Value proposition for the Dutch CCUS Business Community

CATO Winter Event

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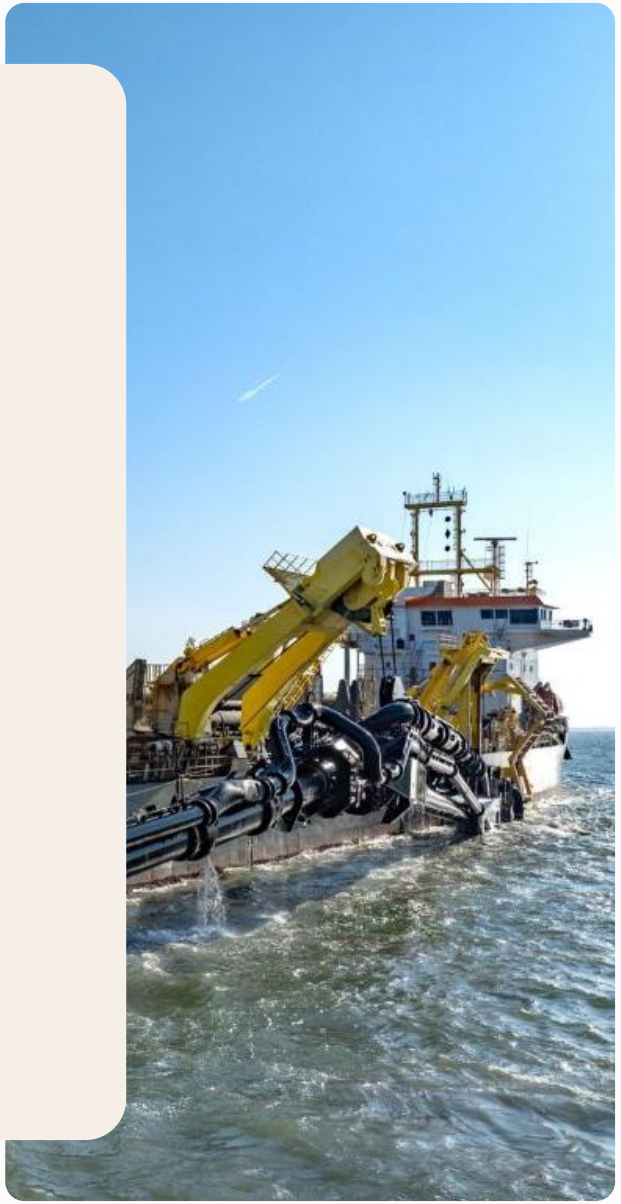
What I will cover

1. Assignment
2. Approach
3. Identified strengths
4. Value proposition



1 Assignment

TNO Study

Business opportunities for Dutch CCS technology, services, capabilities

CATO Spring Workshop

First ideas and questions
CCS Business Platform

Goals & Activities
Organisational structure
Issues / challenges

CATO Survey

Interest in
CCS Business Platform

Interest in
Dutch Pavilion Expo Hamburg

2 Approach

April – May – June

July

September

Stakeholder interviews

Key benefits for international clients?

Distinctive strenghts Dutch business community?

Stakeholder workshop

Core strenghts?

Capabilities complete?

Leverage to build business?

Vale proposition

Insights interviews
+ Workshop +
+ Research
= Key strengths

3 Identified strengths

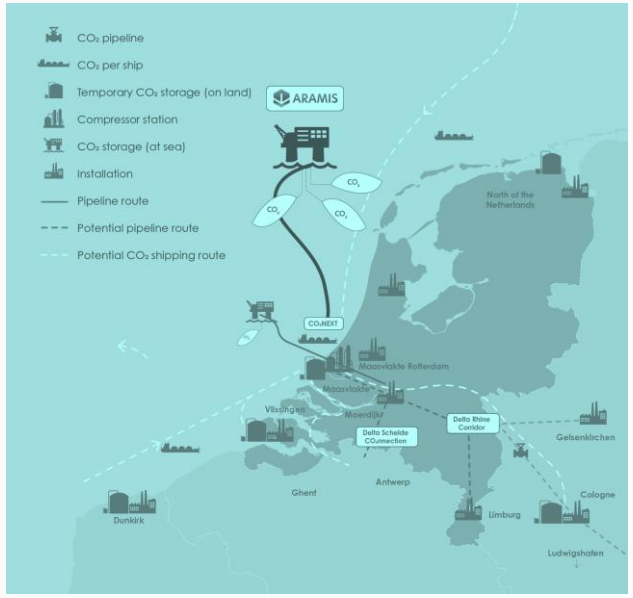
First of a kind projects

4 Value proposition

“The Netherlands is a country of First-of-a-Kind CCUS projects.

Photo: ©TNO

… developing full value chain CCS projects…



Porthos

First large-scale CCS project in the EU
Capacity: 2,5 mtpa
Term: 15 years
Pipeline
Partners: EBN, Gasunie, Port of Rotterdam
Clients: Air Liquide, Air Products, Shell, Exxon
Phase: Execute
Operational 2026

Aramis

Large-scale CO_2 transport project
Capacity: 7,5 - 22 mtpa
Term: 20+ years
Pipeline or ship
Partners: EBN, Gasunie, Shell, TotalEnergies
Clients: TBD – multiple industrial sources
Phase: FEED
FID 2026-2027

*Previous CCUS initiatives in The Netherlands – K12-B and the abandoned Barendrecht[1], ROAD[1] and Athos[1] projects, offer a **strong foundation of technical and non-technical expertise** which can help other countries leap ahead. This includes establishing **effective project governance** and fostering robust **public-private partnerships** to engaging local communities and the integration of environmental and marine ecological considerations into project planning and execution.*

Images: © EBN

[1] The Barendrecht CCS Project was a demonstration project initiated by Shell to store emissions captured at the Pernis refinery onshore near the town of Barendrecht. ROAD was the acronym for Rotterdam Opslag en Afvang Demonstratieproject initaited by Uniper and ENGIE to store emissions captured at a coal-fired power plant. The Athos Project (Amsterdam-IJmuiden CO2 Transport Hub & Offshore Storage) intended to develop a CO2 transport, storage and utilisation network in the North Sea Canal area with Tata as key CO2 emitter.

… operating full value chain CCUS projects…

OCAP

CO_2 pipeline from Rotterdam Port to greenhouses for crop enhancement
Type: CCU
Capacity: 300 ktpa
Partners: Linde
Clients: multiple horticulture companies
Operational since 2005

AVR Duiven

First commercial Post-Combustion Carbon Capture Plant at EfW facility
Type: Energy from Waste + CCU
Capacity: 100 ktpa
Technology: MEA (open solvent)
Clients: multiple horticulture companies
Operational since 2019

Twence

Commercial Post-Combustion Carbon Capturing at EfW facility
Type: Energy from Waste + CCU(S)
Capacity: 100 ktpa
Technology: SLB Capturi
Clients: multiple users of CO_2
Operational since 2025

Yara Sluiskil

1.4 mtpa (60%) of CO_2 emissions from fertiliser production processes used directly in drinks, greenhouses (CCU). Yara will capture and liquify the remaining CO_2 , transport to Northern Lights
Type: Capture, transport via ships
Partners: Yara, Northern Lights
Capacity: 800 ktpa
Phase: Execute

… connecting to a growing European CO_2 transport network…

CO_2next

Terminal that can receive liquid CO_2 via ships and supply CO_2 to Aramis network
Capacity:
Partners: Vopak, Gasunie, Shell, TTE
Clients: Multiple clients, multiple industries
Phase: FEED

Delta Rhine Corridor West

Cross-border pipeline to transport CO_2 from Germany and NL for storage and utilisation
Trajectory: from Boxtel to Moerdijk
Partners: Shell, OGE, Gasunie, BASF
Multiple clients
Phase: Conceptual Design
Operational: 2031-2032

Delta Schelde Co_2nnection

Cross-border pipeline to transport CO_2 from Belgium, Zeeland and Moerdijk area to storage and utilisation
Trajectory:
Partners: Gasunie, Fluxys
Multiple clients
Phase: Conceptual Design

Tata Steel

cross-border CO_2 transport from Port of Amsterdam to Norway
Capture project, transport
Capacity:
Partners: Tata Steel / ECOLOG / Horisont Energi
Phase: Feasibility Study

Photos f.l.t.r: © CO_2next, Gasunie, Gasunie, Tata Steel IJmuiden

4 Value proposition

“The Netherlands is a country of
First-of-a-Kind CCUS projects.
Building on supportive infrastructure

Photo: © Danny Cornelissen

The Dutch build on physical infrastructure…

Direct access to the **North Sea and major ports** make Dutch companies natural partners for CO_2 processing and transport and provides a solid foundation to export related services across European and global markets.

First offshore gas flowed to shore in 1975. Dutch experience with building, operating and repurposing natural gas infrastructure provides the expertise and the assets to set up an efficient CO_2 disposal infrastructure.

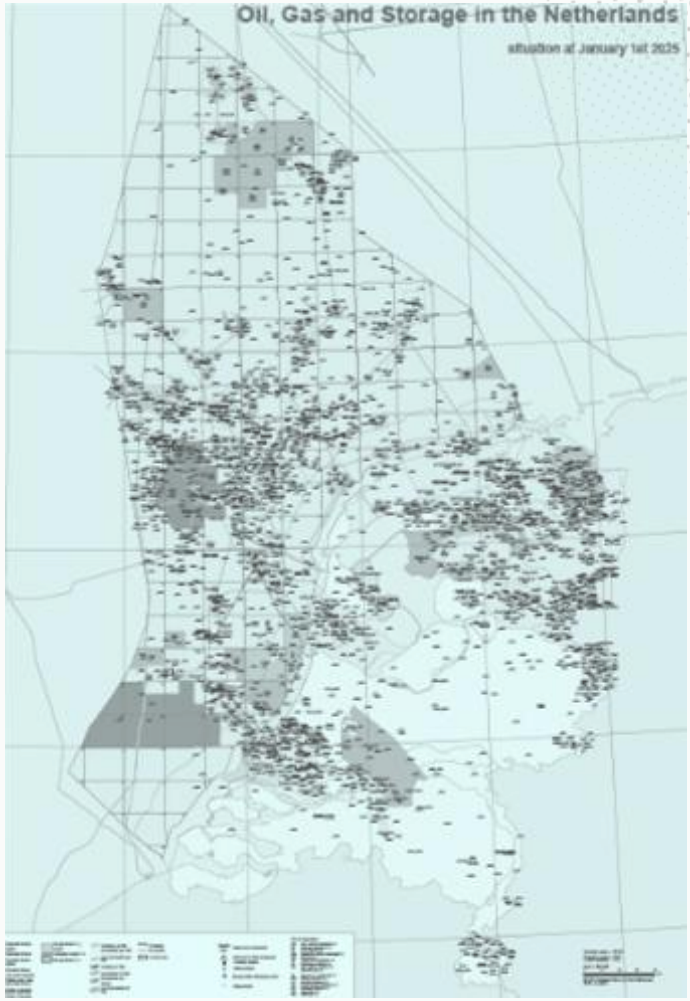


Photo: © Siebe Swart Image: © TNO

as well as non-physical: knowledge and community

Knowledge infrastructure

The Netherlands has a **well-developed knowledge infrastructure**. While small in geography, the country is big when it comes to (technical) universities, research institutes and a highly educated workforce. **It ranks #5 in the IMD World Talent Ranking.**

Dynamic community

The decades of experience in CCS and CCU have shaped a **well-established yet dynamic market**, creating an environment where established players interact with emerging companies, while others exit the space. See Innovation section for examples.

Industrial ecosystem

The **legacy of collaboration with corporate R&D** in the oil & gas, chemical, agri, food, maritime & offshore industries enables an **interconnected industrial ecosystem**. Strong industry bodies bring professionals together.

#5 in IMD World Talent Ranking 2025

Country	2020	2021	2022	2023	2024	2025
Switzerland	1	1	1	1	1	1
Luxembourg	3	3	7	2	3	2
Iceland	4	7	3	3	6	3
Hong Kong SAR	14	11	14	16	9	4
Netherlands	10	9	9	5	8	5
Sweden	5	2	2	10	4	6
Singapore	9	12	12	8	2	7
Denmark	2	5	5	7	5	8
UAE	24	23	21	22	17	9
Austria	6	6	8	9	10	10

Image: © IMD World Talent Ranking 2025 Photo: Femke Perlot-Hoogeveen; Innovation Quarter

4 | Value proposition

“The Netherlands is a country of
First-of-a-Kind CCUS projects.
Building on supportive infrastructure,
an innovation mindset

Photo: ©PorthosCO2

Dutch companies can leverage decades of experience…

1975: L10 produces first gas

The year 2025 marks **50 years of North Sea offshore energy production**. Today, the region drives research and innovation in offshore wind, solar, hydrogen, and marine ecology, while the Dutch maritime & offshore industry operates worldwide, including in CO_2 transport and storage.

In 2004 the **K12-B CO_2-storage pilot** was the first site in the world where CO_2 was reinjected into the same natural gas reservoir from which it originated.

That year the **CATO programme** was founded by 17 partners with an interest in CCS. The programme has run since and is a **key foundation** for the leading international position of Dutch CCS research.

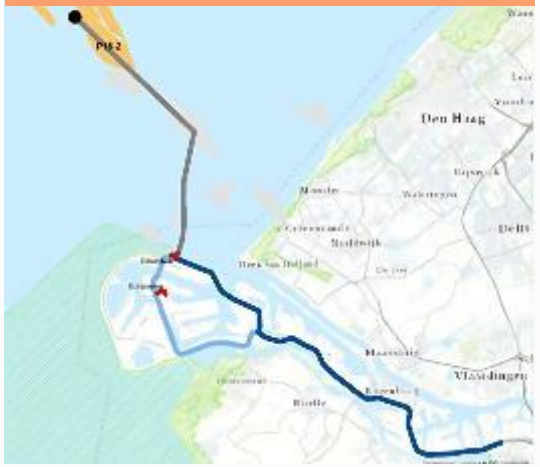
2004: K12-B and CATO

2007-2021: Abandoned projects

In 15 years three CCS projects were initiated and abandonned: Barendrecht, ROAD and Athos. Although unrealised, **the projects have resulted in a body of technical and non-technical research results** regarding facilities (topside, pipelines), injectivity, subsurface modelling, chemical behaviour, commercial model development, public-private partnerships and environmental impact assessments.

Haskoning has extensive and in-demand experience with **full value chain poject roadmaps** and Environmental Impact Assessments. The firm has advised the Porthos project from the outset including on **technical design, regulations, planning to FID, governance, risks and stakeholder engagement**.

2018: Roadmap and EIA



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… for new applications in the maritime & offshore industries

Carbon Collectors
CO_2 Direct Injection vessel
Basin Test at MARIN

CarboTreat
Ship-based CO_2 capture
on board HMC's Sleipnir

Boskalis
Dredging pipeline trench
from coast to platform

Allseas
CO_2 offshore pipelaying
from coast to platform

Mokveld Valves
CO_2 Injection Chokes for
Porthos offshore platform

Wagenborg
CO_2 transport vessel for Ineos /
Greensand (Denmark)

Dutch industry has always thrived on global trade. Companies actively seek partnerships, joint ventures, and collaborative projects to scale carbon management where it's needed – from across Europe to the Middle East, Asia and Latin America.

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… and award-winning capture technology innovations

CO_2 CleanUp
DAC for permanent storage or use by SCW Systems

CarboPac-C
Carbon capture from combustion flue gas by Bright Renewables

Colorado Flow Loop Flowing CO_2 test facility at TNO Rijswijk

Paebbl
CO_2 mineralisation and supplementary cementitiouos material

- The chemical industry dates back to the 19th century with significant growth since the early 20th century.
- **R&D** on capture, onshore and offshore transport, utilisation, geological storage and removal by knowledge institutions, corporates and SMEs build on this foundation, also in international collaborations.
- **Strong chemical expertise** from refineries and chemical industry provides a foundation for **carbon capture innovations aimed at cost reductions and safety**.

CarbonOrO / TNO
Mobile carbon capture plant tested at AVR Duiven

CarbyonGo
High-speed and scalable DAC units by Carbyon

Skytree Stratus
Modular low energy DAC units by Skytree

Biobased Energy, Carbon Capture, Utilisation and Storage by RWE

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4 | Value proposition

“The Netherlands is a country of First-of-a-Kind CCUS projects. Building on supportive infrastructure, an innovation mindset and enabling government,

Photo: ©Ministry of Economic Affairs

The Dutch government actively enables CCUS progress…

The **2019 Climate Agreement** enabled government **support for CCS**, demonstrating a shared industry and government understanding that ambitious 2030 emissions reduction goals for industry are heavily dependent on CCS projects proceeding on time.

Political backing is highly visible with the **clear mandate for state-owned companies like EBN, Gasunie and Port of Rotterdam** for CO_2 transport and storage and the encouragement of public-private-collaboration.

In addition the Dutch government offers **subsidies to develop CCS, CCU and CDR technologies**, covering fundamental research, feasibility studies, test, pilot and demonstration projects.

The Dutch government **adapted the existing subsidy scheme SDE++** allowing CO_2 emitters from hard to abate industry and waste to-energy plants to apply for a subsidy.

Most recently the Dutch government has shown its strong support to developing a European CO_2 transport and storage network by **providing financial backing to the Aramis project**.

Dutch CCS projects can also **count on European support**. Porthos has been recognised as a “Project of Common Interest” and receives co-funding by the EU’s Connecting Europe Facility.

… engaging with public and private stakeholders

2023: Minister Micky Adriaansens signs MoU for CO_2 transport and storage with Belgian counterparts

2024: Minister Sohie Hermans launches Porthos with EBN, Port of Rotterdam CEO and Mayor

2025: Members of Parliament responsible for energy & climate visit Porthos construction sites and meet with Porthos and Aramis representatives

2024: Denmark, Norway, Belgium, Sweden and The Netherlands agree on cross-border CO_2 transport and storage

2024: Minister Sophie Hermans signs MoU with Norwegian colleague Astrid Bergmål on hydrogen and CCS cooperation

2025: H.M. Queen Máxima officially opens Twence CO_2 capture plant and is shown around the facility

2025: Deputy DG Trade & Economic Security Yvette van Eechoud visits Hamburg Expo

4 | Value proposition

"The Netherlands is a country of First-of-a-Kind CCUS projects. Building on supportive infrastructure, an innovation mindset and enabling government, Dutch companies can leverage decades of carbon management R&D and deployment to support international partners in achieving net-zero targets."

Photo: © PorthosCO2

The Netherlands: Carbon tech innovation hub.

- Porthos
- Aramis
- CO_2Next
- Twence
- OCAP
- Delta Rhine Corridor
- Delta Schelde CO_2nnection

"The Netherlands is a country of First-of-a-Kind CCUS projects. Building on supportive infrastructure, an innovation mindset and enabling government, Dutch companies can leverage decades of carbon management R&D and deployment to support international partners in achieving net-zero targets."

- North Sea and North Sea ports
- Natural gas infrastructure
- Knowledge infrastructure
- Dynamic community
- Interconnected industrial ecosystem

- 100+ years of chemical industry.
- 50+ years of offshore energy activities
- 20+ years experience with CO_2 storage
- Optimally integrated industrial cluster.
- R&D on capture, transport, utilisation, storage and removal by knowledge institutions, corporates and SMEs

- Regulatory framework tailored to CCUS deployment
- Subsidies to scale CCS, CCU and CDR technologies
- Political backing to mandate state-owned companies with CO_2 transport and storage and encourage public-private-collaboration

Photo: © PorthosCO2

The Netherlands:

Partnering with organisations from the Dutch CCUS business and innovation community means accelerating your transition to low emissions operations with dependable, forward-thinking allies.

Whether you need technology deployment, infrastructure design, or system integration, Dutch firms are ready to deliver at scale to each link in the CCUS chain.

Carbon tech innovation hub.

Team

Client

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