Carbon Capture and Storage: ports as intermediary between CO2 emitters and storage

ESPO Conference Paris 2024

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Climate action!

About us: Bellona Europa is an independent non-profit organisation that meets environmental and climate challenges head on. We are solutions-oriented and have a comprehensive and cross-sectoral approach to assess the economics, climate impacts and technical feasibility of necessary climate actions. To do this, we work with civil society, academia, governments, institutions, and industries.

Nearly a decade of Bellona Europa's work on ports as decarbonisation hubs...

BELLONA EUROPA

Published in 2016

...and over three decades of work on CCS

While Statoil was working to solve the CO_2 problem at Sleipner, Bellona came across a Statoil note that triggered Bellona's founder Frederic Hauge. Already in 1992, Bellona and Sintef started a discussion about CCS.

Bellona founder Frederic Hauge has been talking about CCS since 1992. Photo: Photo: Anne Karin Saether/Bellona

About the project

Ports2Decarb

Getting to net zero faster with ports as decarbonisation hubs

- Launched by Bellona in October 2023
- **Purpose: define and amplify the role of ports in delivering industrial decarbonisation solutions**, primarily CO2 capture, transport, and storage (CCS).
- Funded by FedEx

Source: https://www.un.org/en/climatechange/paris-agreement

SPECIAL REPORT ON GLOBAL WARMING OF 1.5°C, 2018

ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

'LIMITING GLOBAL WARMING TO 1.5°C REQUIRES RAPID, FAR-REACHING AND UNPRECEDENTED CHANGES IN ALL ASPECTS OF SOCIETY'

Global net zero CO_2 emissions by 2050 (carbon neutrality)

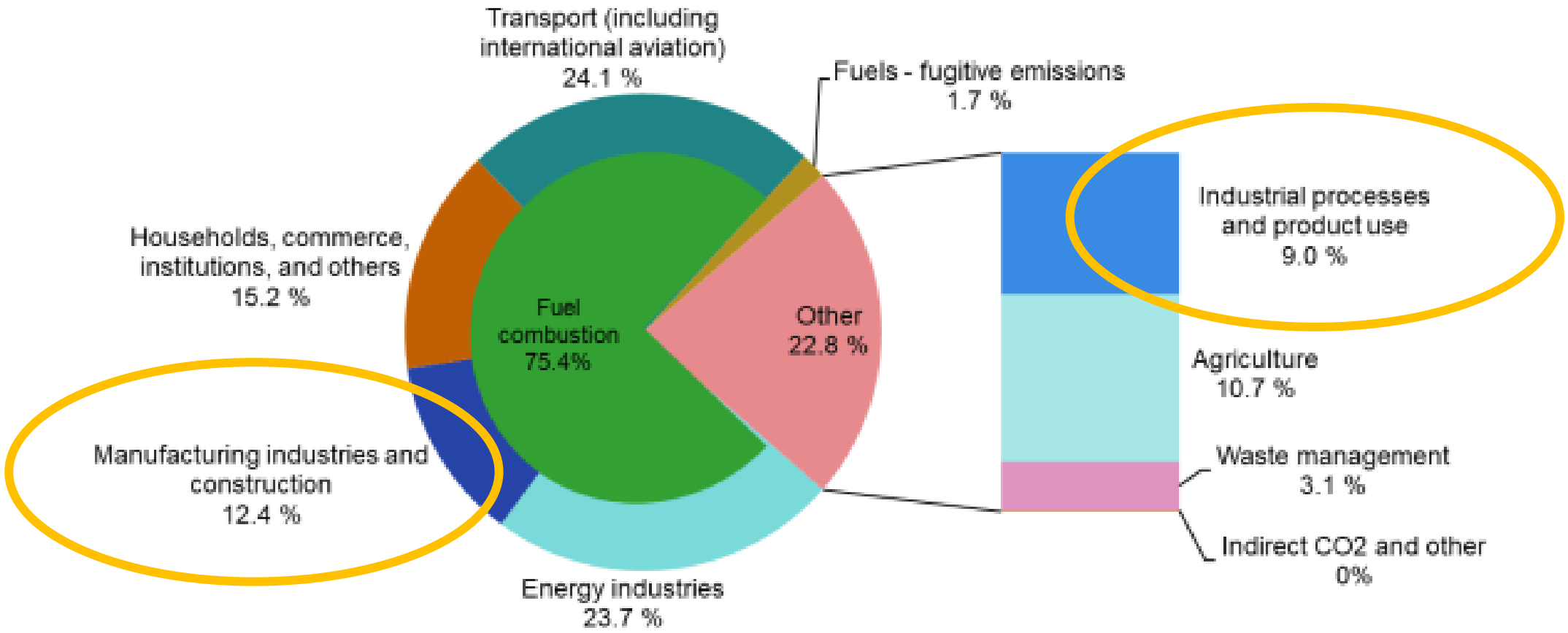
CO_2 emissions need to decline 40-60% from 2010 levels by 2030

Renewables supplying 70-85% of global electricity by 2050

Required energy system investment of around $2.4 trillion every year until 2035

Source: IPCC, https://www.ipcc.ch/report/infographic/worlds-apart/

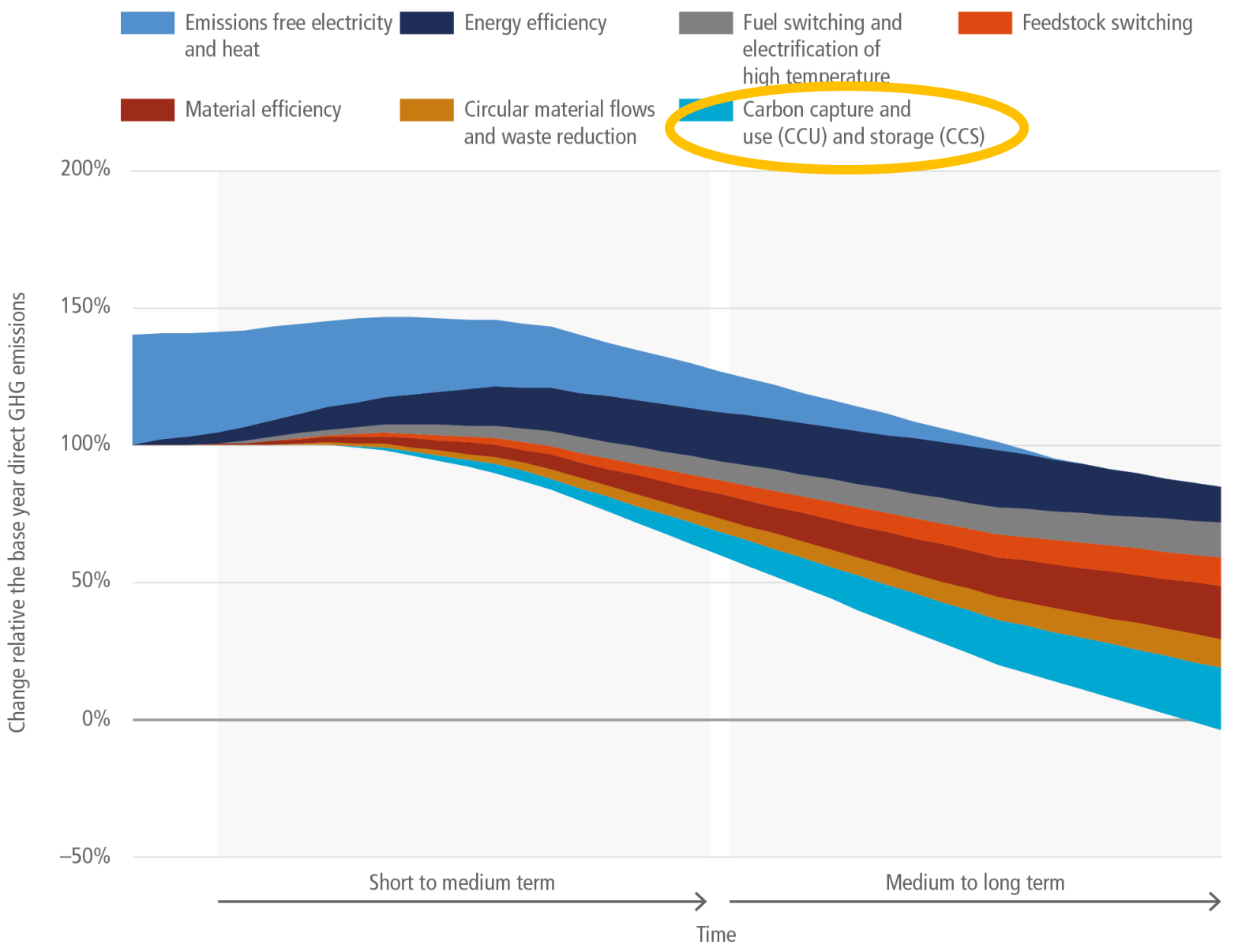
Industry represents around 20% of EU GHG emissions



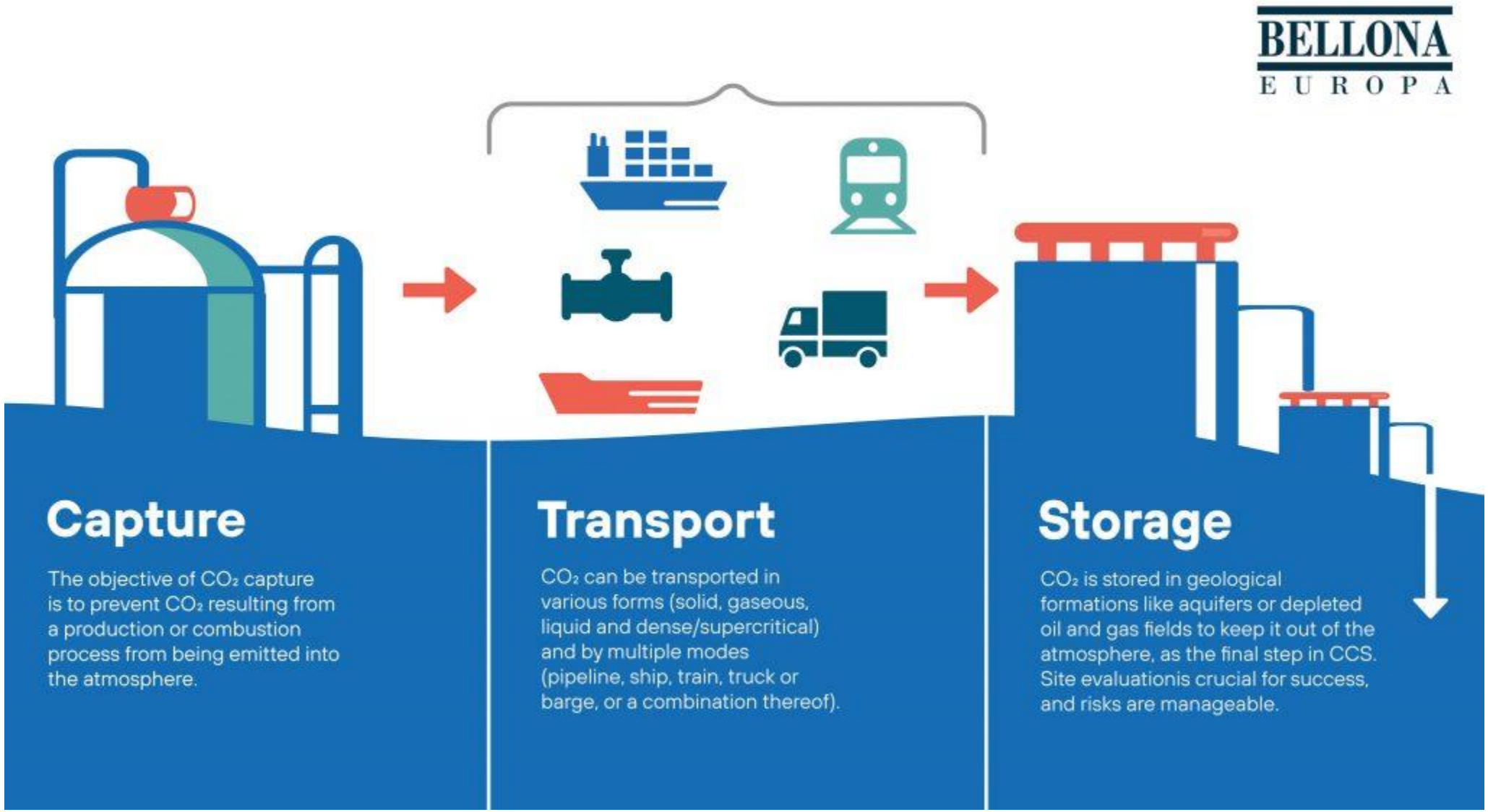
Source: EEA, republished by Eurostat (online data code: env_air_gge)

eurostat

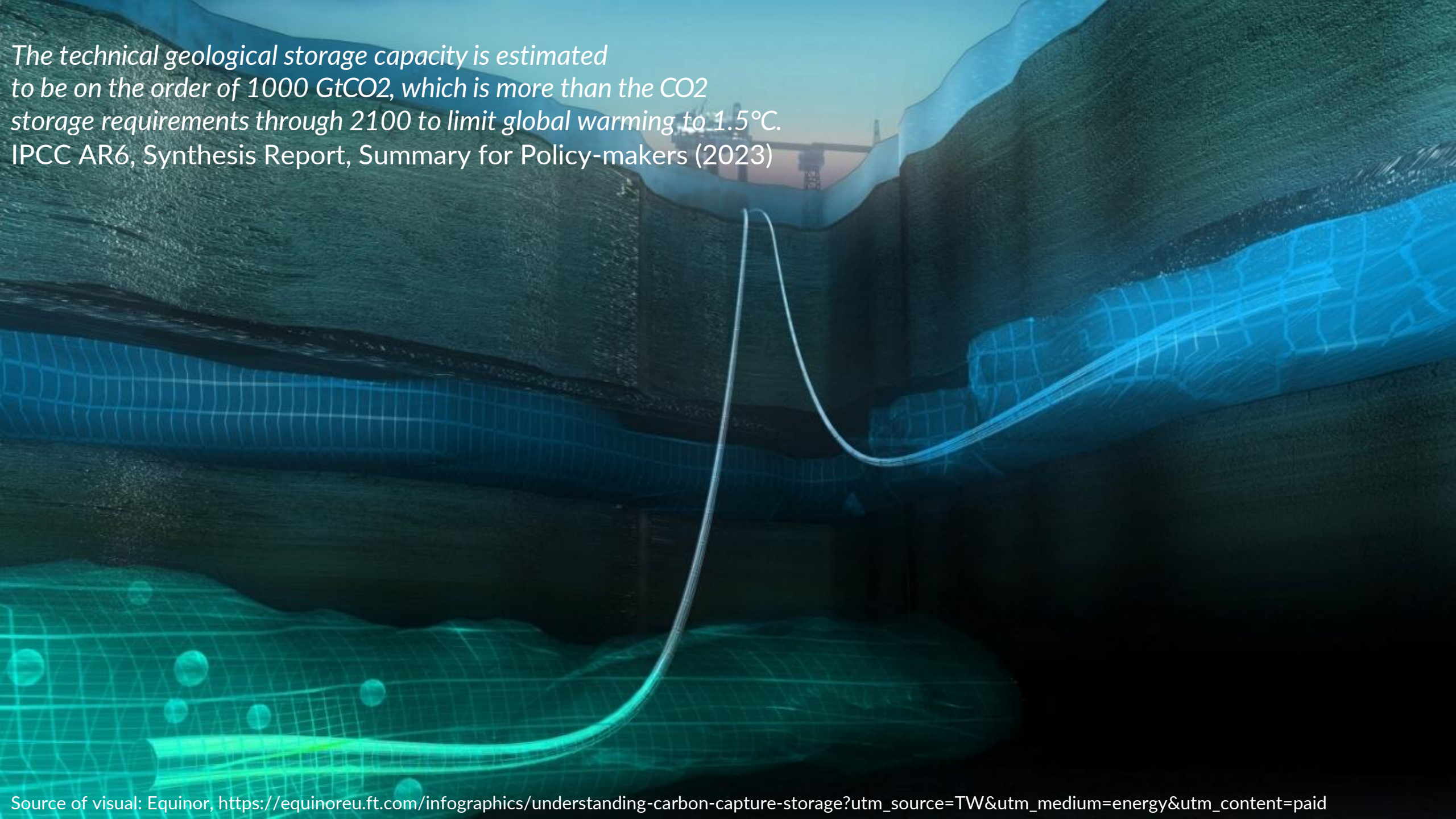
How to cut industry emissions



Source: IPCC AR6,
https://www.ipcc.ch/report/ar6/wg3/chapter/chapter-11/



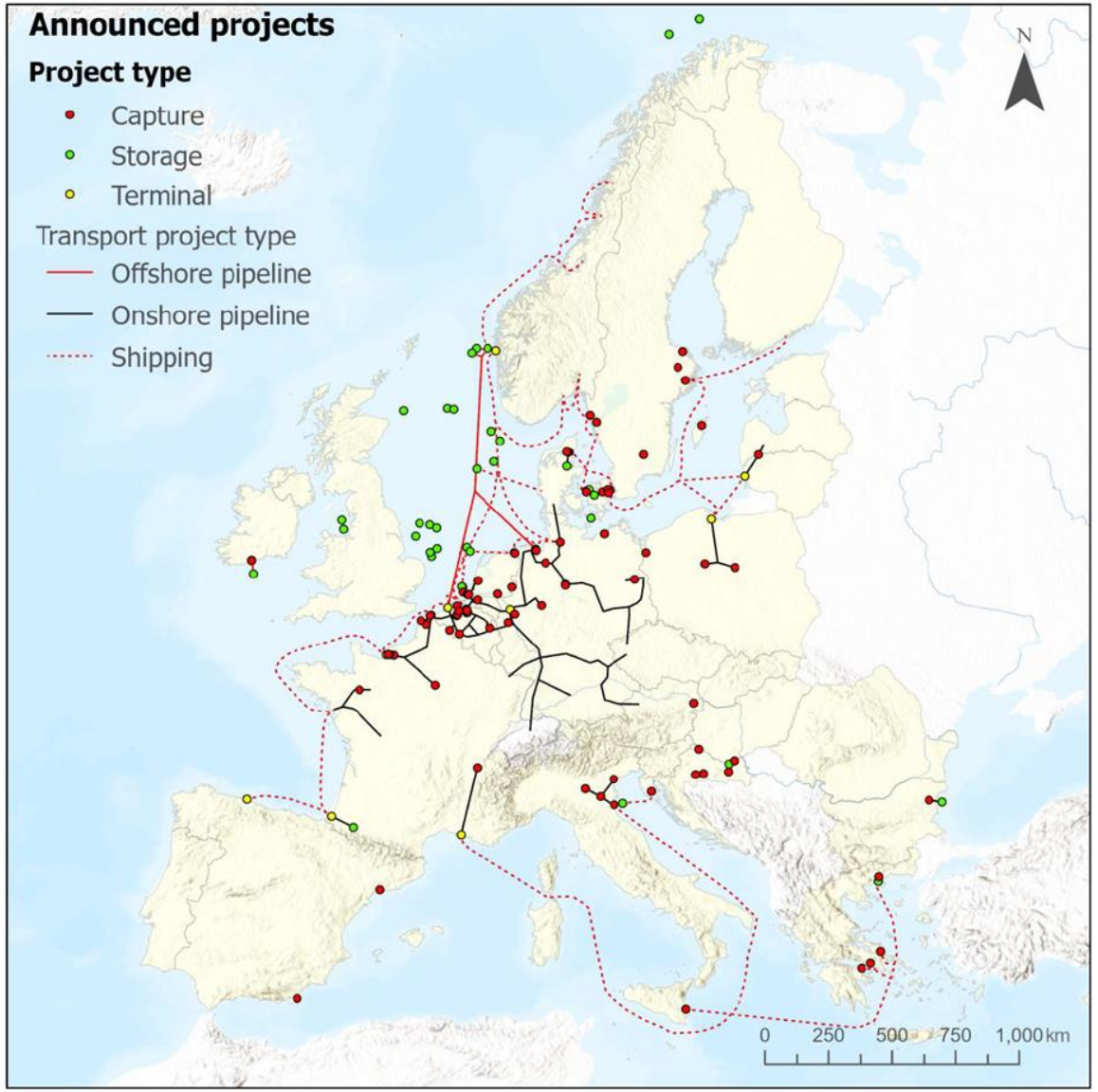
Source: Bellona Europa CCS Explainer
https://bellona.org/news/eu/2023-06-carbon-capture-and-storage-a-crucial-piece-of-the-puzzle-in-industrys-path-to-net-zero



The technical geological storage capacity is estimated to be on the order of 1000 GtCO2, which is more than the CO2 storage requirements through 2100 to limit global warming to 1.5°C.
IPCC AR6, Synthesis Report, Summary for Policy-makers (2023)

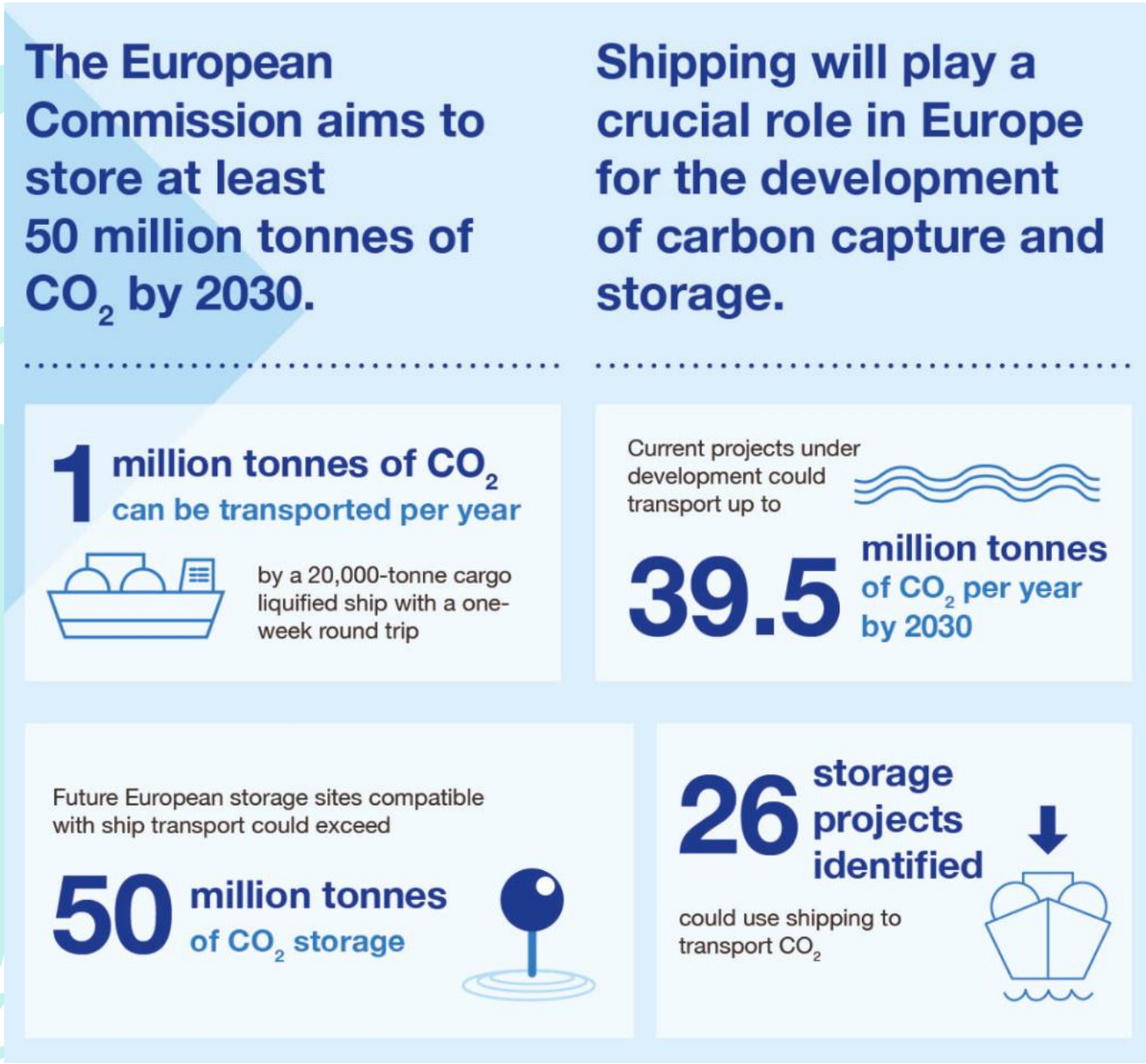
Source of visual: Equinor, https://equinoreu.ft.com/infographics/understanding-carbon-capture-storage?utm_source=TW&utm_medium=energy&utm_content=paid

How future CO2 network might look like



Source: JRC, Shaping the future CO2 transport network for Europe", 2024

Up to 50 CO2 carriers might be needed by 2030 for European CCS projects



Source: *Achieving a European market for CO2 transport by ship* – report by ZEP and CCSA
https://zeroemissionsplatform.eu/co2-transport-by-ship-market/

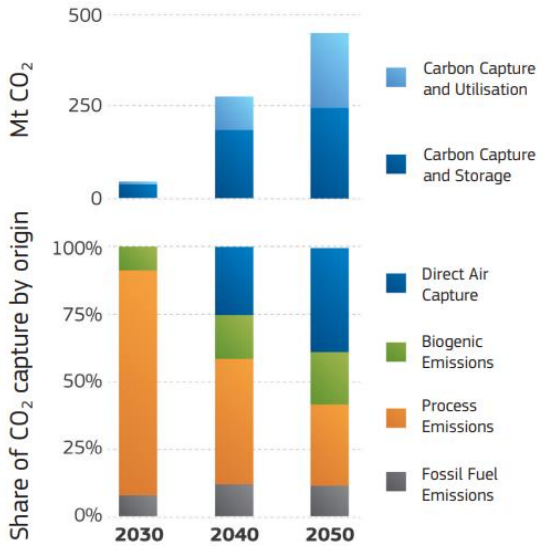
EU Industrial Carbon Management Strategy

Achieving our ambitious climate targets requires a significant reduction in CO_2 emissions in the coming years. While much of this can be achieved through investing in energy efficiency and renewable energy, we will also need technologies that can capture and store CO_2, or utilise it. This will be particularly important in sectors where it is the most challenging to reduce emissions, such as cement and waste-to-energy.

To reach the recommended **90%** net emissions reduction by 2040 and climate neutrality by 2050, the EU will need to be ready to capture:

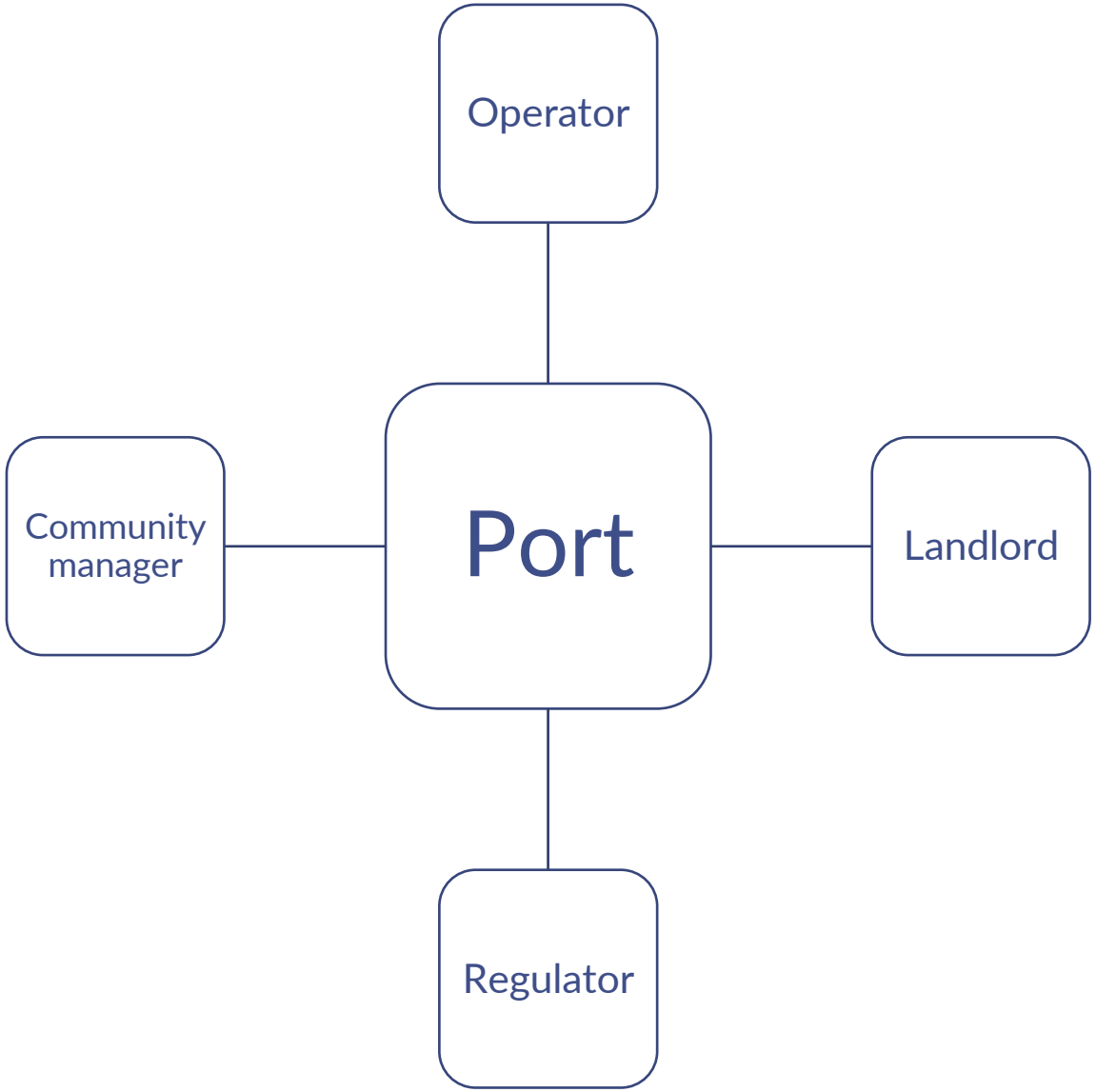
- at least **50 million tonnes** of CO_2 per year by 2030,
- approximately **280 million tonnes** by 2040,
- and around **450 million tonnes** by 2050.

This will also require **removing CO_2 from the air**.



Source: European Commission, https://op.europa.eu/en/publication-detail/-/publication/ae697359-d210-11ee-b9d9-01aa75ed71a1/language-en?WT.mc_id=Searchresult&WT.ria_c=37085&WT.ria_f=3608&WT.ria_ev=search&WT.URL=https%3A%2F%2Fenergy.ec.europa.eu%2F

What roles for ports in CCS?



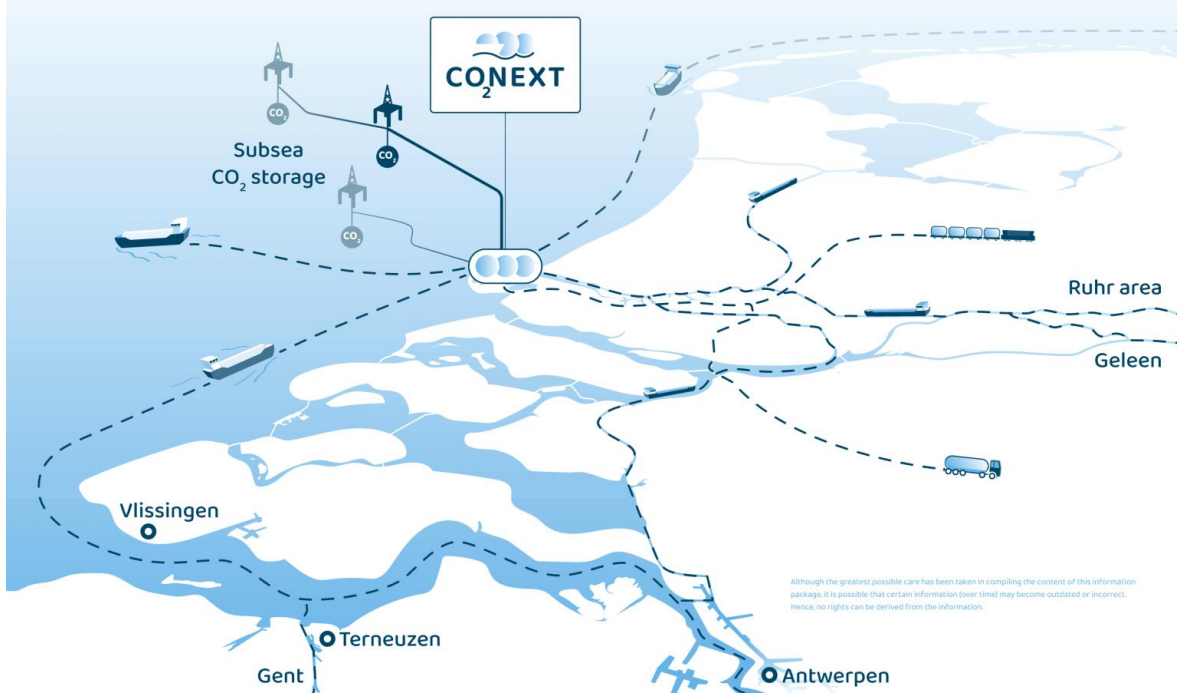
Source: Hendriks, C., de Gooyert, V, 2023. *Towards sustainable port areas: dynamics of industrial decarbonization and the role of port authorities.*

Ports logistical functions in CCS networks

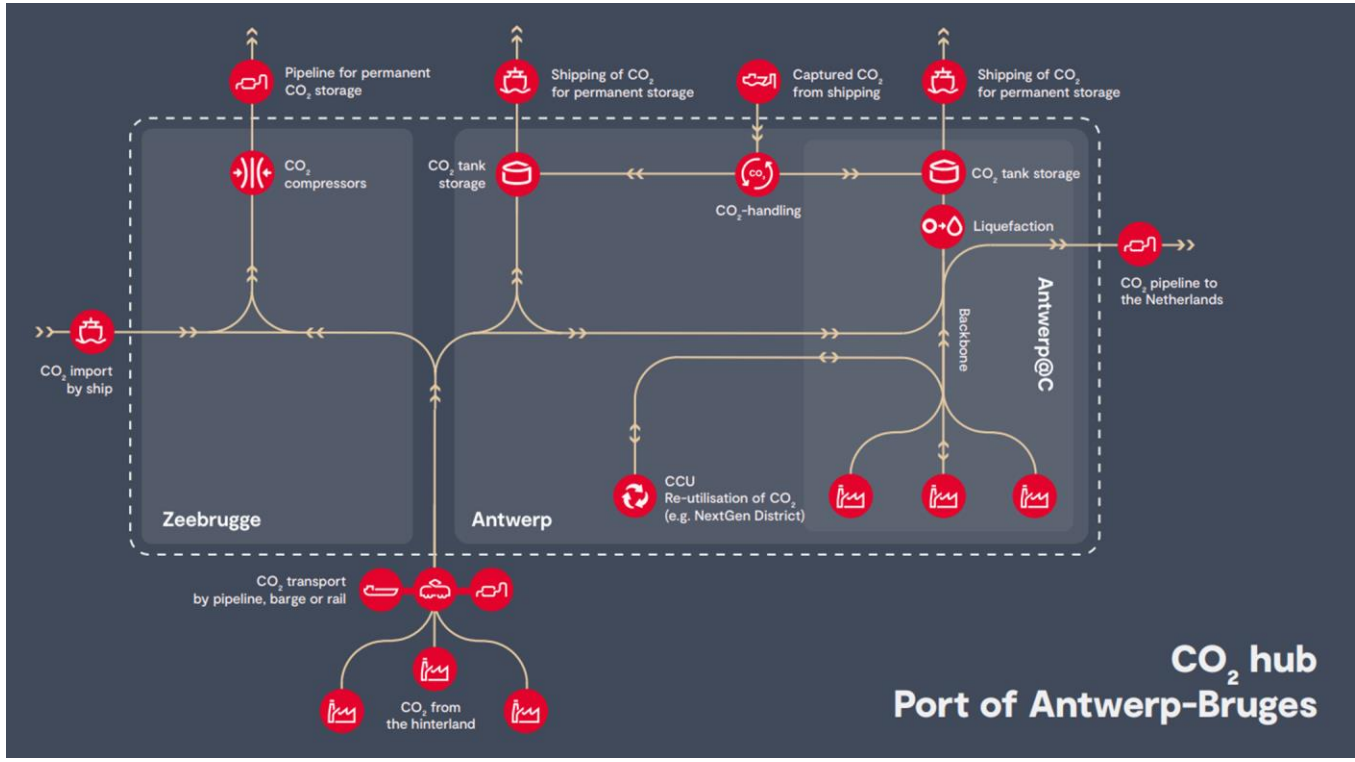
Selected examples based on public information

Port	Project name	Collect CO2 from onsite emitters	Receive CO2 from external and/or inland emitters	Import terminal	Export terminal	Pipeline to storage or to another port/hub
Antwerp-Bruges	Antwerp@C	yes	yes	yes	yes	yes
Rotterdam	Porthos Aramis CO2Next	yes	yes	yes	yes	yes
Dunkirk	Dartagnan Dunkirk Hub	yes	yes	no	yes	yes
Øygarden	Northern Lights	no	yes	yes	no	yes
Gdańsk	ECO2CEE	no	yes	yes	yes	no
Klaipeda	Baltic CCS Consortium	no	yes	no	yes	no
Hirtshals	Greenport Scandinavia	no	yes	no	yes	no

Examples of a port-centred CO2 infrastructure hubs



Source: https://co2next.nl/study/



13 out of 14 Projects of Common/Mutual Interest (PCI and PMI) selected by the European Commission in 2023 in the CO2 networks category are directly or indirectly linked to ports

CO2 projects included in the 1st PCI/PMI list

Project name	Countries involved	
EU2NSEA - EU2NSEA ('EU to North Sea')	NO, BE, DK, FR, DE, NL, CH, LV, PL	
Geothermal CCS	HR, HU	
Nautilus: North Europe CO2 Liquefaction Transport and Storage project	FR, DE, NL, DK, NO, IS	PMI
Northern Lights European CO2 Transport EcoSystem (N-LiTES)	NO, FR, BE, UK, NL, DE, PL, SE	PMI
Norne	DK, SE, BE, UK	onshore
Prinos CO2 Storage	EL, BG, CY, HR	
PYrenean CO2 Abatement through Sustainable Sequestration Operations ('PYCASSO')	FR, ES	onshore
Aramis Cross Border CO2 Transport and Storage	NL, DE, BE, FR	
Bifrost	DK, DE, PL, SE	
CALLISTO ('CArbon Liquefaction, transportation and STOrage') - Mediterranean CO2 Network	FR, IT	
CCS Baltic Consortium	LT, LV	
CO_2TransPorts	NL, BE	
Delta Rhine Corridor	NL, DE, BE	
ECO2CEE	PL, LT	

Connecting Europe Facility funding for ports CO2 infrastructure

1 The port of Dunkirk
€189 million for the construction of a **CO2 collecting pipeline** and an **export terminal**

2 The port of Rotterdam
€157 million for CO2NEXT **import terminal** for the reception of and of a 200 km undersea **trunkline** (Aramis project) connecting the port to the future CO2 storage site in a depleted gas field offshore.

3 The Northern Lights project
€131 million for the expansion of the **CO2 import terminal** in Øygarden in Norway and the construction of a 100 km offshore **pipeline** to the storage site.

4 The EU CCS Interconnector in Gdańsk
€2.54 million for **studies** necessary to the project implementation.

Based on grants approved in December 2023

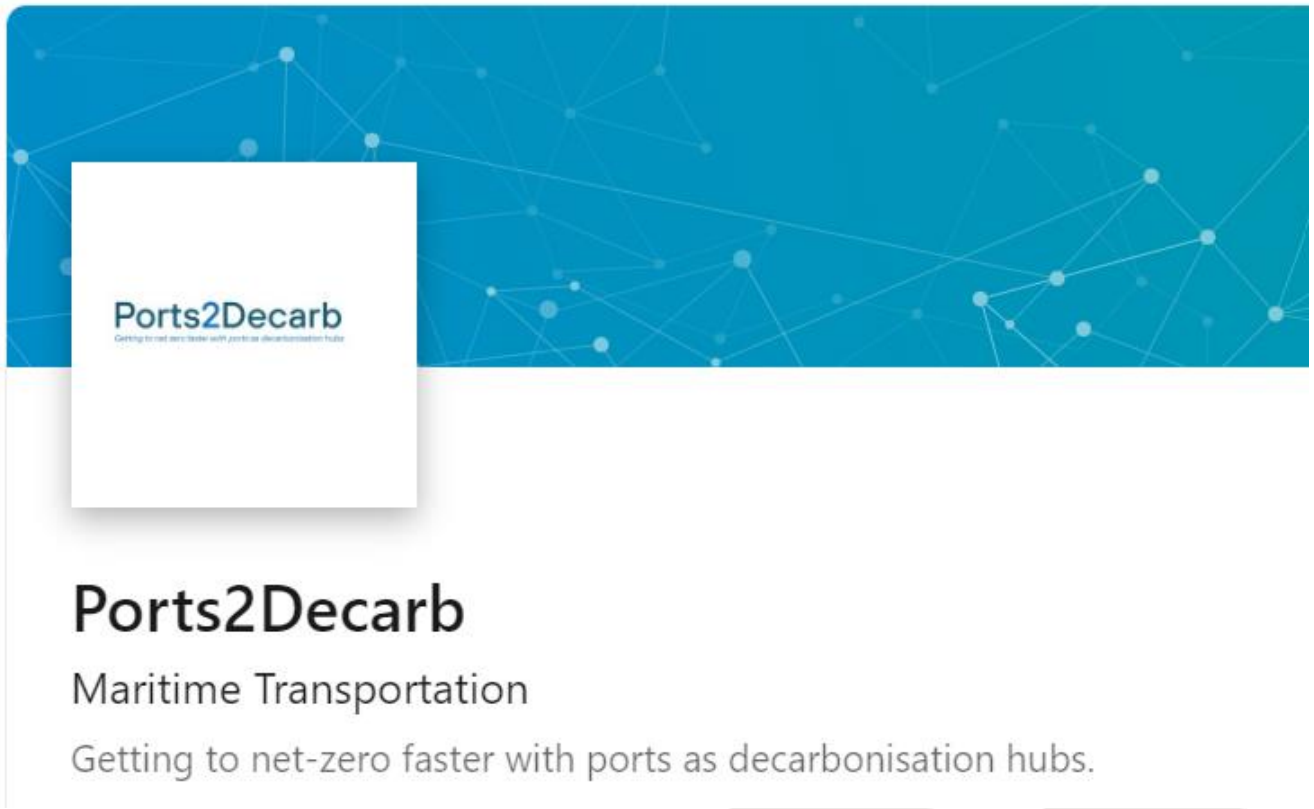
Unlocking ports CCS potential: Bellona Europa's approach

Ports2Decarb

Getting to net zero faster with ports as decarbonisation hubs

- **Collaboration** with ports, maritime sector, industrial hubs, civil society, and others.
- **Events** held at various locations, including ports.
- **Policy and Funding Solutions**: Establishing a narrative and writing a report with specific recommendations.
- **Support the implementation** of recommendations, facilitate access to funding mechanisms
- **Communication** activities for awareness-raising and knowledge-sharing

Our event in the European Parliament, 6 March 2024



As of 24 April 2024… and counting

We're on LinkedIn
https://www.linkedin.com/company/ports2decarb

GET IN TOUCH!

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