PATHWAYS TO A DECARBONISED PORT

The *Paris Agreement* makes it very clear that we need to take significant steps towards decarbonisation of our economy by 2050. The Wuppertal Institute for Climate, Environment and Energy has formulated three possible *decarbonisation pathways* as well as one *business as usual pathway* for the Port of Rotterdam.

The pathways cover different levels of ambition and different technologies. No single pathway is an accurate prediction of the future, the future will most likely be shaped by a combination of them.

CLOSED CARBON CYCLE
The energy system is fully decarbonised by a radical shift to renewables. Carbon from fossil feedstock is kept in a circular system of production and recycling. Both lead to a radical overhaul of the port-industrial cluster.

BIOMASS AND CCS
A drastic shift towards 100% renewable energy production and large scale CCS help virtually eliminate CO_2 emissions. Fuel production shifts from fossil to renewable feedstock (both electric and biobased).

TECHNOLOGICAL PROGRESS
Both rapid implementation of best available technologies and large scale CCS for power plants and parts of refineries help decrease CO_2 emissions.

98% CO_2 REDUCTION 2050 vs. 2015

98% CO_2 REDUCTION 2050 vs. 2015

75% CO_2 REDUCTION 2050 vs. 2015

Closed Carbon Cycle pathway

- WATER ELECTROLYSIS (H2 PRODUCTION)
- SYNTHETIC CHEMICALS PRODUCTION BASED ON CARBON FROM WASTE STREAMS
- LARGE SCALE AVAILABILITY OF 100% RENEWABLE ELECTRICITY PRODUCTION
- HEAT GRID EXTENSION
- POWER TO HEAT & GEOTHERMAL HEAT

Biomass and CCS pathway

- SYNTHETIC FUEL & BIOBASED PRODUCTION
- POWER TO HEAT
- WATER ELECTROLYSIS (H2 PRODUCTION)
- 100% BIOMASS / WASTE-FIRED POWER PLANTS (+ CCS)
- HEAT GRID EXTENSION
- LARGE SCALE AVAILABILITY OF SUSTAINABLE BIOMASS
- REINVESTMENTS IN REFINERIES AND PETROCHEMICAL PLANTS
- CARBON CAPTURE AND STORAGE
- RAPID ADOPTION OF BEST AVAILABLE TECHNOLOGIES (ENERGY EFFICIENCY)

Technological Progress pathway

- POWER TO HEAT
- WATER ELECTROLYSIS (H2 PRODUCTION)
- LARGE SCALE CCS (FOR POWER PLANTS AND REFINERIES)

BUSINESS AS USUAL
Optimisation of existing activities and a decrease in refinery activities, due to diminishing demand, lead to a gradual but limited decrease of CO_2 emissions. The goals stipulated by the Paris agreement are not achieved.

30% CO_2 REDUCTION 2050 vs. 2015

- POWER TO HEAT (SMALL SCALE)
- WATER ELECTROLYSIS (H2 PRODUCTION)
- REINVESTMENTS IN REFINERIES AND PETROCHEMICAL PLANTS

- WIDESCALE IMPLEMENTATION OF PARIS AGREEMENT
- INCREASED SHARE OF RENEWABLE ELECTRICITY (WIND / SOLAR)
- (SLOW) ADOPTION OF BEST AVAILABLE TECHNOLOGIES

Legend

- **GREENFIELD INVESTMENT** — New process that is currently not in use or in construction.
- **RETROFIT** — Process currently in use which will have to be retrofitted.
- **CHALLENGE** — Pathway specific challenge that would need to be overcome.
- (!) This infographic is highly simplified for clarity reasons. For a full understanding, please refer to the report "Decarbonization pathways for the industrial cluster of the Port of Rotterdam".

RIGHT HERE RIGHT NOW MAKE IT HAPPEN.

Current activities in the port such as fuel and power production, are major contributors to CO_2 emissions and require drastic rethinking. The transition towards a decarbonised economy offers many new business opportunities such as offshore wind, biobased chemistry, demand-side-management and energy storage, CO_2 transport and storage and synthetic fuel production. The Port of Rotterdam is in a unique position to be frontrunner in this transition, because of its scale, its location, its excellent infrastructure, the companies already present, the combined available know-how and ambitions. **Will you join us?**
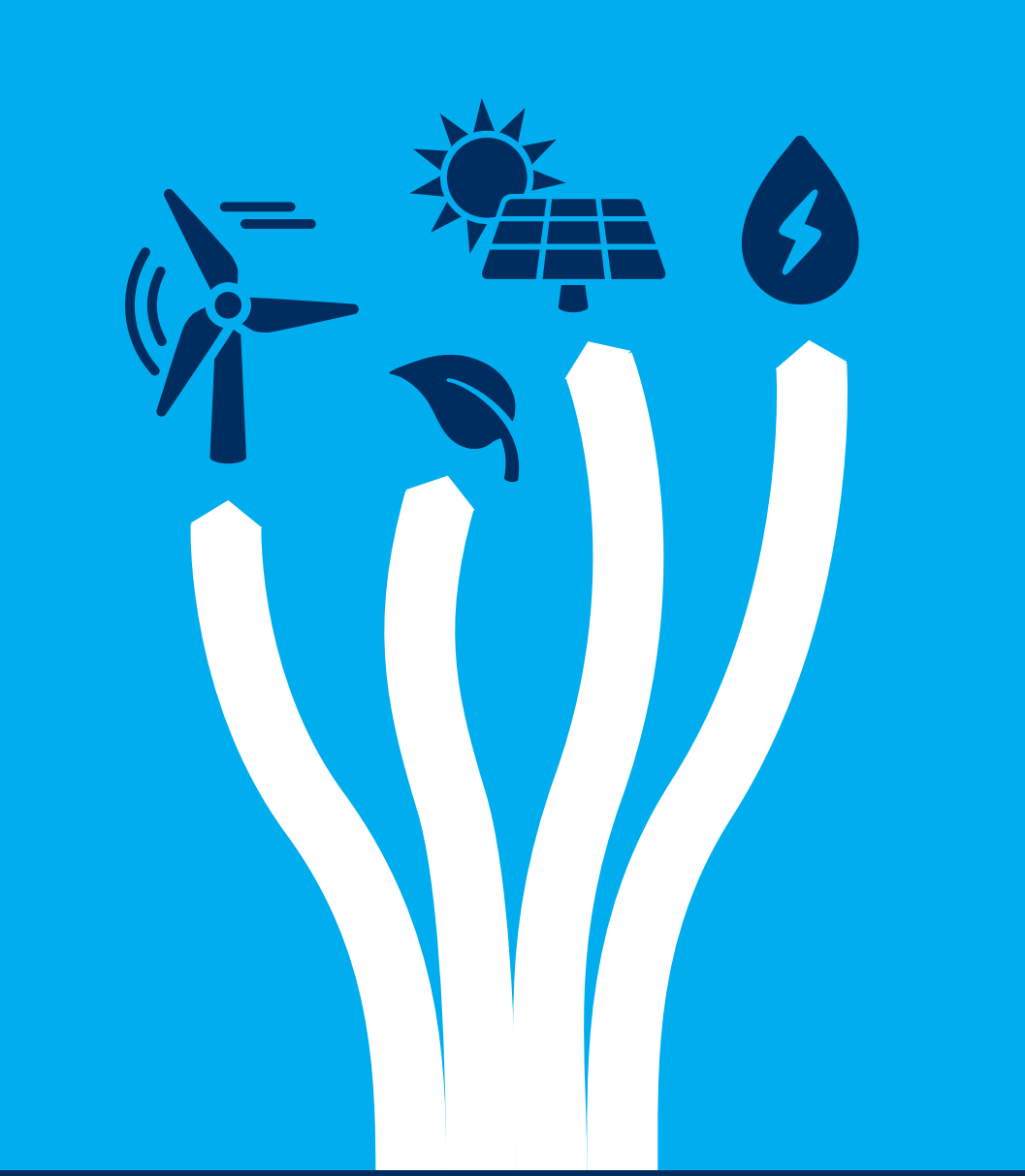
Port of Rotterdam

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Pathways to a decarbonised port