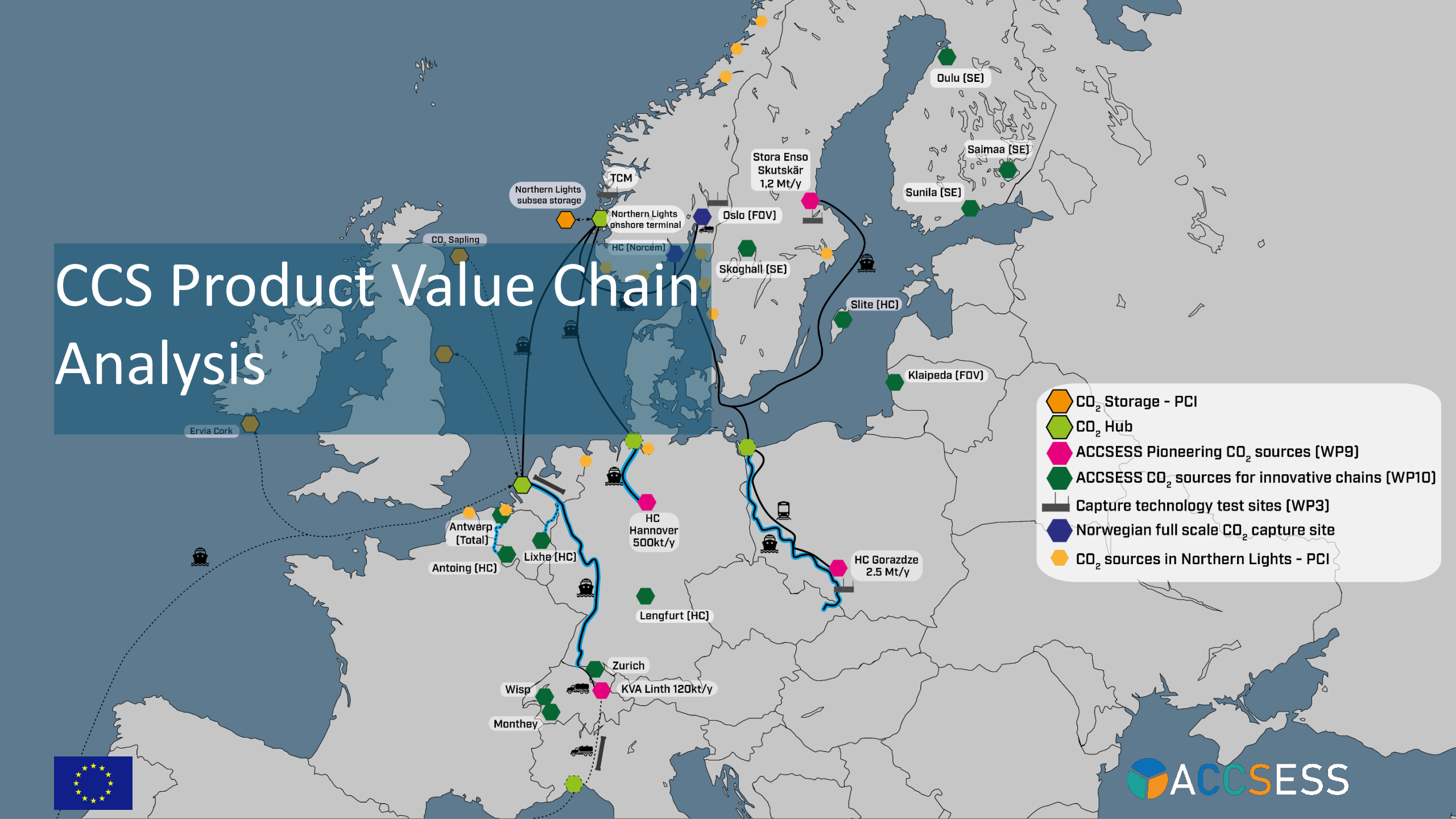
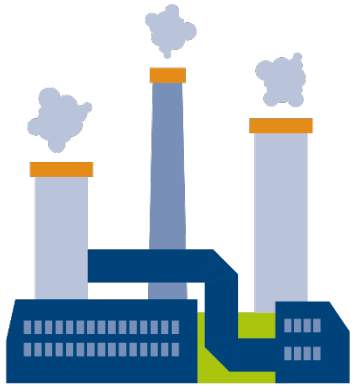
CCS Product Value Chain Analysis



Introduction

- Carbon Capture and Storage (CCS) product value chain analysis
  - Provide impact on costs and emissions for climate neutral and climate positive basic material and end-products and services as a result of application of CCUS technologies
- Aim: Demonstrate how CCS significantly can reduce end-products' carbon footprint with marginal cost increase
- Value chain analysis
  - Case studies of specific end-products
  - Map out the value chain
  - Analyse how costs and emissions are affected through the value chain when applying CCS



CCUS mitigation costs at point emissions currently significantly higher than EU-ETS

Value chain analysis of end-products and services

EU Sustainable cities
Demand for climate neutral or climate positive end-products and services

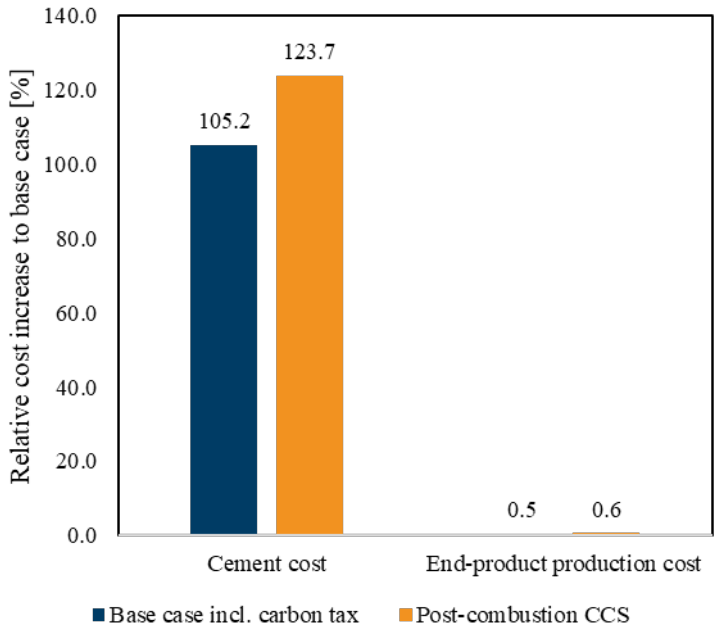
"Marginal increase in cost and price of end-products, while significantly reducing their carbon footprint, or even providing CDR"

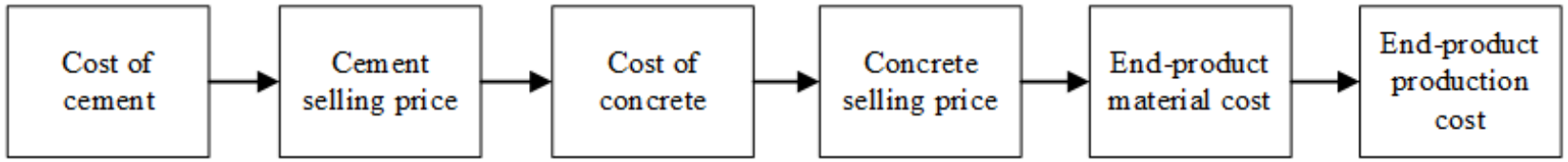
Cement

- End-product case study: High-speed railway
  - Slab track → large amounts of concrete used
  - 75-80% of total emissions from material use
  - Cement/concrete alone stands for 43% of total emissions
- Retrofitting existing cement plant with post-combustion CCS
- What is the impact on costs and emissions in the value chain when applying CCS on the cement production?

Cement: Costs

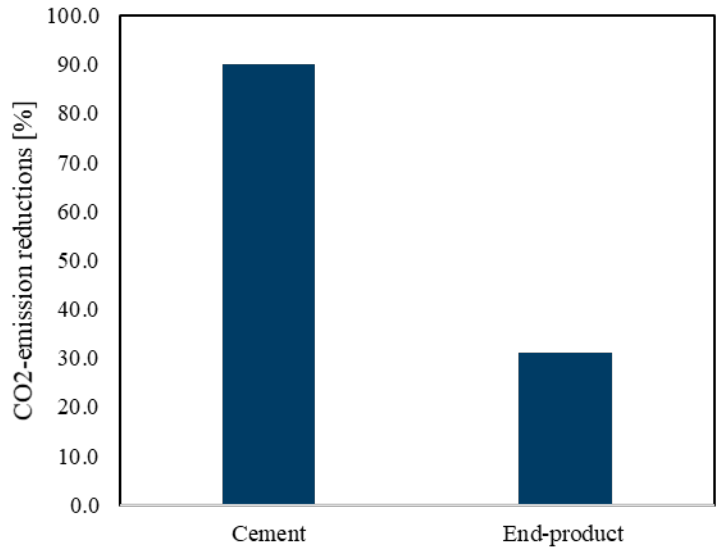
- Assuming full cost pass-through
- Scenarios:
  - Base case
  - Base case including CO_2-tax on fossil-based emissions
  - Post-combustion CCS
- Preliminary results:
  - Relative cost increase with CCS compared to base case:
    - Cement cost:
      - Base case including CO_2-tax: 105.2%
      - Post-combustion CCS: 123.7%
    - End-product production cost:
      - Base case including CO_2-tax : 0.5%
      - Post-combustion CCS: 0.6%

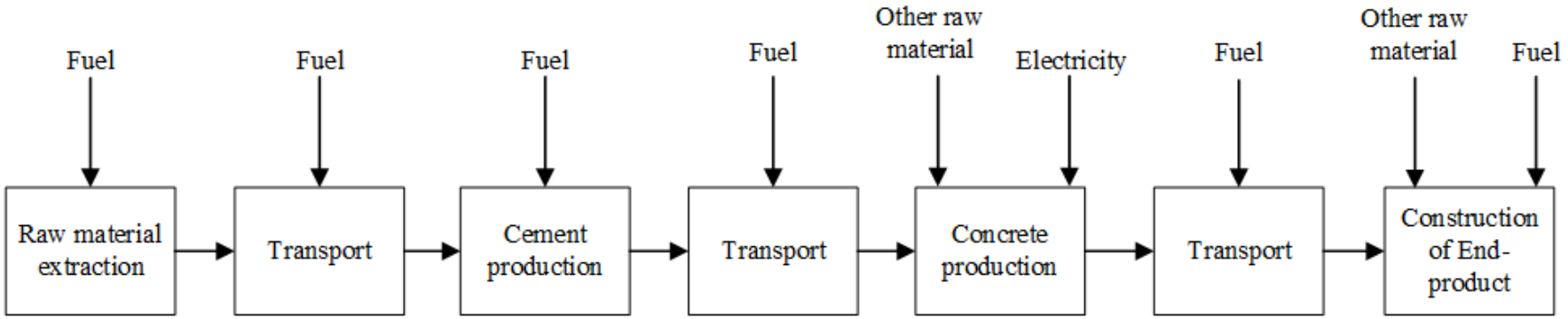




Cement: Emissions

- Scenarios:
  - Base case
  - Post-combustion CCS
- Preliminary results:
  - CO_2-emission reductions:
    - Cement production 90%
    - End-product 32%





Thank you for listening!