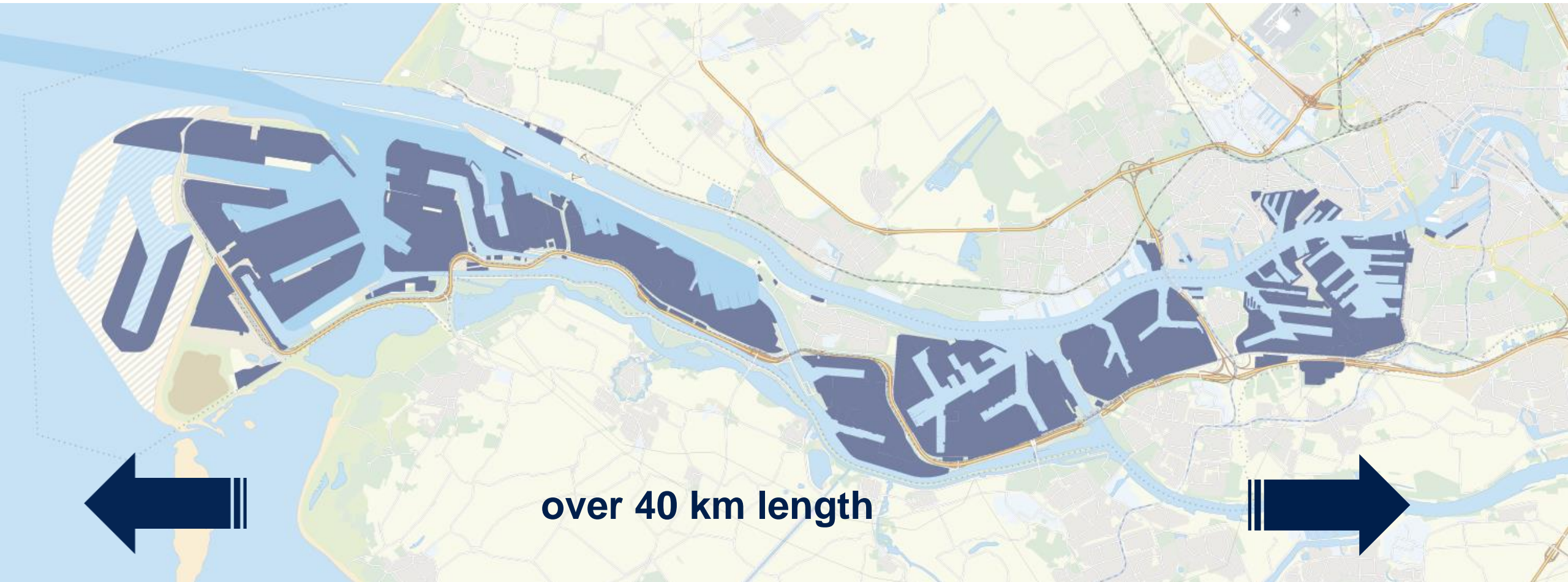


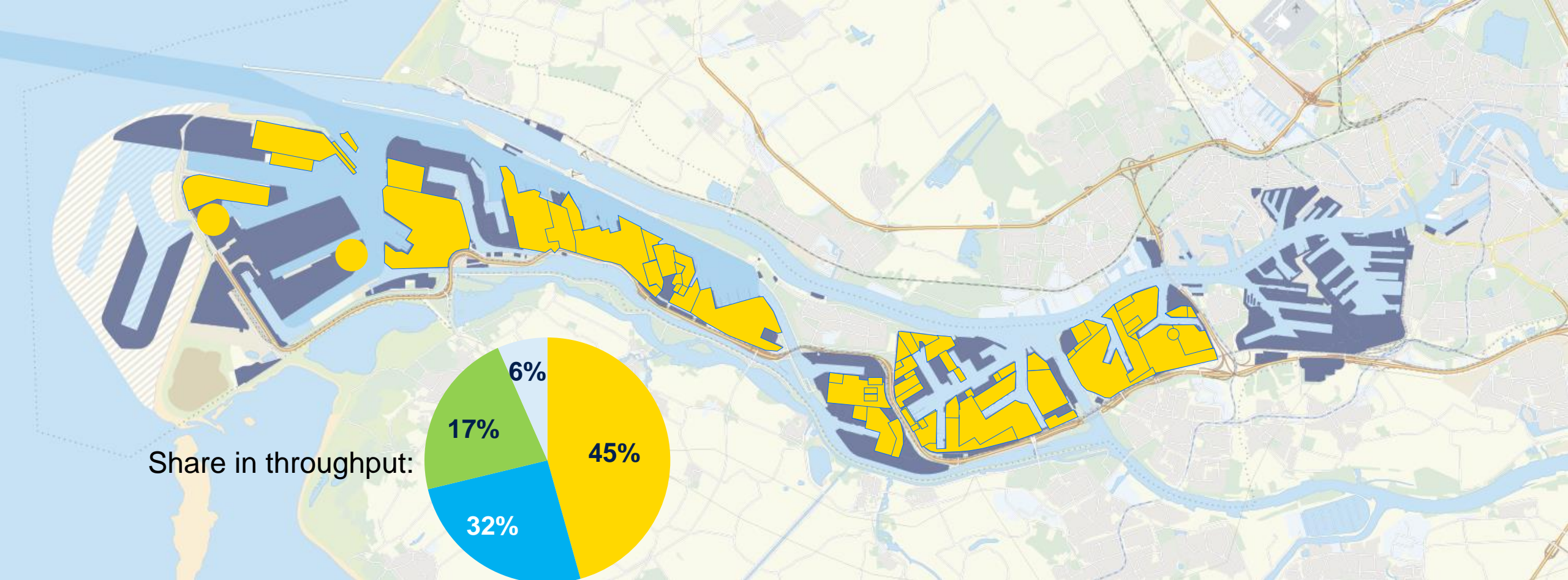
# Port of Rotterdam

over 5,000 ha leased sites



# Port of Rotterdam

Half of the sites leased to oil & chemical industry & liquid bulk terminals



- Liquid bulk
- Containers
- Dry Bulk
- Breakbulk

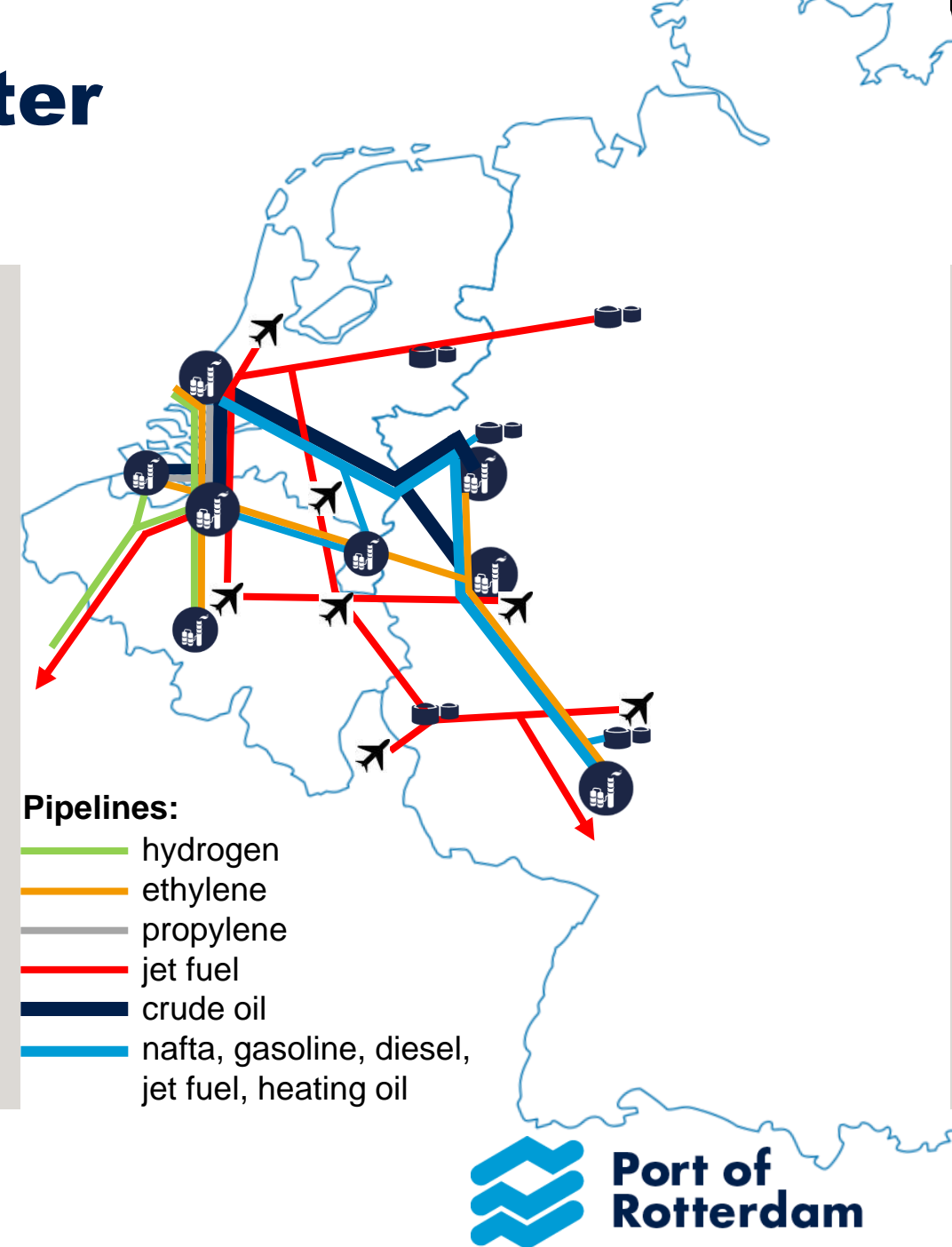
# Port of Rotterdam

## Big players in oil & chemicals



# Europe's Oil & Chemical Cluster

- ❖ Netherlands, Belgium & Germany:
  - 30% of EU oil refining
  - 45% of EU chemical sales
- ❖ Driven by ARA-Rhine-Ruhr Cluster: deep sea ports, river delta, pipeline systems
- ❖ Strengthened by production integration between refineries and chemical industry
- ❖ Empowered by highly qualified labour force, education and R&D, based on more than a century of regional development in oil and chemicals



# The port industry is carbon intensive

Crude oil

Oil Products

Coal

Biomass

LNG

Waste



**5** refineries



**36**  
chemical  
companies



**6** power plants  
**12** cogens

Fuels & Feedstocks

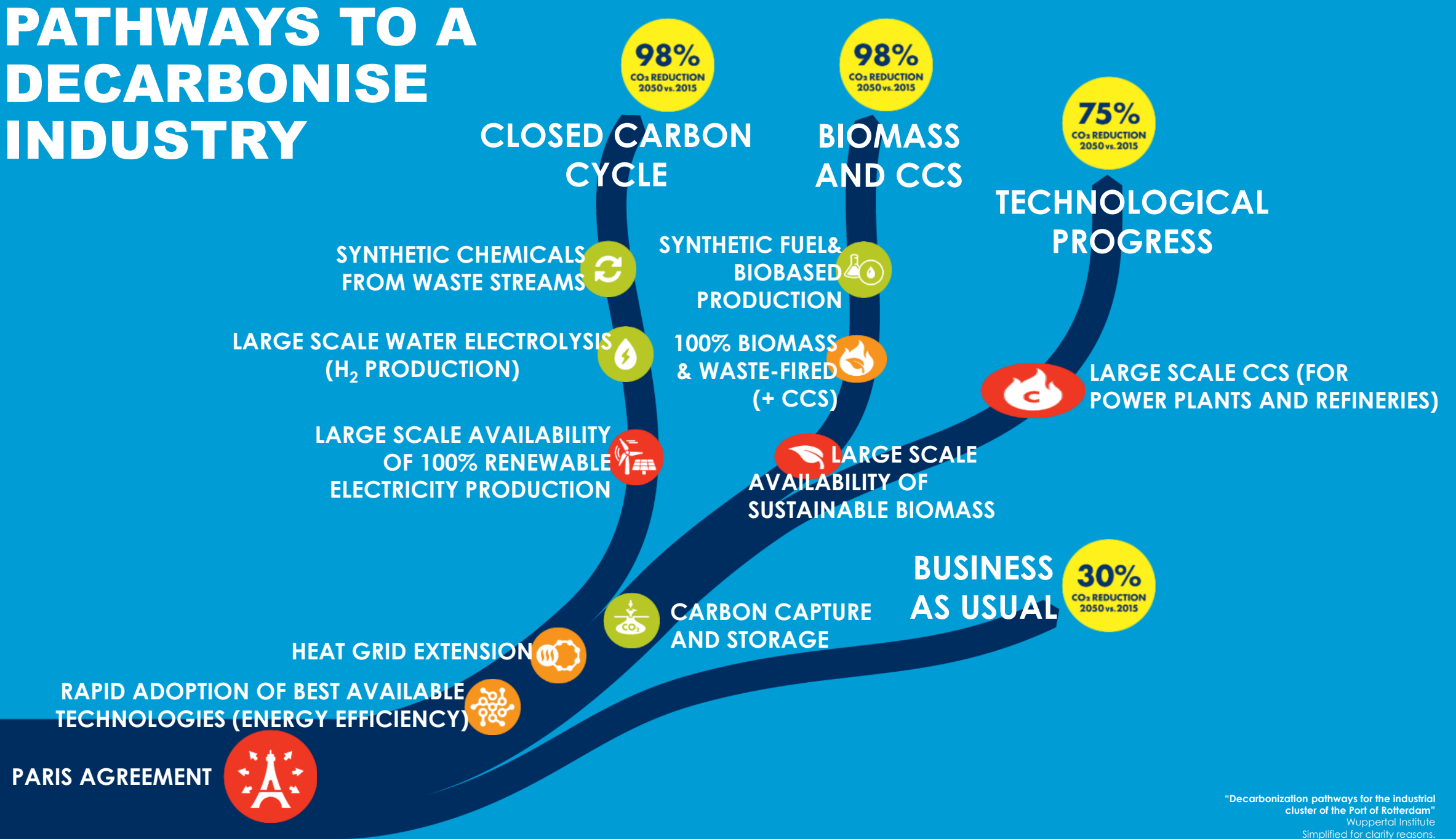
Chemical products

Electricity & heat

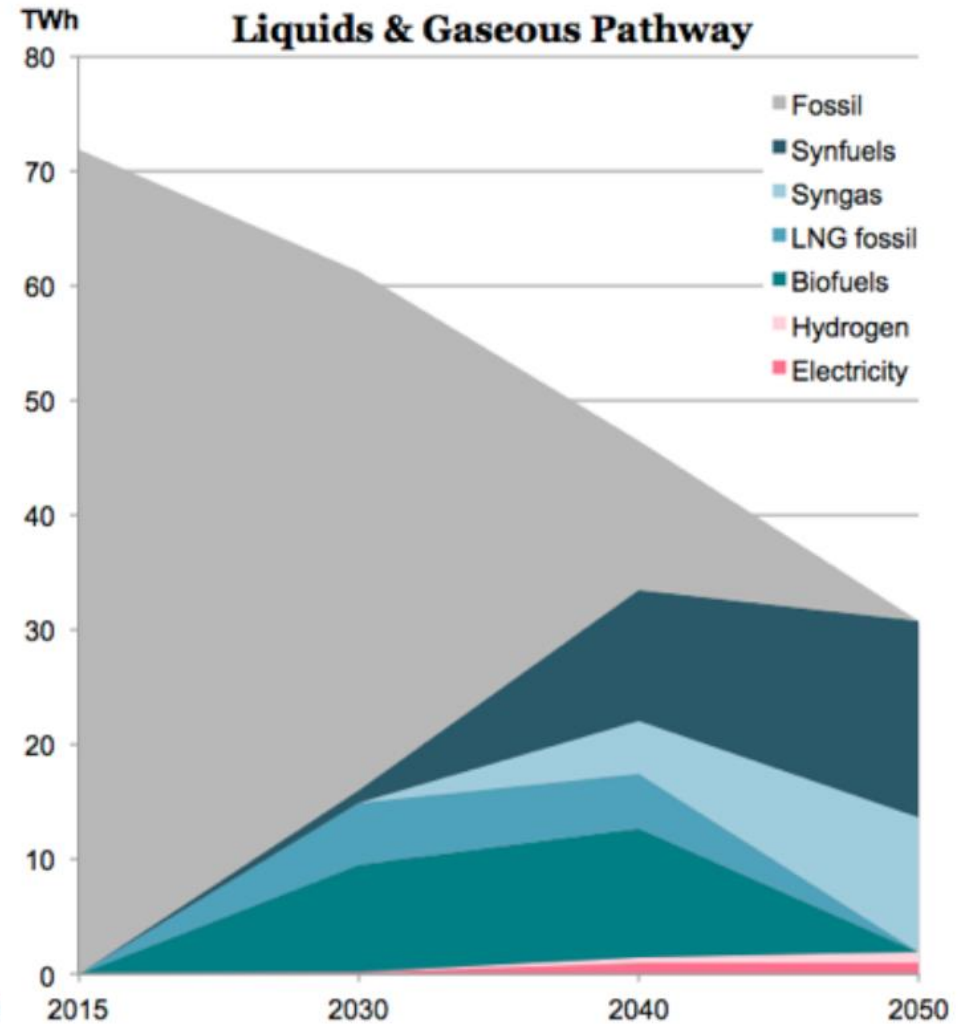
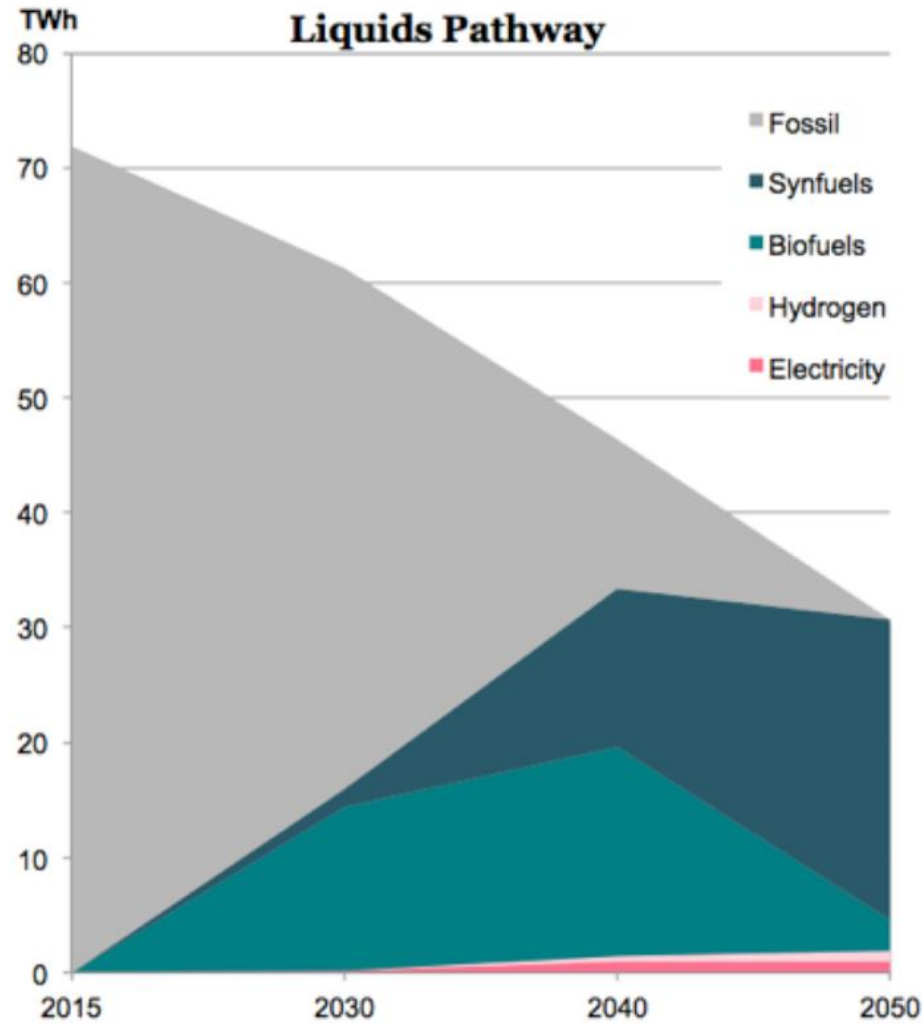
Natural Gas

**17%**  
of the Netherlands'  
total CO<sub>2</sub> emissions

# PATHWAYS TO A DECARBONISE INDUSTRY



# 2 pathways for sea-going vessels



# Towards CO<sub>2</sub>-neutral



**STEP 1**  
NOW-2025

**EFFICIENCY; INFRA FOR HEAT, STEAM, CCUS;**



**STEP 2**  
2020-2030

**TOWARDS A NEW ENERGY SYSTEM**



**STEP 3**  
2030-2050

**TOWARDS A NEW SYTEM FOR RAW MATERIALS AND FUELS**



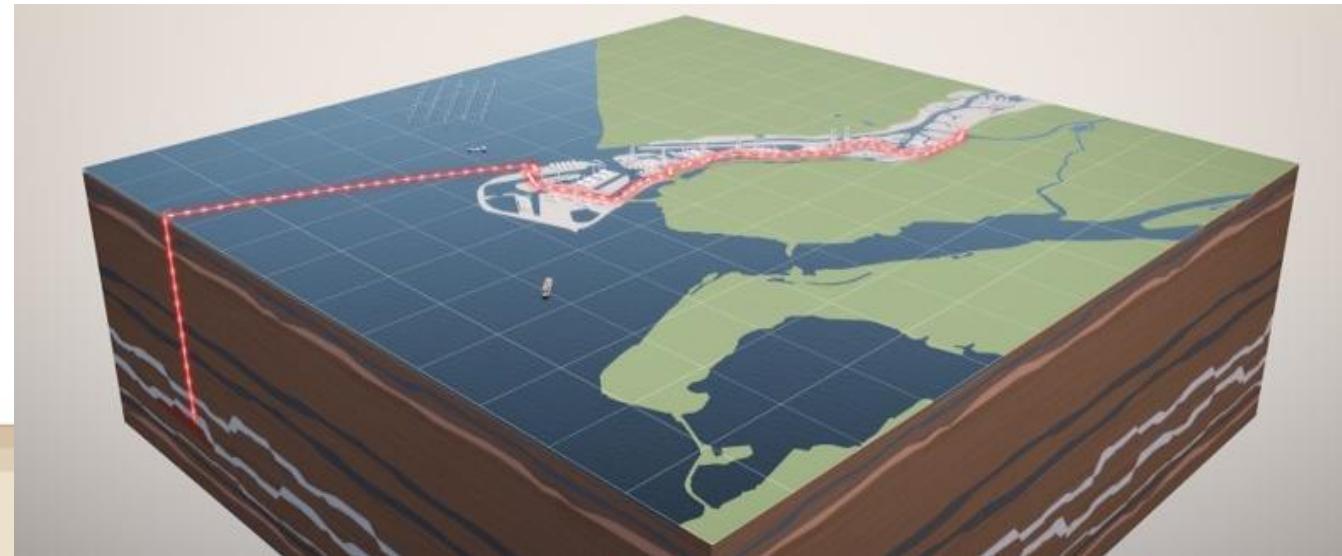
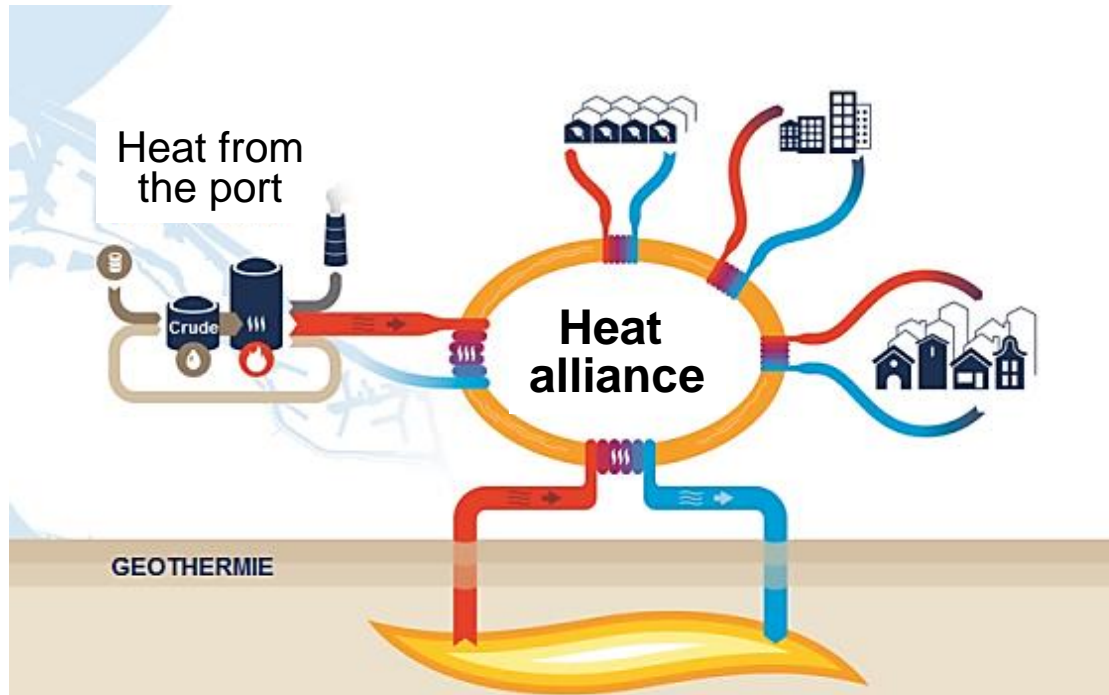
**THE GOAL**  
2050

**LIMIT GLOBAL WARMING TO 1,5°C to 2°C**





# New energy infrastructure for LT-Heat and CCUS



- 40 PJ heat transport network in South-Holland for potentially 500.000 households, greenhouses and enterprises
- Joint venture Gasunie – Port of Rotterdam, FID in 2019
- Natural gas avoided: 1.3 bcm; CO<sub>2</sub>-reduction: 2 Mt p/a

- Back bone for transport and storage of CO<sub>2</sub> in empty offshore gas fields
- Feasibility study EBN - Gasunie - Port of Rotterdam, in consultation with companies and ministry of EZK
- CO<sub>2</sub>-reduction: 2-5 Mt p/a

# Closed carbon cycle with renewable energy

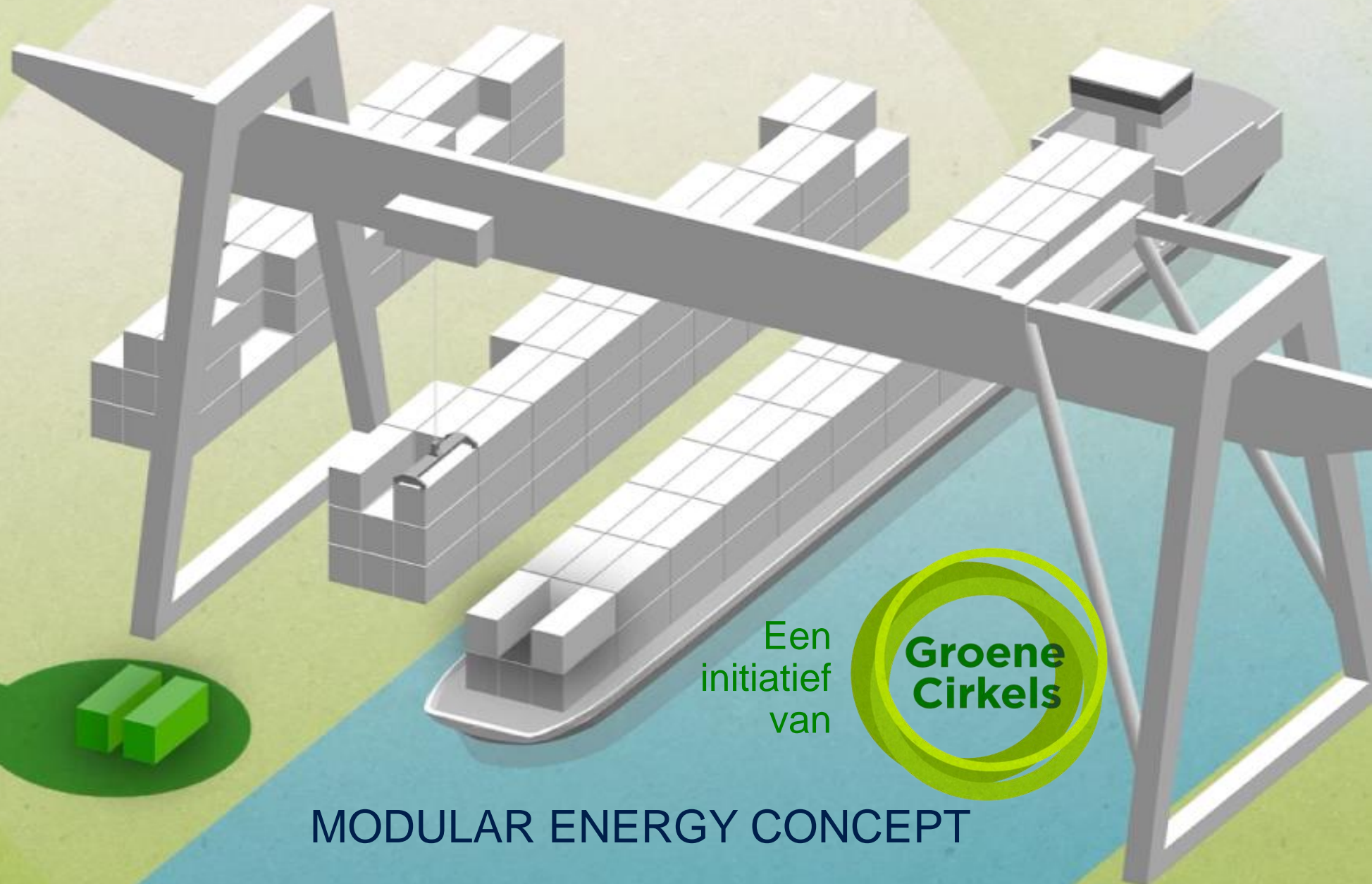


- 360 kt waste transferred into 220 kt green methanol
- Consortium Enerkem, Air Liquide, AkzoNobel & Port of Rotterdam Authority, FID in 2019
- CO<sub>2</sub>-reduction: 0,3 Mt p/a



- Opportunity: internationally coordinated, large scale development of far-shore wind energy at the North Sea, producing renewable energy at competitive prices from 2030
- Feasibility study on hub-and-spoke energy infrastructure for electrons and molecules (hydrogen) by a consortium of Tennet (NL and Germany), Energinet (Denmark), Gasunie & Port of Rotterdam

**MECs**



Een  
initiatief  
van



**Groene  
Cirkels**

**MODULAR ENERGY CONCEPT**