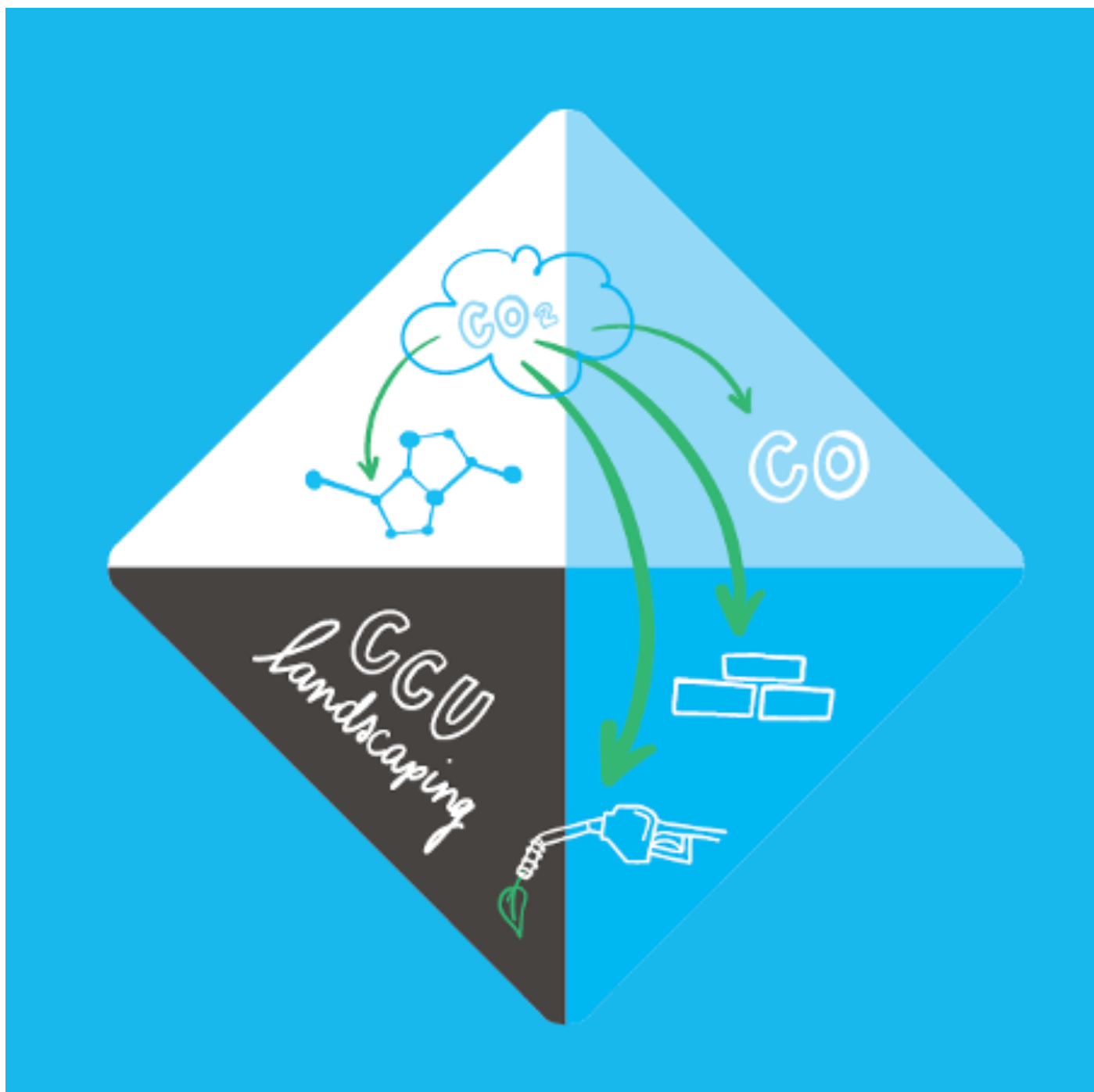


THE GREATER ROTTERDAM THE HAGUE AREA, THE HOTSPOT FOR YOUR CCU BUSINESS



INTRODUCTION

To stimulate and accelerate the uptake of Carbon Capture and Utilization (CCU) business in the greater Rotterdam The Hague area, a program has been established by four associations from the regional innovation ecosystem: InnovationQuarter, Deltalinqs, SmartPort and Clean Tech Delta.

This document describes promising options for CCU in this region of the Netherlands. The greater Rotterdam The Hague area consists of 23 municipalities including two major cities with a total of 2.4 million people, the Port of Rotterdam and the Westland greenhouse area. The region contributes 15% to the GDP of the Netherlands. The document highlights why the region is the right place for developing and implementing innovative CCU technologies and how they can be integrated into the existing infrastructure and value chains.

MISSION, VISION, STRATEGY

The program's mission is to accelerate the transition from fossil to circular and renewable feedstock and to establish a future proof industry through the development and deployment of CCU technologies in the region. The realization of CCU technologies will contribute to

fossil-based feedstock replacement and CO₂ emission reduction and mitigation. At the same time, new business opportunities, relevant to the (petro-)chemical and energy sectors, will be developed.

The greater Rotterdam The Hague area will be the circular feedstock hub and sustainable energy port of Europe based on waste, biomass, and CO₂. This large industrial cluster, with its numerous production facilities, extensive infrastructure, and renowned knowledge institutes, provides a highly suitable environment for real-life testing of CCU technologies.

The program accelerates the energy and circular transition by bringing together the right partners from knowledge institutes, industry, technology providers, regional and national government. Our approach to doing so is twofold.

1. Validate and attract innovative companies with fitting technology options
2. Accelerate the development and deployment of the most promising options via joint efforts with relevant public and private stakeholders throughout the value chain.



WHY CARBON CAPTURE AND UTILIZATION?

Why Carbon Capture and Utilization?

A sustainable industry requires renewable energy and circular feedstock to meet the Paris climate targets (1.5C). We firmly believe that CCU is an important part of the solution. It must be further developed, scaled-up and applied in pilots and demonstrations without further delay.

CCU is the term for technologies and processes that capture CO₂ and convert it into valuable products. CO₂ capture can be classified into two categories:

- Direct Air Capture (DAC): capture CO₂ from ambient air.
- Point Source Capture: capture CO₂ from a single identifiable (industrial) emission source.

Utilization refers to creating products from the captured CO₂, utilizing CO₂ as a circular feedstock as a substitute for fossil carbon feedstock in the production of chemical building blocks, synthetic fuels, and building materials.

WHY THE GREATER ROTTERDAM THE HAGUE AREA?

The industry in this region faces a huge climate and economic challenge in transitioning to a sustainable economy. The (petro) chemical process industry and energy producers are major contributors to both economic prosperity and greenhouse gas emissions. The industry in the greater Rotterdam The Hague area accounts for more than 20% of the total greenhouse gas emissions in the Netherlands. The region is characterized by a high density of CO₂ point sources as well as existing hydrogen and CO₂ infrastructure and various (petro) chemical value chains.

Businesses and authorities in the area are committed to the transition towards a low-carbon sustainable and future-proof industry, as illustrated by initiatives such as H-Vision (blue hydrogen), Porthos (CCS), Fieldlab Industrial Electrification (FLIE) and Planet.B.io. This CCU program complements these existing initiatives and aims to be the linking pin in the portfolio of CCU solutions to advance the transition.



THE GREATER ROTTERDAM THE HAGUE AREA IS THE HOTSPOT FOR YOUR CCU BUSINESS BECAUSE IT PROVIDES:

FEEDSTOCK

- Abundance of CO₂ point sources in the Port emitting a total of 27 Mton CO₂ per year (EU-ETS registered companies). These sources, with varying CO₂ purity, are mainly found in industrial processes (52%) and post-combustion activities (45%).
- Availability of CO₂ through the OCAP pipeline which delivers several hundreds of kilotons of CO₂ per year to over 600 greenhouse owners in the Westland area.
- Porthos - the CCS project to store 2.5 Mton CO₂ per year in the North Sea from 2024 onwards is on schedule.
- The region is developing its hydrogen value chains to become Europe's hydrogen hub with large scale green and blue hydrogen production and

import. A hydrogen backbone will become operational in 2023 and building pipelines connecting to the national H₂-network and Northrhine-Westfalen

- Access to green electricity from offshore wind farms coming ashore at the Maasvlakte (e.g. Hollandse Kust 1.4 GW capacity in 2022).
- Availability of waste heat from industry (69 sources, more than 25 PJ) and presence of infrastructure for district heating to the city of Rotterdam and the Westland greenhouses.

MARKETS

- Large offtake potential for CCU products in the Port of Rotterdam: the regional petrochemical cluster and Europe's largest bio-based fuels cluster.
- Access to the Antwerp-Rotterdam-Rijn-Ruhr-area (ARRRA), representing 40% of the (petro)chemical industry in the European Union.
- The construction sector in the region has a large building task at hand; an additional 150,000 'sustainably built' homes are needed up to 2030 and 60,000 homes between 2030 and 2040.



- CCU products of particular interest are:
 - * Chemical intermediates: syngas, methanol, ethanol, olefins, monomers and aromates,
 - * Chemical end products: polymers, speciality chemicals,
 - * Fuels: gasoline, diesel, and kerosene, and
 - * Building materials: concrete, cement, carbonates
- Various national and regional subsidy instruments support innovation and the roll out of carbon neutral technologies at different levels of technology readiness.
- A national carbon tax on top of the EU-ETS stimulates investments into the direction of carbon neutral alternatives.

MONEY AND NETWORK

TECHNOLOGY & PILOTING

- World leading technology development at the Delft University of Technology and technology institute TNO.
- Pilot and demonstration facilities at fieldlabs such as PlantOne and Fieldlab Industrial Electrification
- Availability of lively entrepreneurial ecosystem such as YES!Delft, Erasmus Centre for Entrepreneurship, CIC and RDM in Rotterdam.

- Introducing your business to our strong network of private financiers including regional and national Venture Capital funds and banks
- Business Development and financial engineering support from InnovationQuarter to scale your business, with close ties to regional and national governmental services
- Strong knowledge network e.g. knowledge institutes, fieldlab network and thriving public-private partnerships

GOVERNMENTAL SUPPORT

- The national sustainability targets are embedded in a climate law. These targets are 49% CO₂ reduction in 2030 and 95% in 2050 with respect to 1990 levels.

