PATHWAYS TO A SUSTAINABLE PORT

Paul Smits

November 29, 2018

Port of Rotterdam

Mission:

The Port of Rotterdam Authority creates **economic and social value** by working together with clients and stakeholders on the realisation of **sustainable growth** in Rotterdam's world-class port.

Port of Rotterdam

Port in figures

Port of Rotterdam engine of the economy

- Total port area 12,643 ha (net 6,046 ha)
- Total employment 180,000 people*
- Total added value ± € 23 billion (3.3% GNP)*
- 3,000 companies
- Largest port in Europe, 10th port worldwide
- Throughput 467,4 mln tons; 13.7 million TEU (containers)
- Depth up to 75 ft (= 24 m)
- Visits: 29,646 sea-going vessels
  105,000 inland navigation

Employment

* source: Erasmus University

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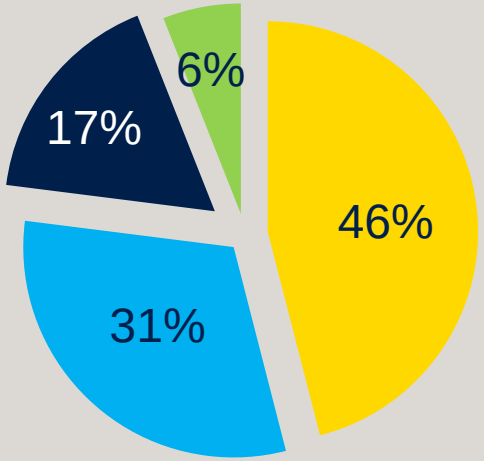
Port is dominated by fossil energy and logistics



- Liquid bulk
- Containers
- Dry bulk
- Breakbulk

2017

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THE WORLD AGREES

… reach global peaking of greenhouse gas emissions as soon as possible … rapid reductions as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century …

2˚C

above pre-industrial levels
and pursue efforts to limit temperature increase to 1.5˚C

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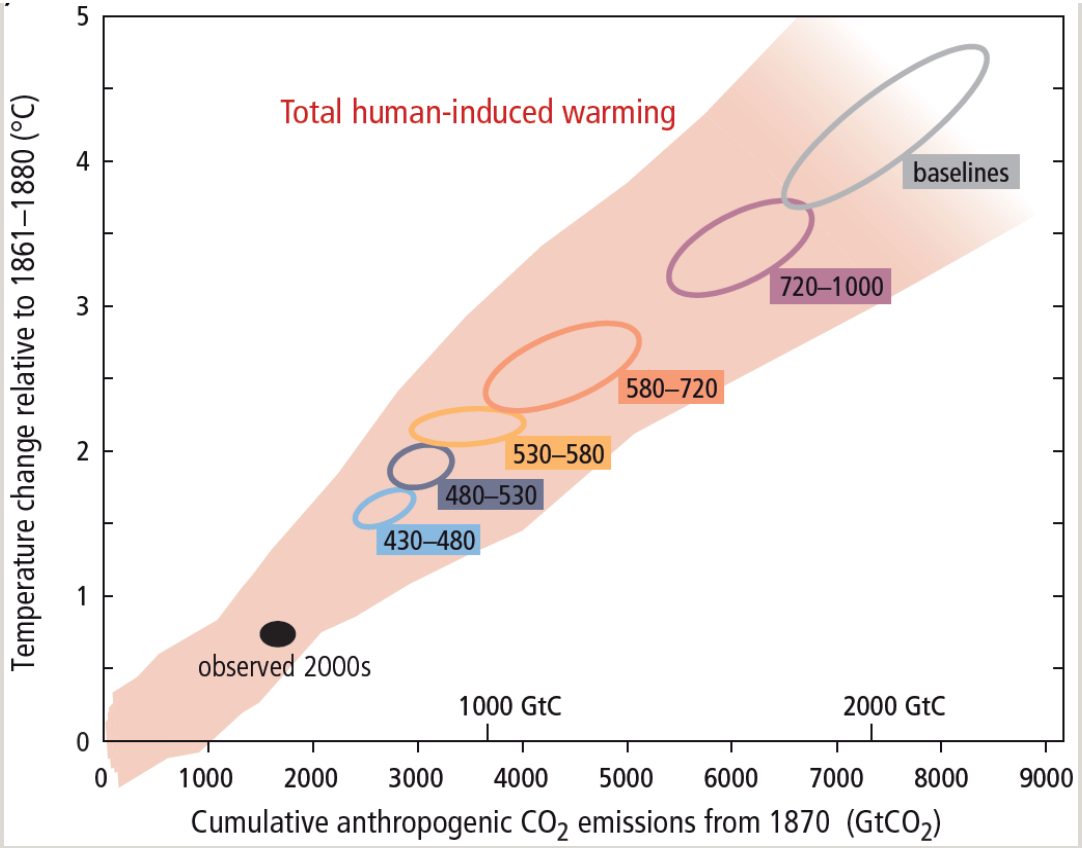
Remaining cumulative CO_2 budget <1000 Gtons



Warming versus cumulative CO_2-emissions

…limiting total human-induced warming to less than 2°C relative to the period 1861–1880 … would require cumulative CO_2 emissions from all anthropogenic sources since 1870 to remain below about 2900 $GtCO_2$… About 1900 Gt CO_2 had already been emitted by 2011.

Source: IPCC, Climate Change 2014 synthesis report

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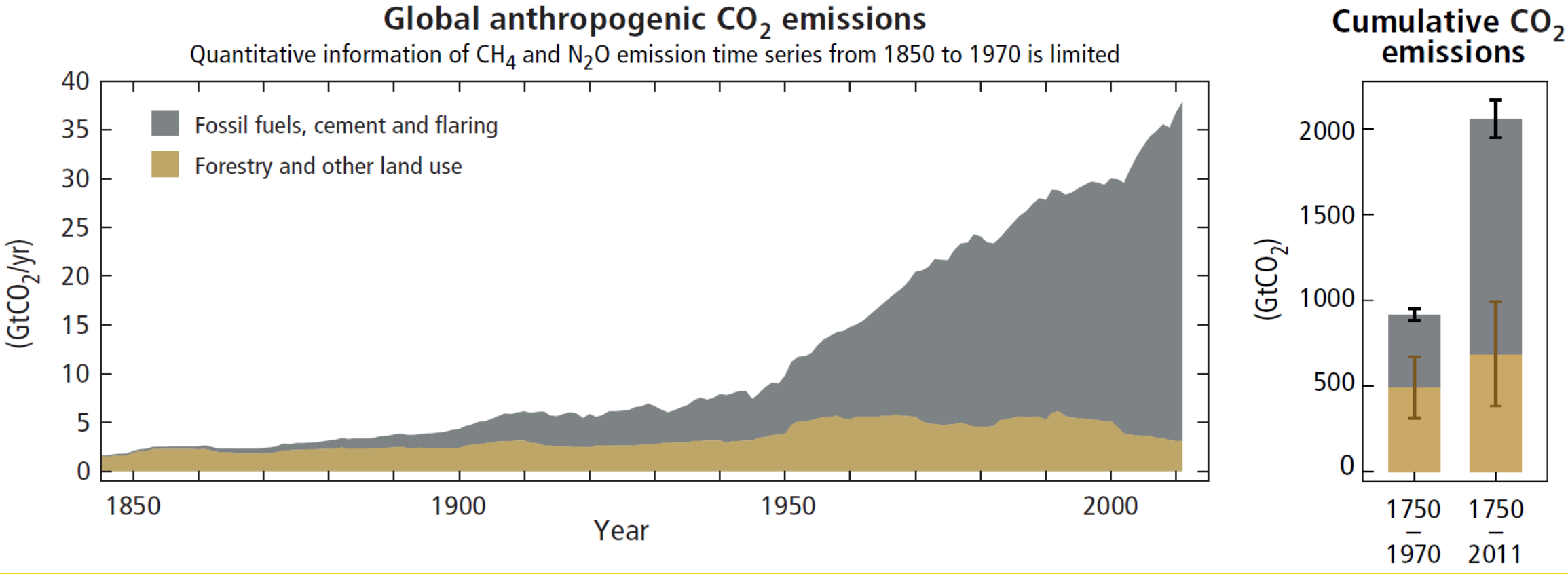
Current CO_2 emission ~35 Gtons / yr



Source: IPCC, Climate Change 2014 synthesis report

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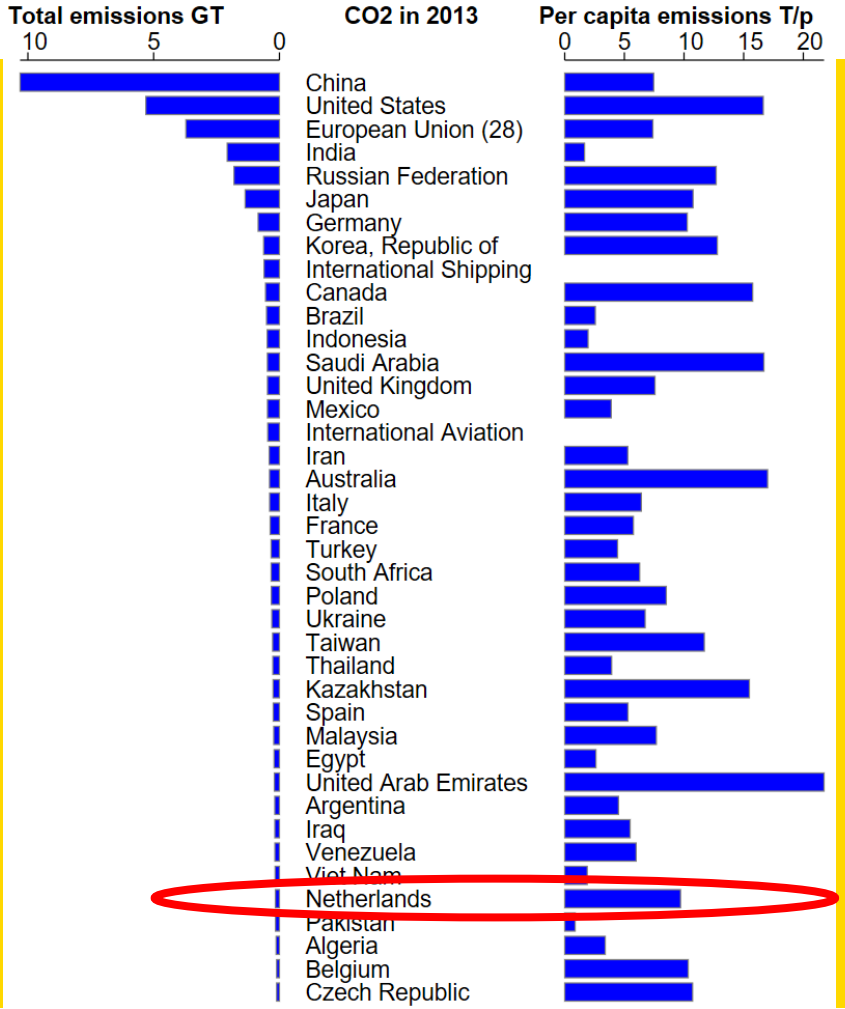
The Netherlands emits ~0.5% of worldwide CO_2 emission



Source: Wikipedia

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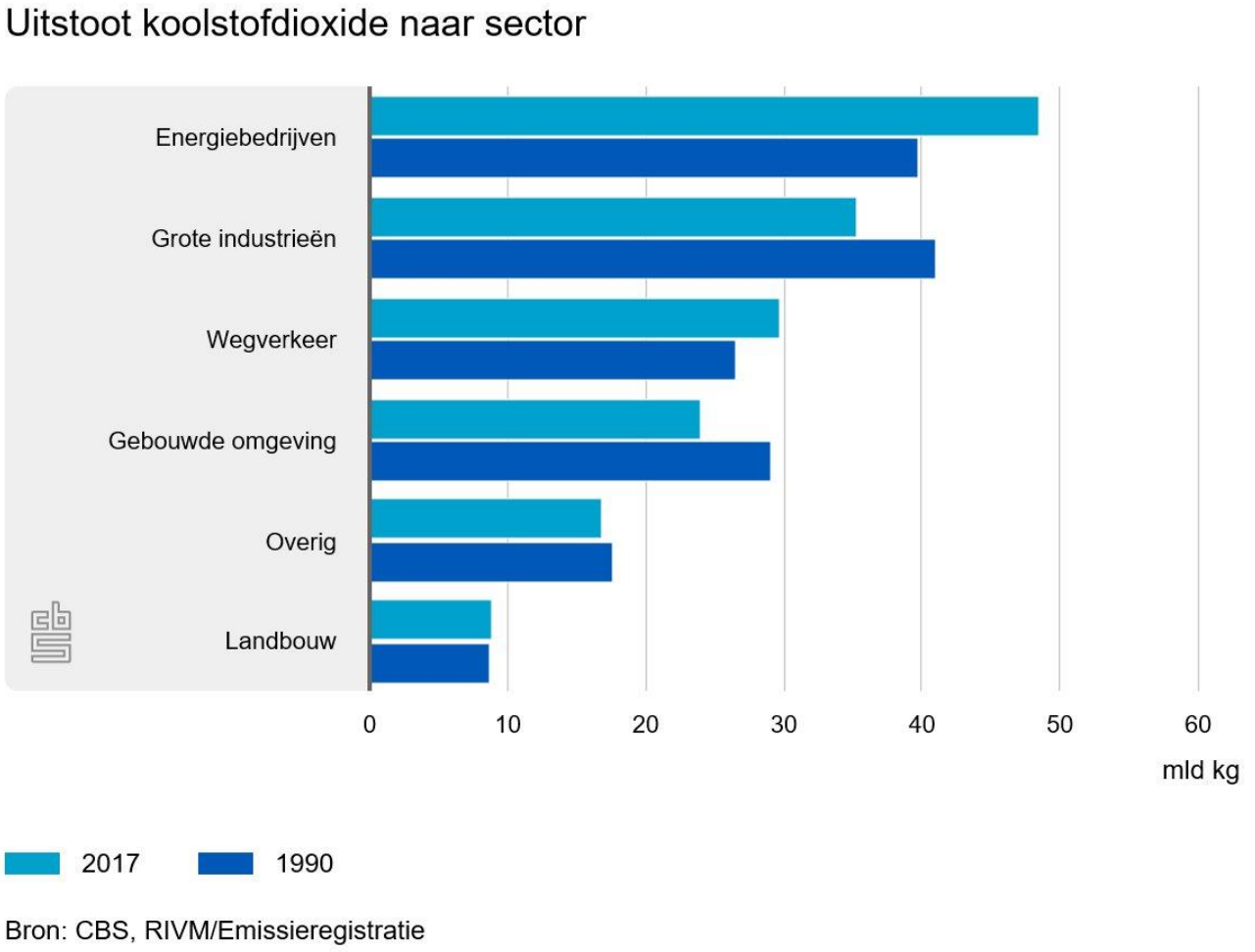
Energy sector and industry are responsible for 30% resp. 22% of CO_2 emissions in The Netherlands



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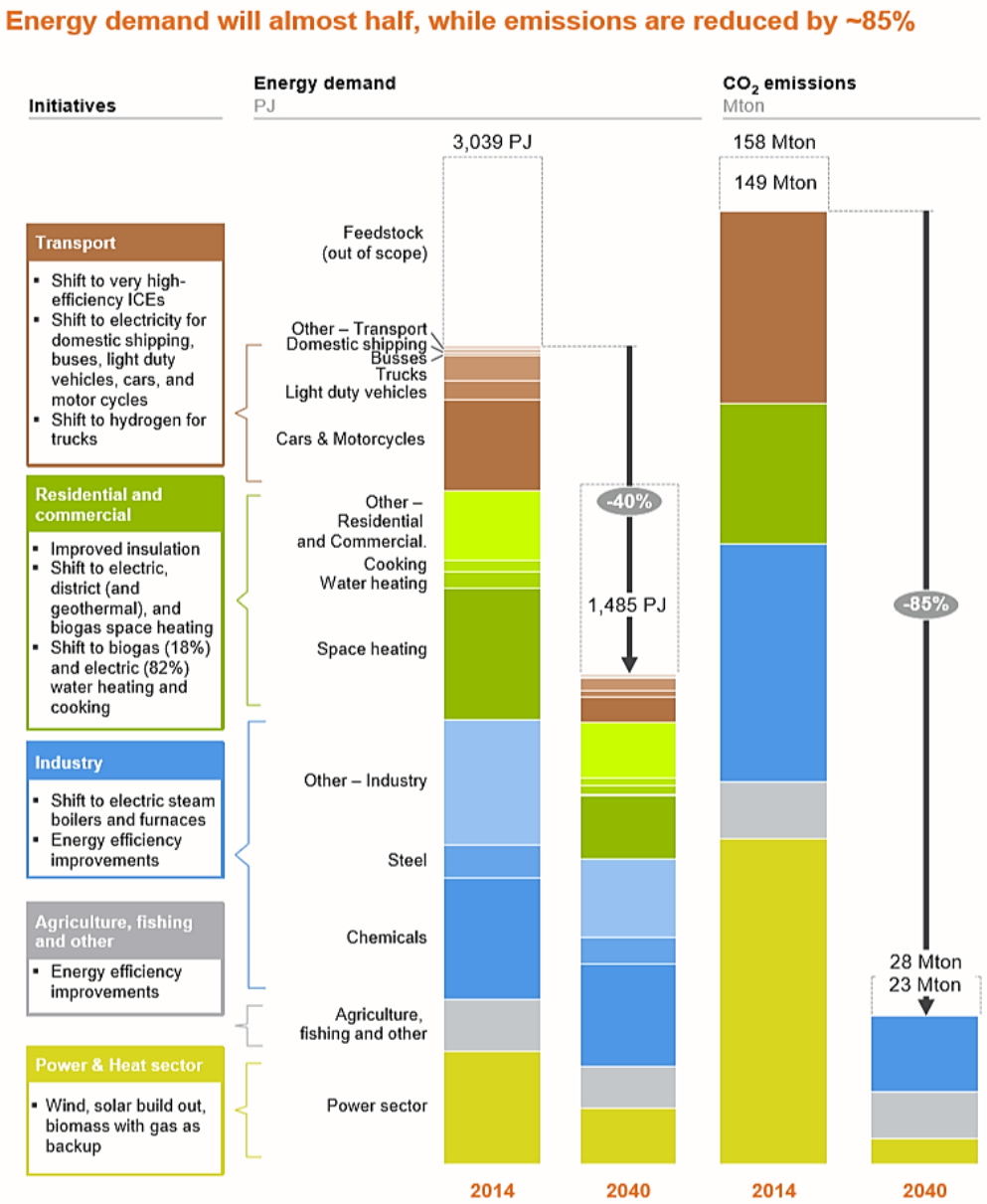

Investment of ~15 bln euro / yr needed to reduce emissions by 85% in 2040

This amounts to ~120 euro per ton CO_2 reduced

Source: McKinsey - Accelerating the energy transition: cost or opportunity?

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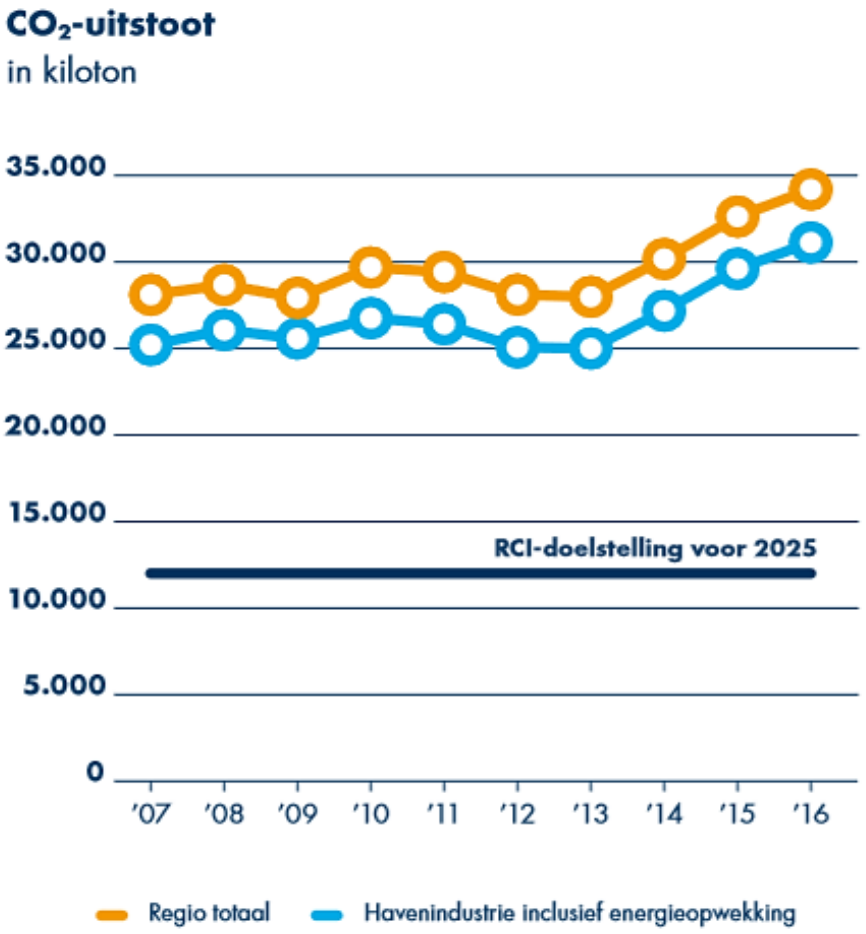
CO_2 emission in the port is ~ 32 mln tons



Has increased since 2012 because of two new coal fired power plants

Will decrease from 2017 onwards because of closure of old coal fired power plants

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THE PORT INDUSTRY IS CARBON INTENSIVE

- Crude oil
- Oil Products
- Coal
- LNG
- Waste
- Biomass

> 30 refinery processes

> 40 petrochemical processes

> 70 electricity generation units

- Fuel & Feedstock
- Products
- Natural Gas
- Electricity

20%

of the Netherlands' total CO_2 emissions

Products: fuel

5 refineries in Rotterdam:

- Shell
- BP
- Exxon
- Gunvor

Total capacity:

- 1 million barrels per day
- 50 million tonnes per year

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Products: Chemistry

Chemical industry in Rotterdam/Moerdijk

- Salt - Chlorine
- Olefins:
  Ethylene, Propylene, Butylene
- Aromatics:
  Benzene, Ortho-xylene and Paraxylene

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2017

30 Mton
CO_2 emissions
[~ 20% NL]

DECARBONISE PORT
INDUSTRY

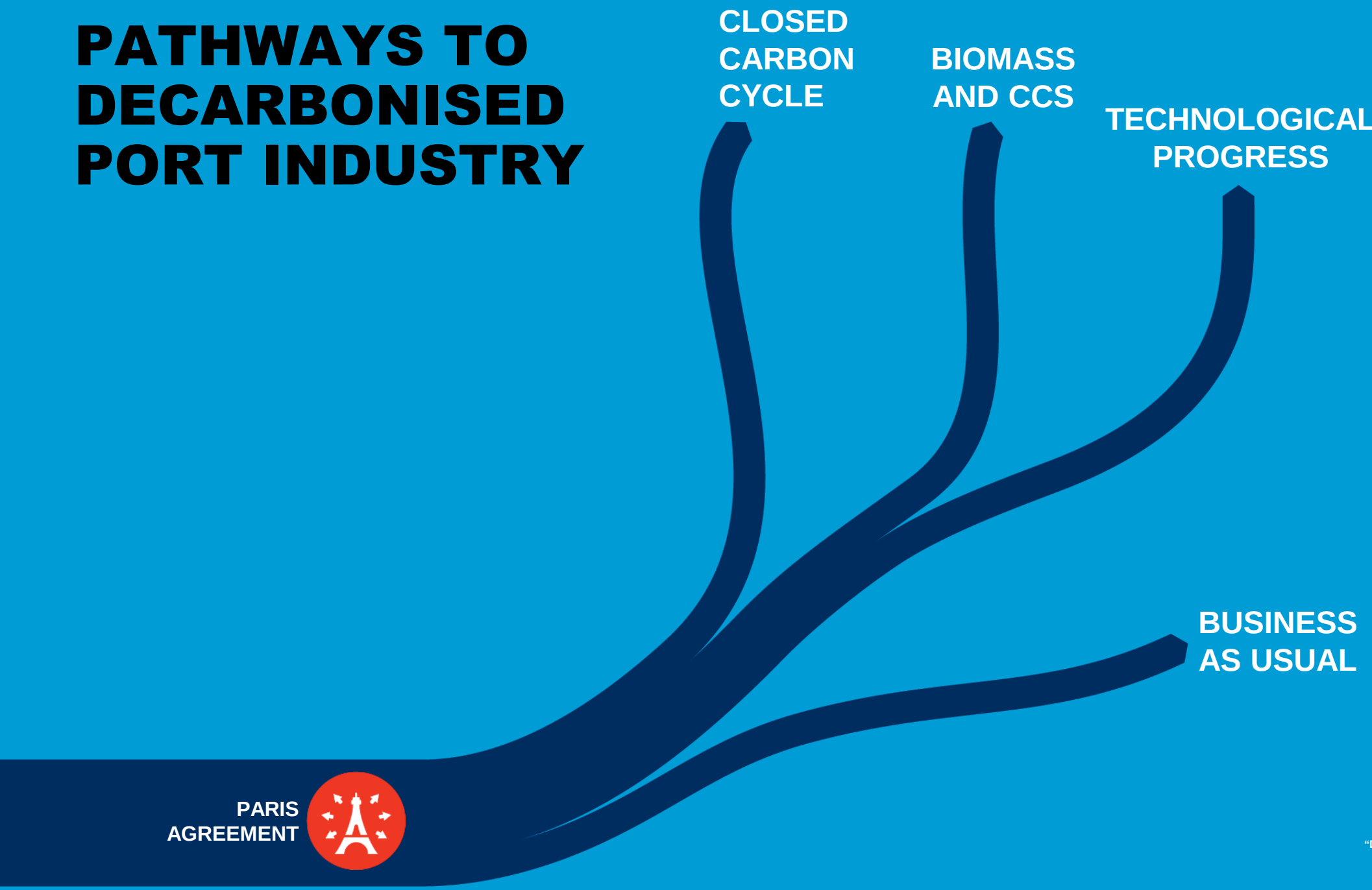
+

2018

25 Mton
CO_2 emissions

DECARBONISE PORT TRANSPORT

PATHWAYS TO DECARBONISED PORT INDUSTRY



"Decarbonization pathways for the industrial cluster of the Port of Rotterdam"
Wuppertal Institute
Simplified for clarity reasons.

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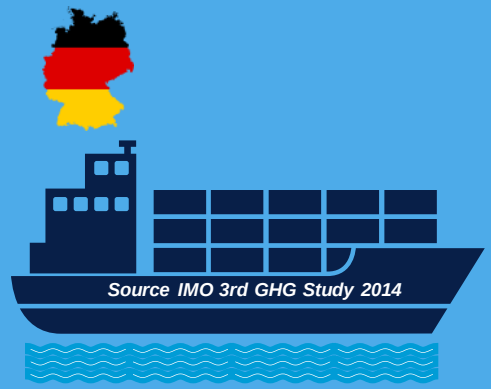
CO_2 Emissions Transport, worldwide

23%
of global CO_2 emissions

30%
caused by transport of goods

2,5%
by deep sea shipping



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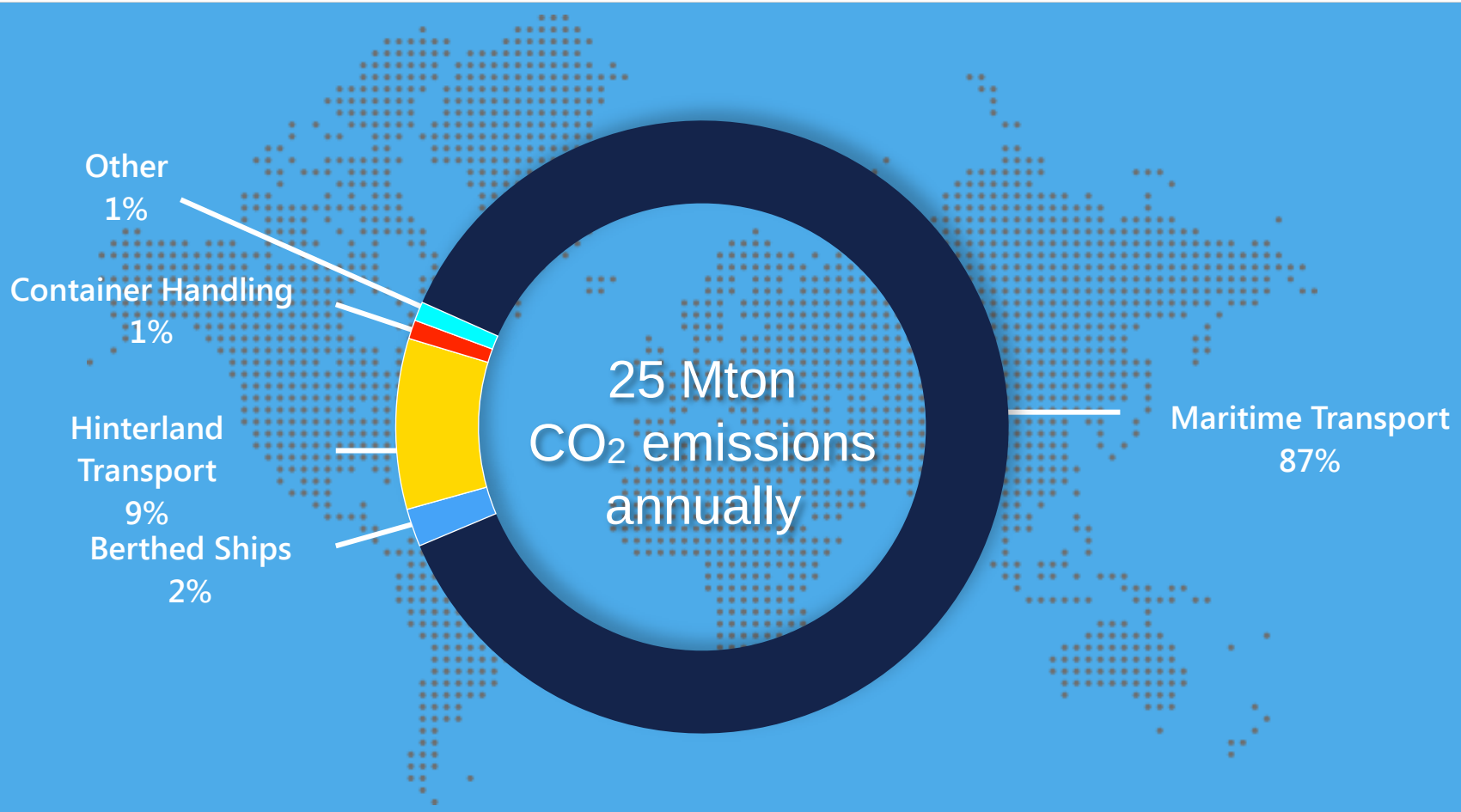
CO_2 Emissions Transport, Rotterdam related



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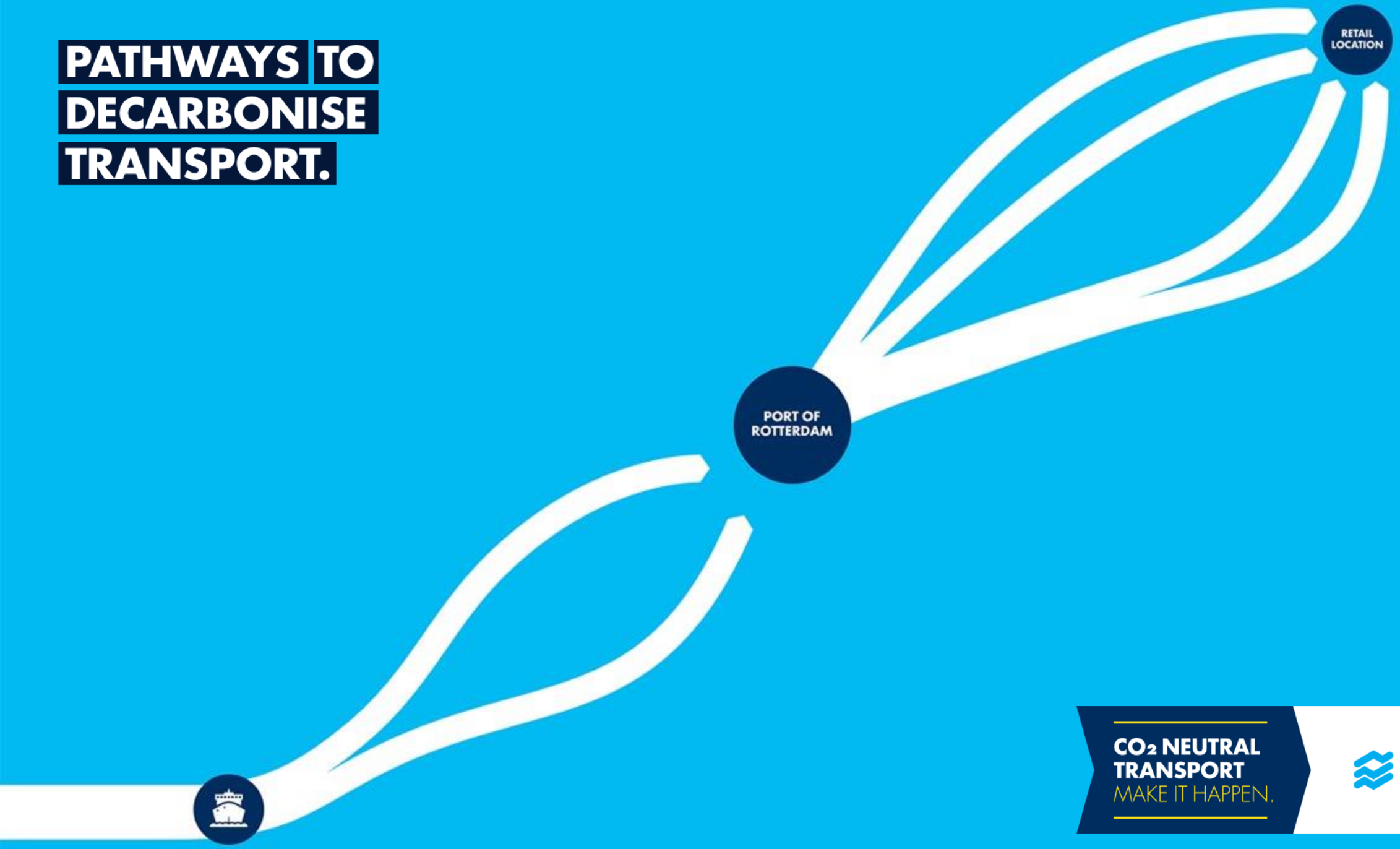
PATHWAYS TO DECARBONISE TRANSPORT.



CO_2 NEUTRAL TRANSPORT
MAKE IT HAPPEN.

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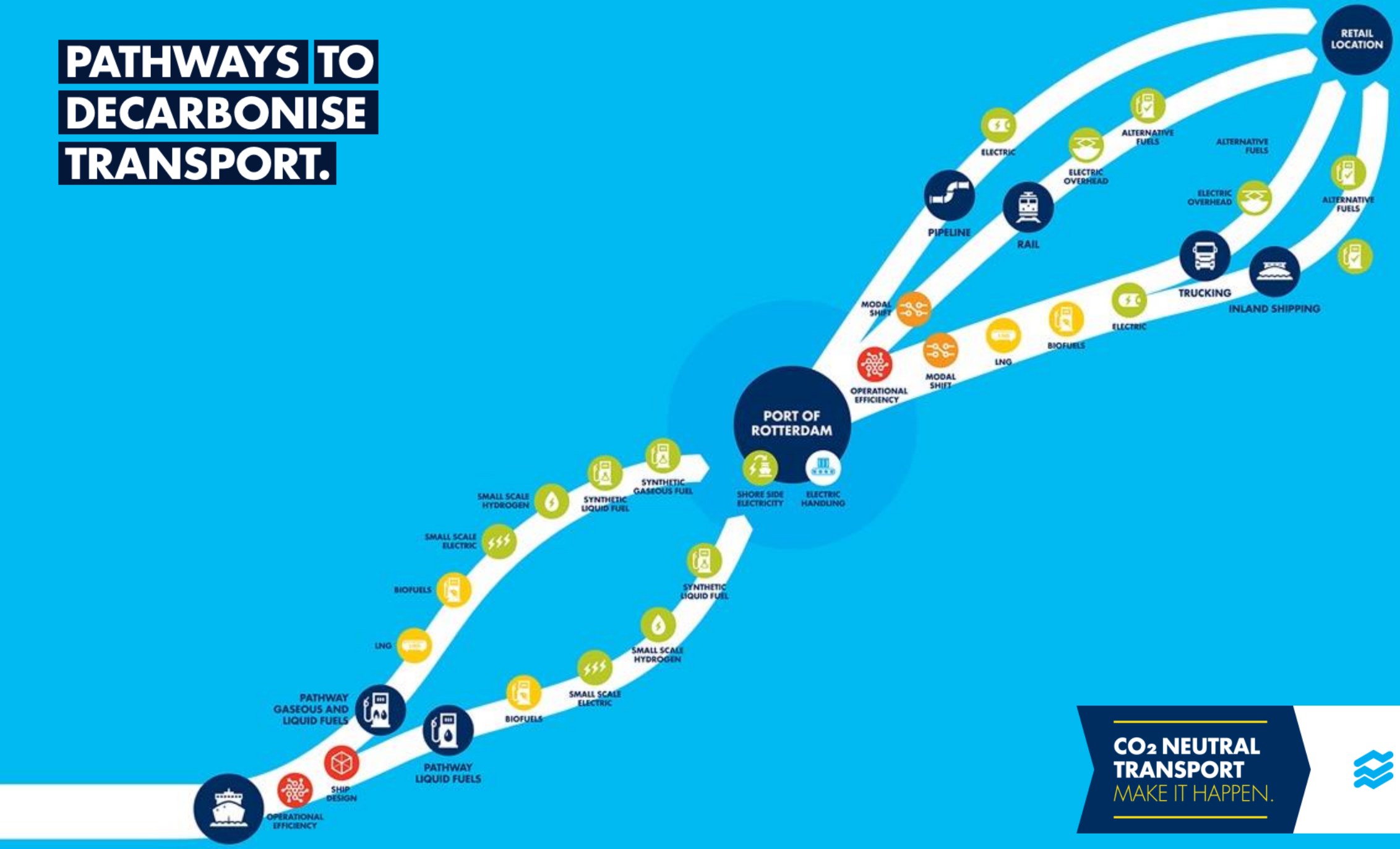
PATHWAYS TO DECARBONISE TRANSPORT.



CO_2 NEUTRAL TRANSPORT
MAKE IT HAPPEN.

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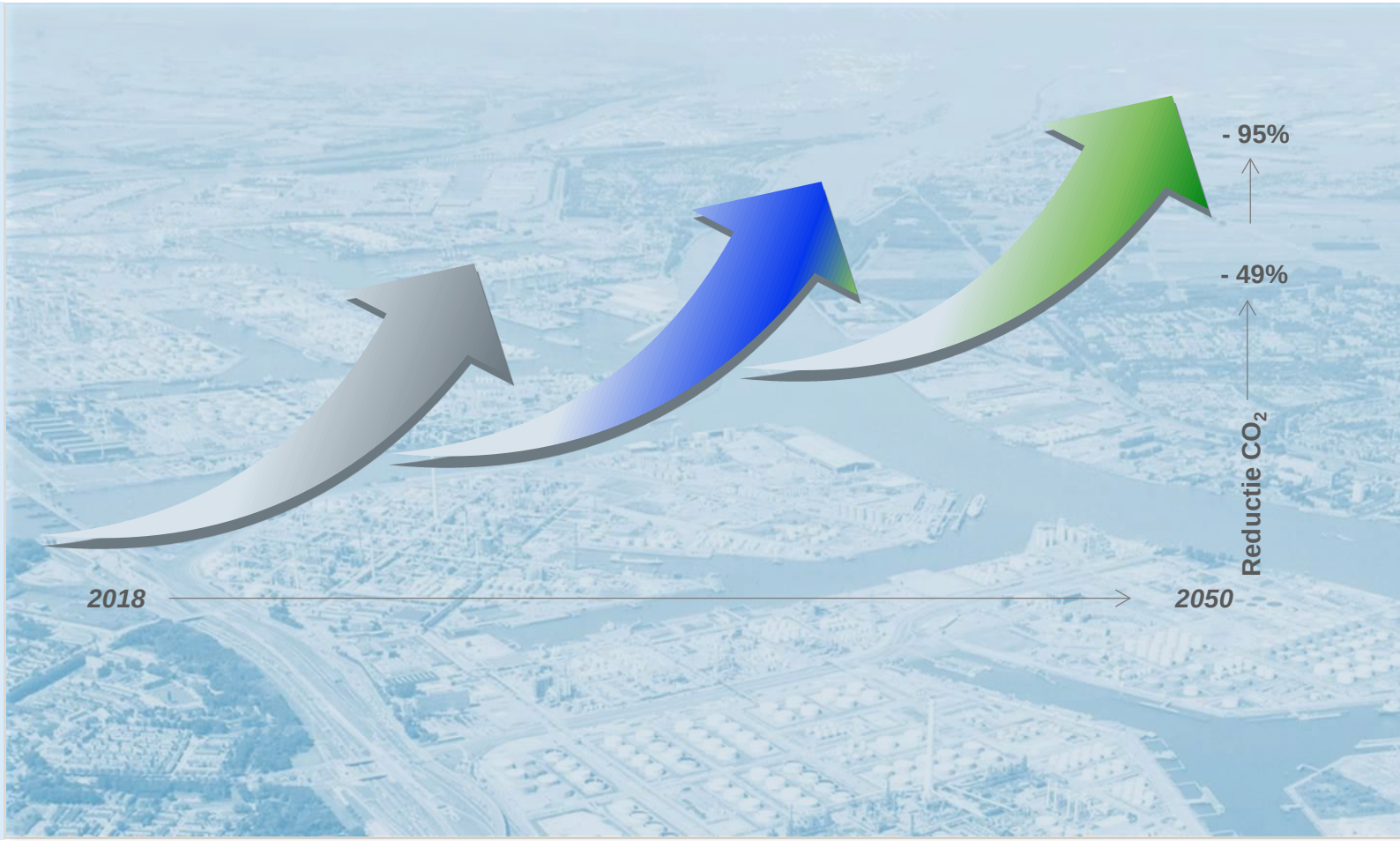
HOW?

“In 3 steps towards a sustainable industrial cluster Rotterdam-Moerdijk”

1. 2018-2025: reduction of CO_2 emissions (efficiency, networks for residual heat & steam, CCUS); innovation for steps 2 & 3
2. 2020-2030: Towards a new energy system for the industry (electrification, hydrogen)
3. 2030-2050: Towards new systems for raw materials (industry) and fuels (transport)



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Towards CO_2-neutral

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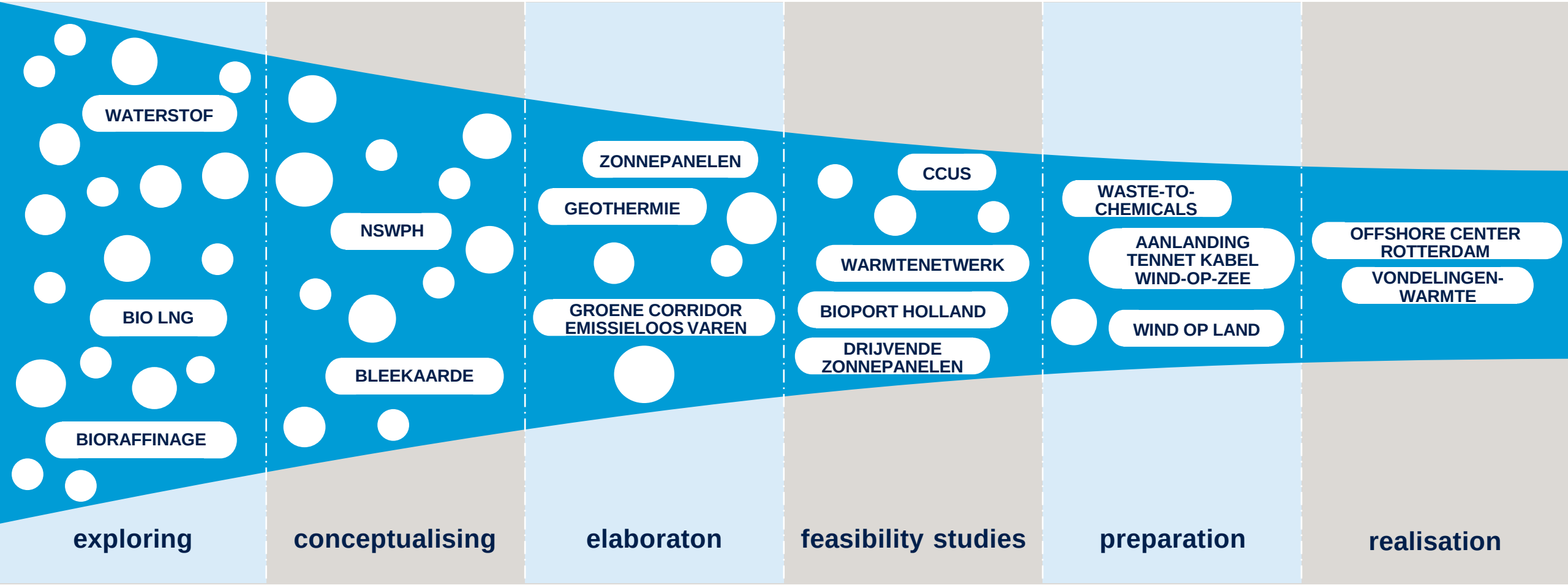
Funnel energy transition projects



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Examples of projects

Warmtealliantie Zuid-Holland

Vijf partners werken aan een warmtenet voor een betaalbare, betrouwbare en CO_2-arme warmtevoorziening

Port of Rotterdam · gasunie crossing borders in energy · provincie Zuid Holland · Eneco · Warmtebedrijf Rotterdam

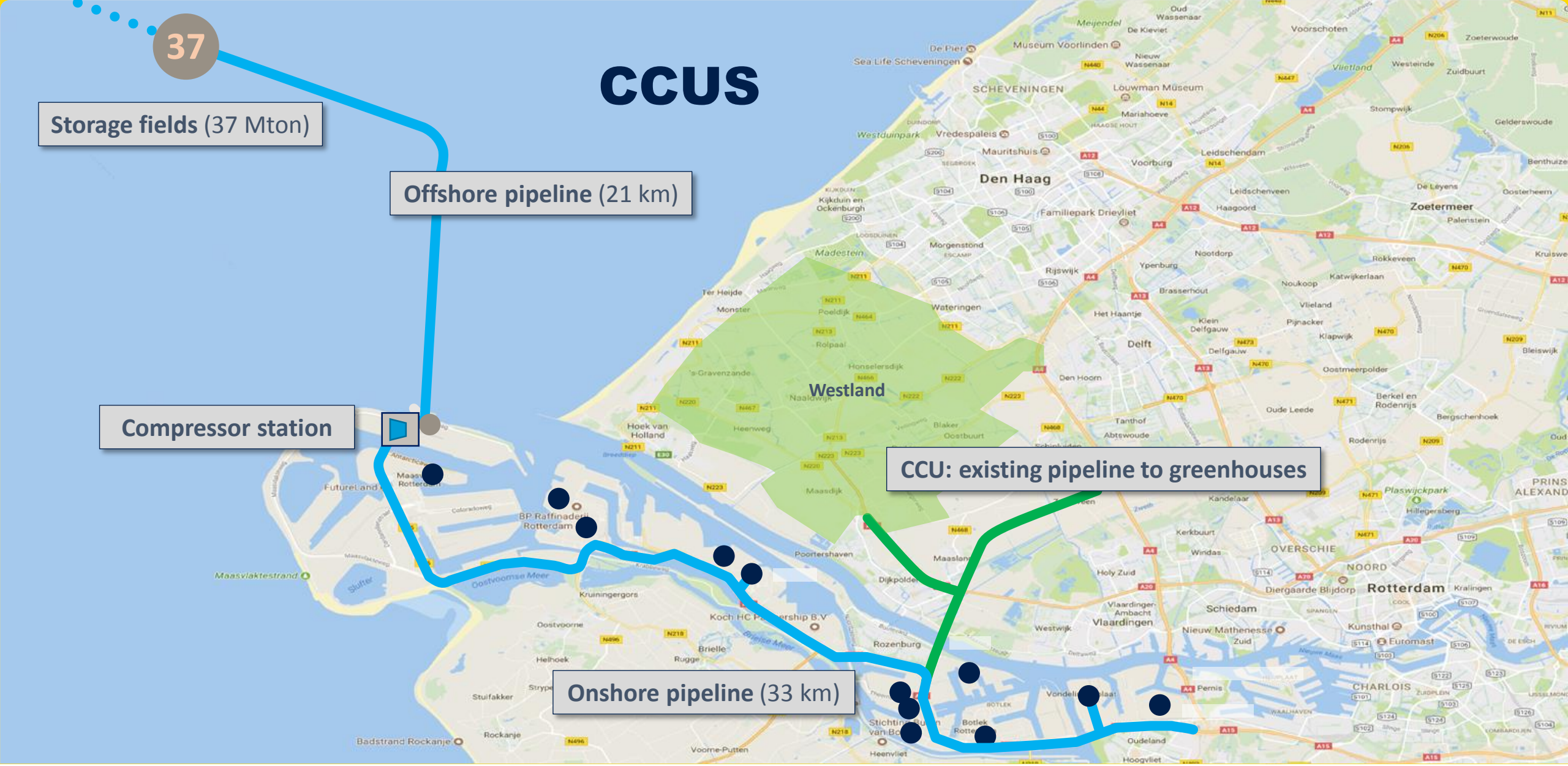
Restwarmte uit Shell Pernis voor regio Rotterdam

CO_2

Energielevering uit Shell Pernis is: **20 Megawatt** = **0,6 Peta Joule** ≈ **16.000 Huishoudens verwarmen**

Partners in dit project zijn Shell Pernis, Havenbedrijf Rotterdam en Warmtebedrijf Rotterdam

CCUS



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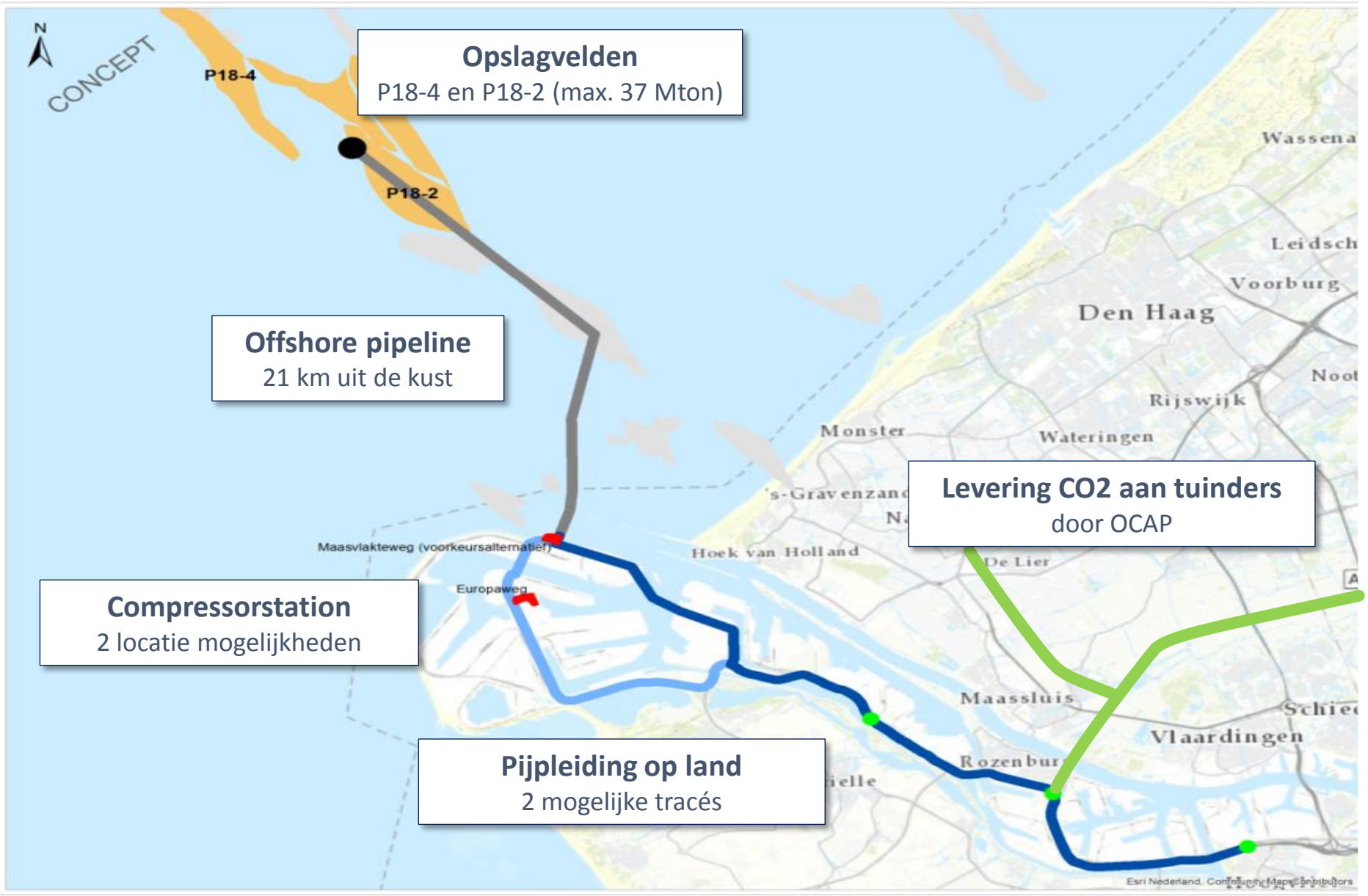
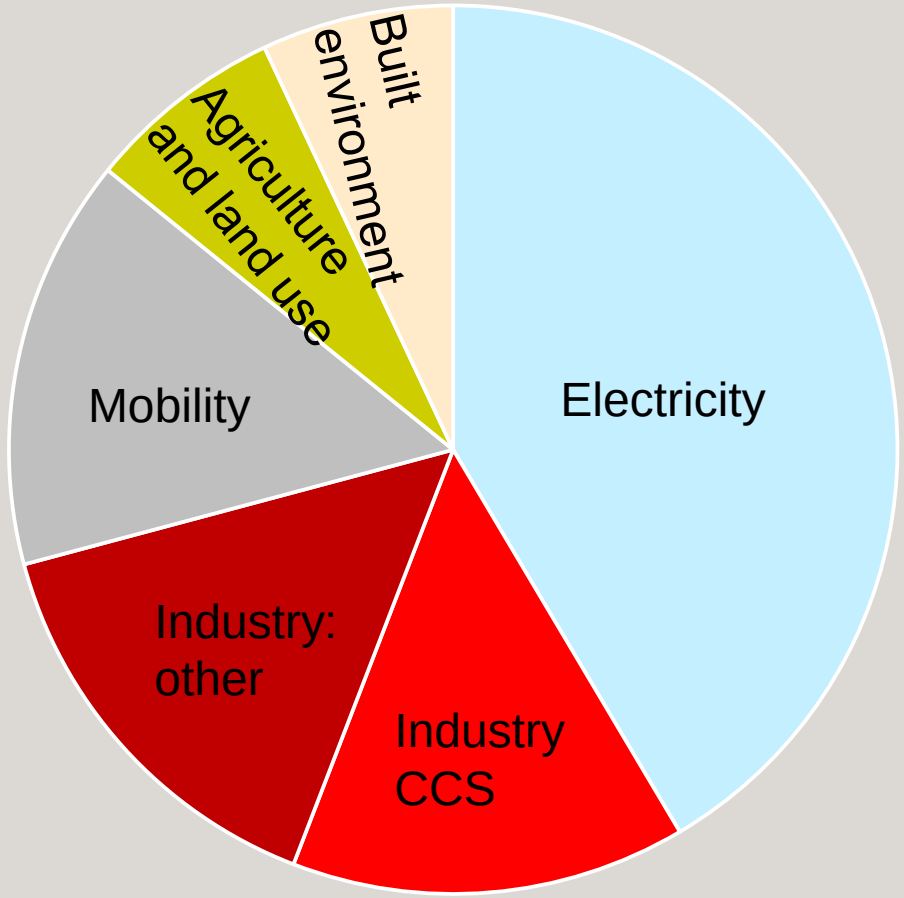

CONCEPT
P18-4
P18-2
Opslagvelden
P18-4 en P18-2 (max. 37 Mton)
Offshore pipeline
21 km uit de kust
Compressorstation
2 locatie mogelijkheden
Maasvlakteweg (voorkeursalternatief)
Europaweg
Pijpleiding op land
2 mogelijke tracés
Levering CO2 aan tuinders
door OCAP
Wassena
Leidsch
Voorburg
Den Haag
Rijswijk
Monster
Wateringen
Hoek van Holland
De Lier
Maassluis
Vlaardingen
Esri Nederland, Contributors

CCS has substantial share in VHKA



- 7 Mton CCS is over 14% of the total Dutch CO_2 reduction in 2030
- 7.3 Mton ‘other industry’ comprises:
  - Electrification and hydrogen (4)
  - Extra efficiency (2)
  - Reduction in laughing gas (1)
  - Recycling, CCU, bio-based chemistry (1)

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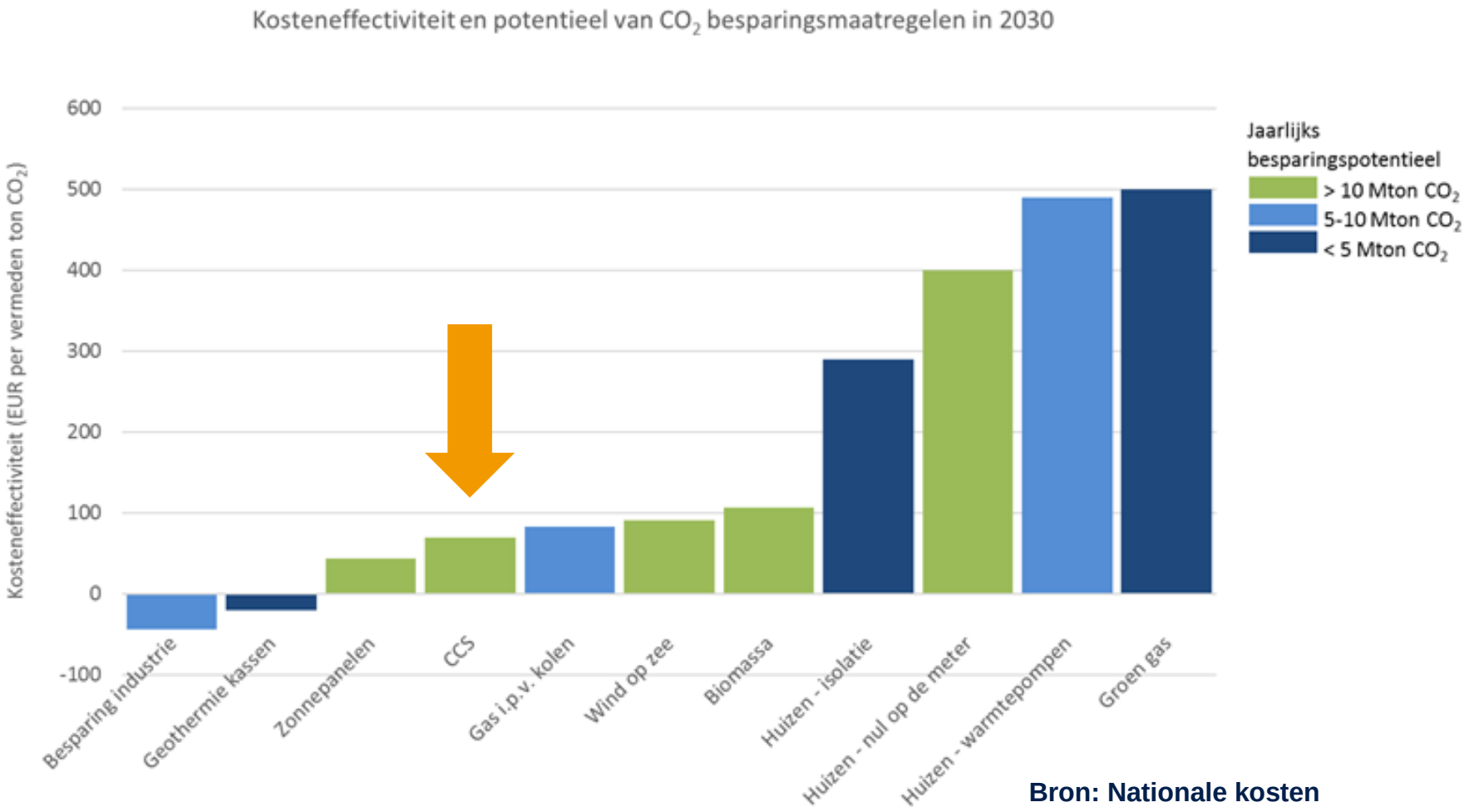
CCUS: cost efficient, large volumes, rapidly operational



Bron: Nationale kosten energietransitie in 2030, PBL 2018

Public-private partnerships are needed for CCUS

Public companies
Infrastructure initiators & investors

PORTHOS

Private companies
Invest in capture, pay for transport and storage

Public parties
Mandate, bridge costs for CCUS - ETS, long-term responsibility CO2

WASTE TO CHEMICALS

Enerkem AkzoNobel SPECIALTY CHEMICALS Air Liquide

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Sif

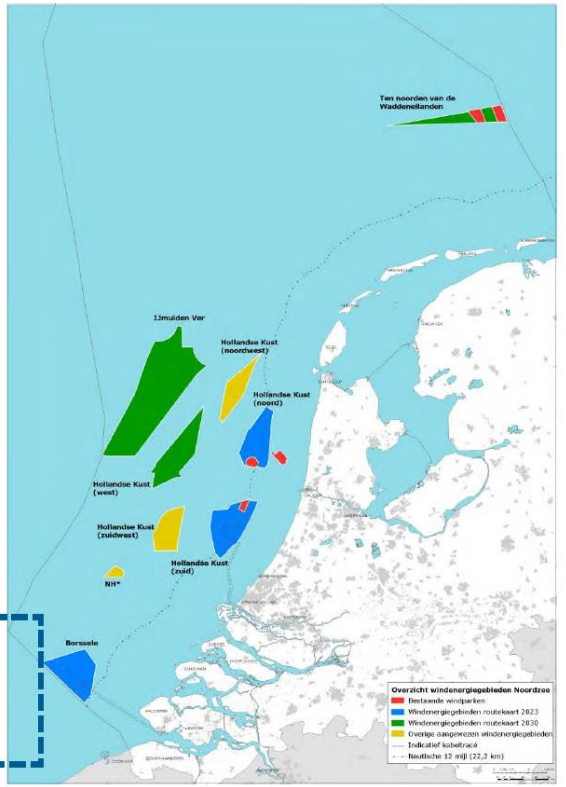
Offshore wind energy and Port of Rotterdam

Current situation

- >6 GW installed generation capacity (fossil based)
- Security of Supply: Dutch High Voltage Grid >99,99%
- Grid is future proof and ready for 2030 offshore wind targets
- Port of Rotterdam part of the offshore wind coalition*

Totaal windenergie op zee

Windparken / kavels	MW	Jaar tender	Ge-bouwd
OWEZ	108	2001	2006
Amalia	120	2004	2007
Luchterduinen	129	2009	2015
Gemini	600	2009	2016
Borssele I en II	752	2016	2019
Borssele III en IV + V	750,5	2016	2020
Hollandse Kust (zuid) I en II	740+	2017	2021
Hollandse Kust (zuid) III en IV	700	2018	2022
Hollandse Kust (noord) V	700	2019	2023
Hollandse Kust (west) VI en VII	1.400	2021	2025
Ten noorden van de Waddeneilanden I	700	2022	2026
IJmuiden Ver	Ca 4.000	2023-2026	2027-2030
Totaal	**Ca. 11.500**		**2030**



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Projection offshore wind 2030 by Ministry of Ecomic Affairs, Source: https://www.rvo.nl/file/presentatie-regiosessies-ezkpdf

* https://www.portofrotterdam.com/nl/zakendoen/vestigen/vestigingsmogelijkheden/offshore/rotterdam-offshore-wind-coalition

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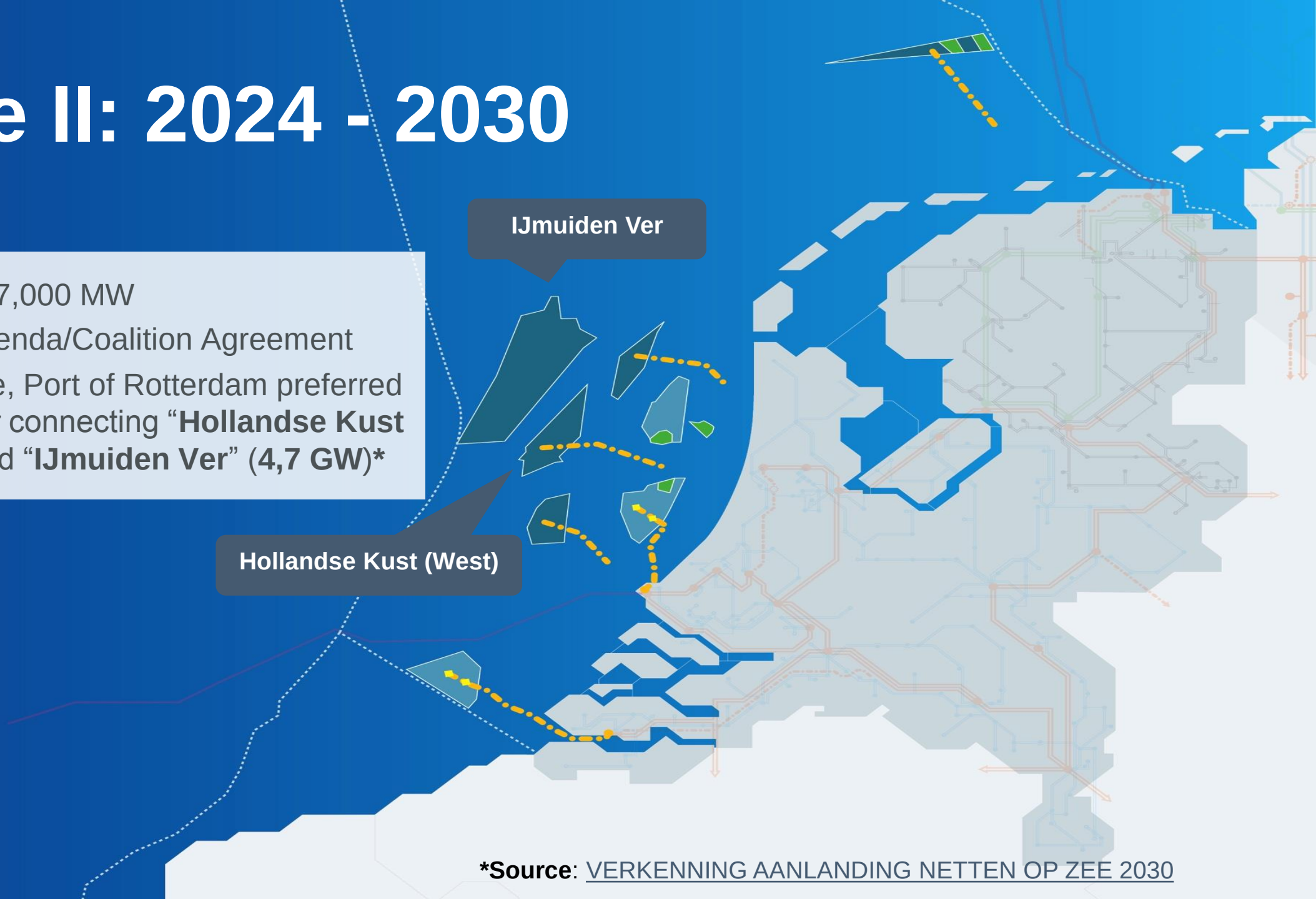
Phase I: to 2023

- 3,500 MW: 5 x 700 MW
- **Hollandse Kust (Zuid) to Maasvlakte, Port of Rotterdam, 1,4 GW**
- Standardized concept
- AC connections

Phase II: 2024 - 2030

- Additional 7,000 MW
- Energy Agenda/Coalition Agreement
- Maasvlakte, Port of Rotterdam preferred location for connecting “**Hollandse Kust (West)**” and “**IJmuiden Ver**” (**4,7 GW**)*



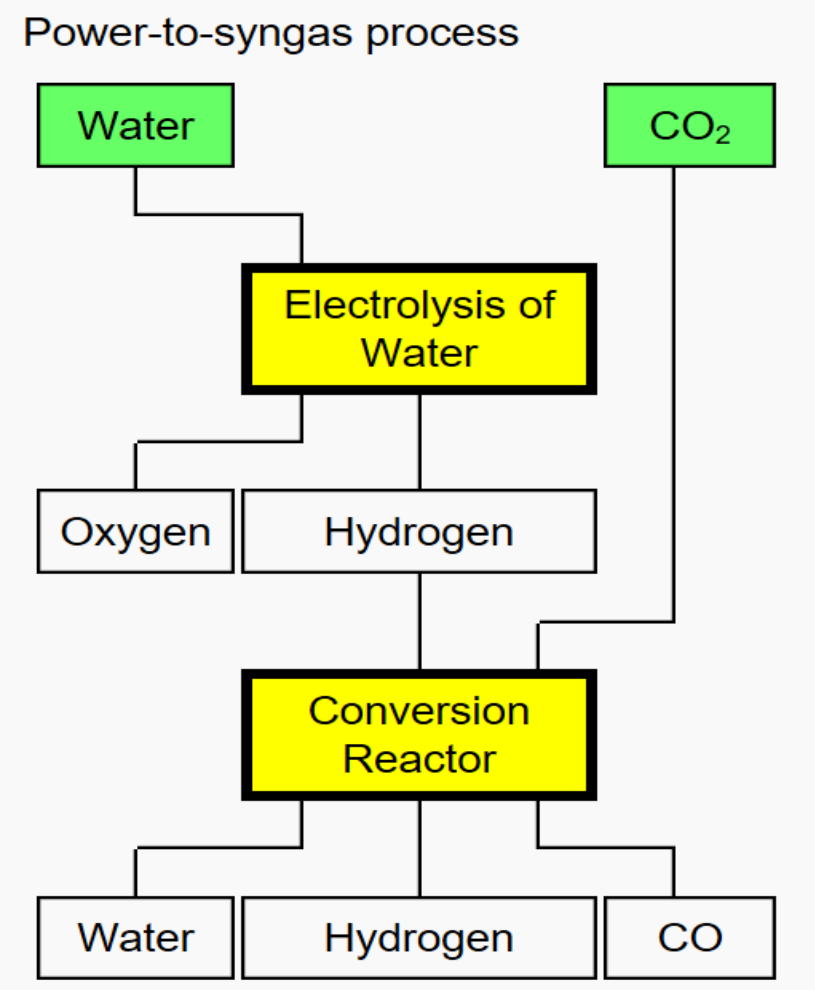
***Source**: VERKENNING AANLANDING NETTEN OP ZEE 2030

North Sea Wind Power Hub

The Power Link Island: a modular approach

- Far shore becomes near shore
- Distribution point for different countries
- Space for multiple converters (AC→ DC)
- Power to Gas

Power-to-hydrogen
and power-to-gas-to-chemicals



Electrification of the industry: using sustainable electricity hydrogen, syngas and other base chemicals can be produced

Green hydrogen production is close to being competitive: projects of 100 MW are being announced in several regions in The Netherlands

However, production of syngas and other chemicals will take until ~2030 to reach maturity

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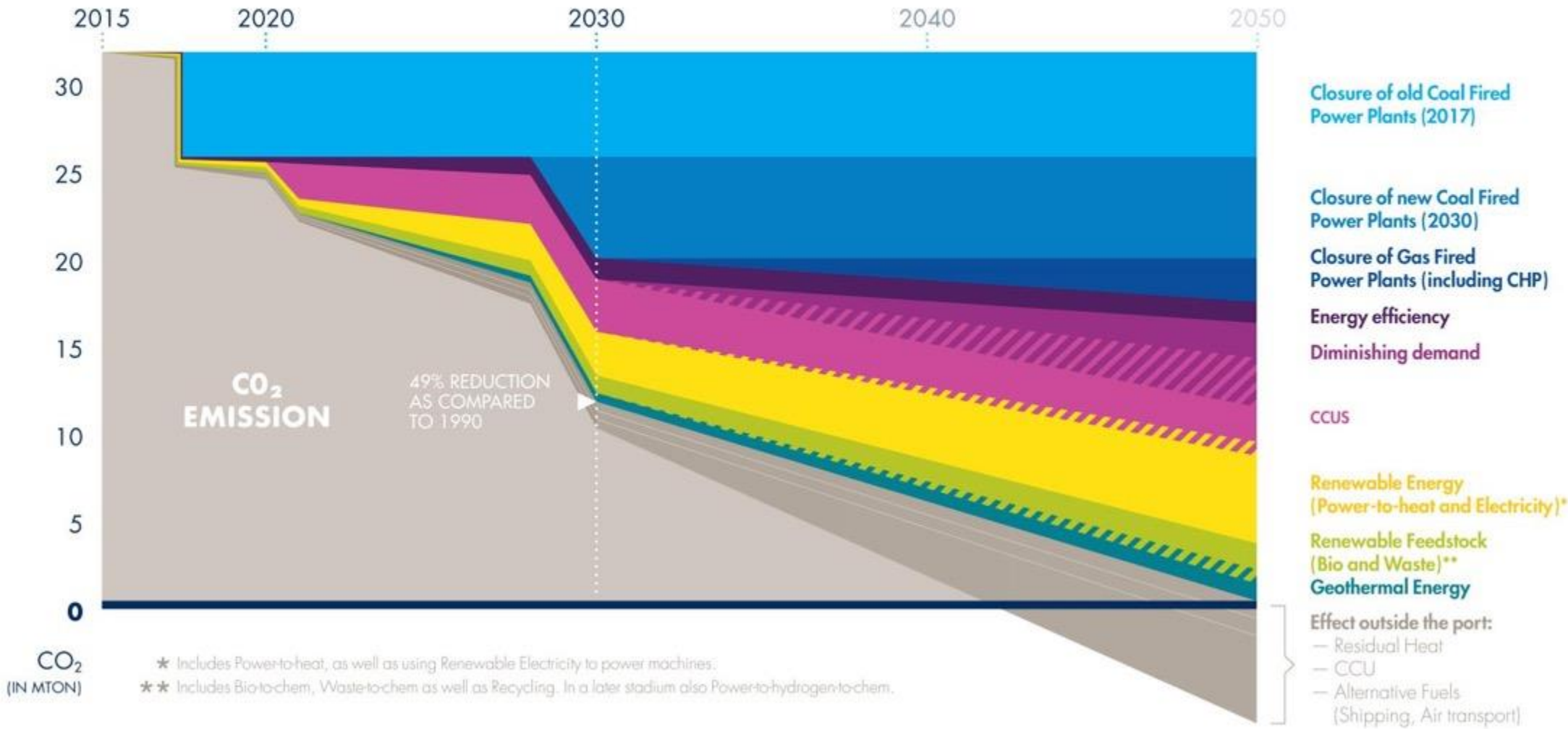
Reduction CO_2 emission 2015 - 2030 - 2050



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The Port of Rotterdam has the ambition to be frontrunner

- Rotterdam has the ambition to be Europe's energy transition fieldlab, frontrunner and flagship region
- 'Renewing the existing' and 'Supporting the new' together will help us to realise the Paris Agreement goals

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QUESTIONS?