Trilateral Chemical Region - Value Chain Structures

An analysis of legacy chemicals production infrastructure in the TCR and transition to sustainable competitiveness

Public update – September 2024

3C·VaCS

3C-VaCS

- Trilateral Chemical Region (Flanders, North Rhine-Westphalia, the Netherlands)
- Governments (funding)
- Research Institutes
- Chemical Industry Associations

Project Duration:
01.01.2024 - 31.12.2025

Trilateral Chemical Region

vito
Energy Ville ENERGY IN TRANSITION

TNO innovation for life

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Research questions

The purpose of this summary is to inform the reader about the reasons for commissioning this project, the chosen approach and the status of on-going work (September 2024).

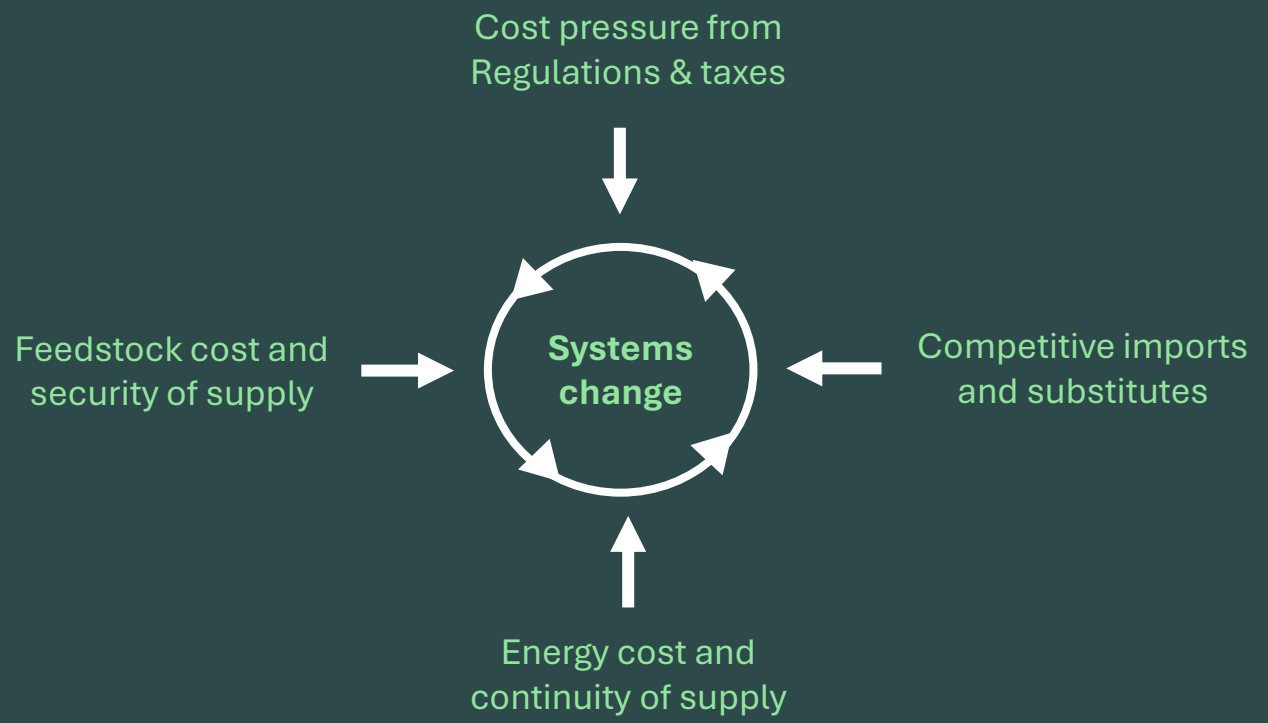
- What are the main chemicals value chains in the TCR?
- How do they link to each other and to the rest of the world?
- What may affect the profitability of operations?
- How may the region enhance industry's competitiveness and resilience?

Background

- The Trilateral Chemical Region (TCR) is Europe's industrial heartland, with a legacy knowledge-industrial complex
- Advanced high-quality products of the chemical industry have a significant contribution to Europe's global trade balance
- Strategic autonomy for Europe necessitates the capability to produce key chemical products
- Innovation for advanced products and technologies within Europe requires industrial-scale operations

The European chemical industry is under economic pressure *

- Market forces (high EU energy cost, competitive imports, weaker demand for EU-made products)
- Regulatory pressure (EU climate targets, ETS, RFNBO, CEAP, Waste-to-Chemicals, REACH)
- Systems change (electrification, circular & renewable feedstock, operational synergy)

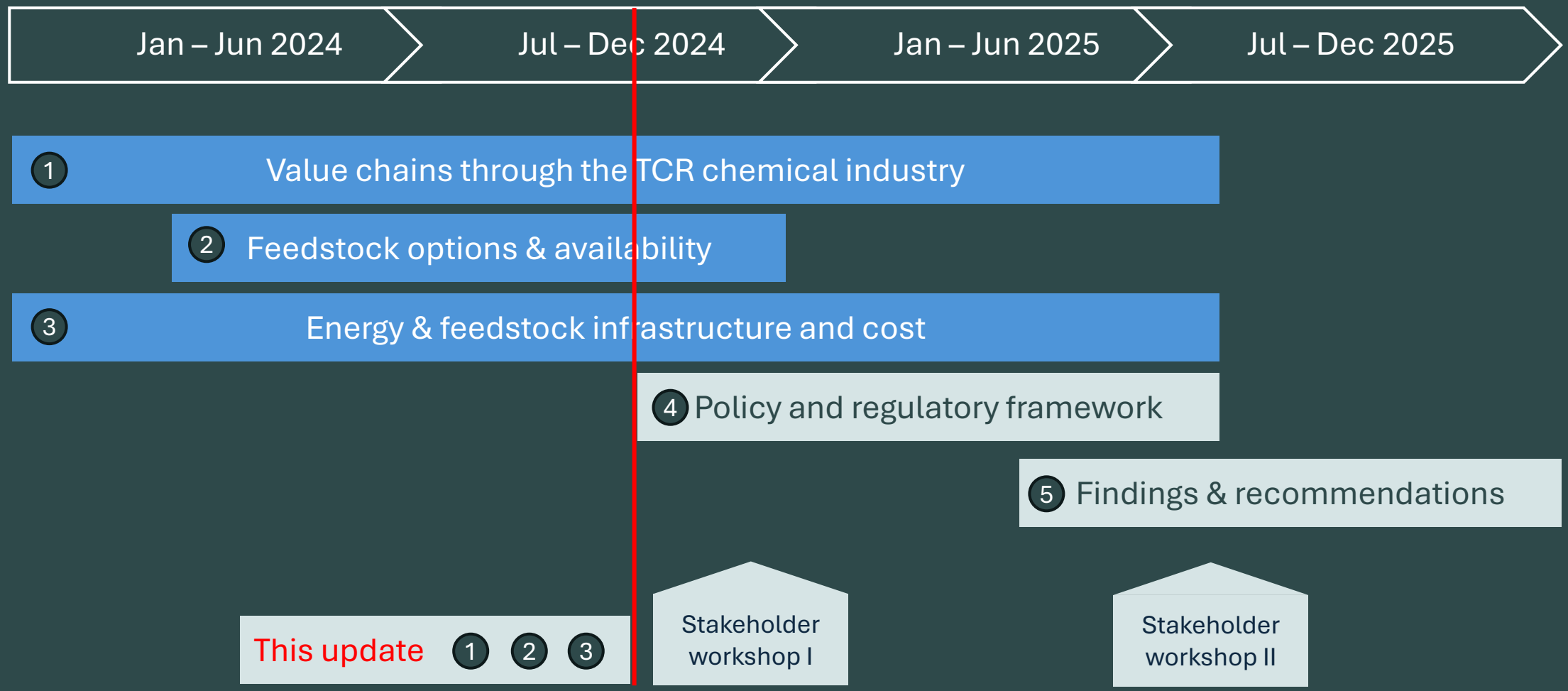


*See Appendix

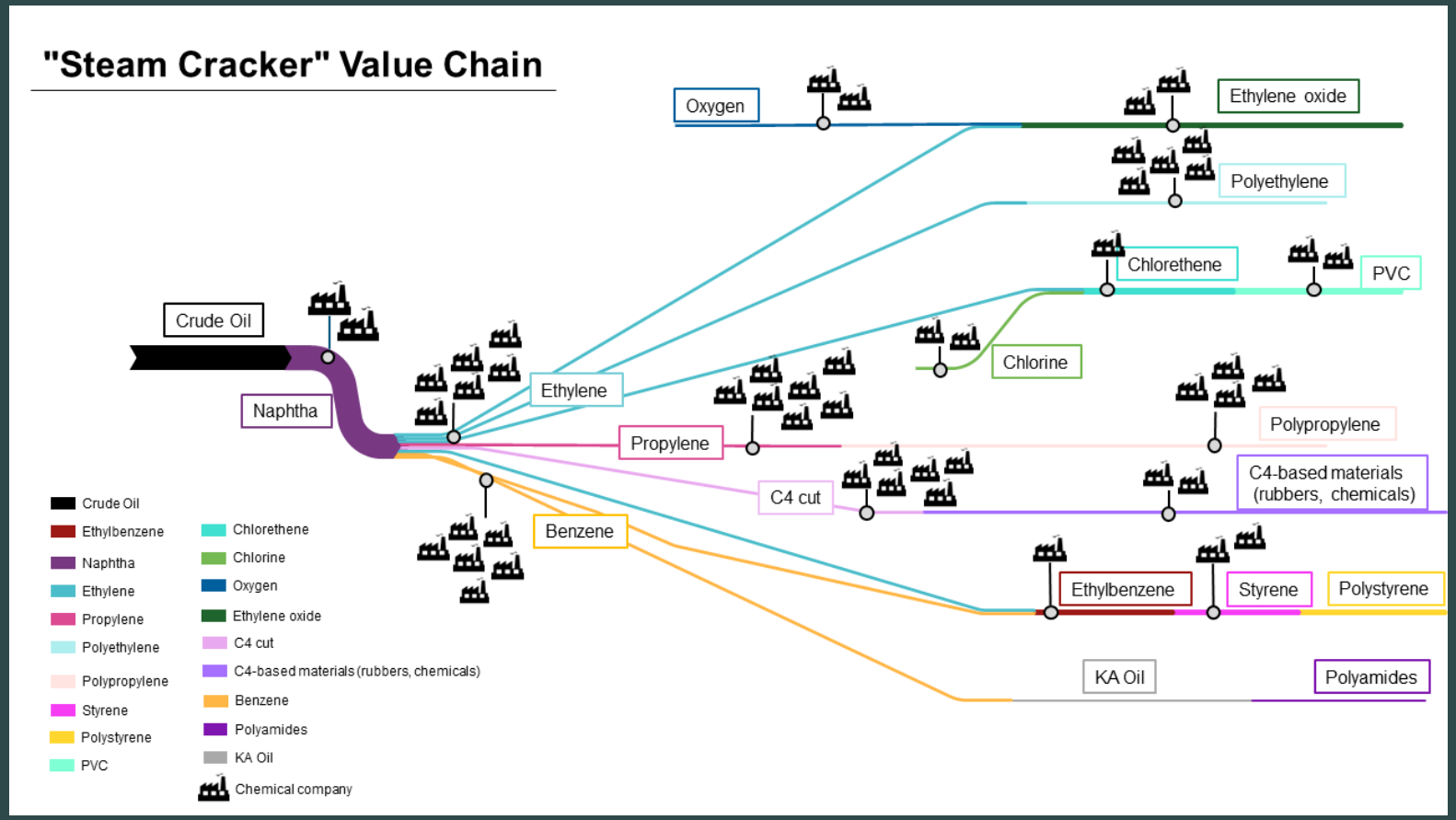
Objectives of 3C-VaCS Project

- Map the legacy, cross-border production infrastructure in the TCR and the relation to global markets and trade
- Evaluate the effect of regulation and the drive towards non-fossil resources on the position, volume, and margin of the European chemical industry
- Identify enablers and obstacles for the European chemical industry to lead the global transformation to sustainable products
- → Policy advice

Timeline and key activities



(1) Value Chains through the TCR chemical industry

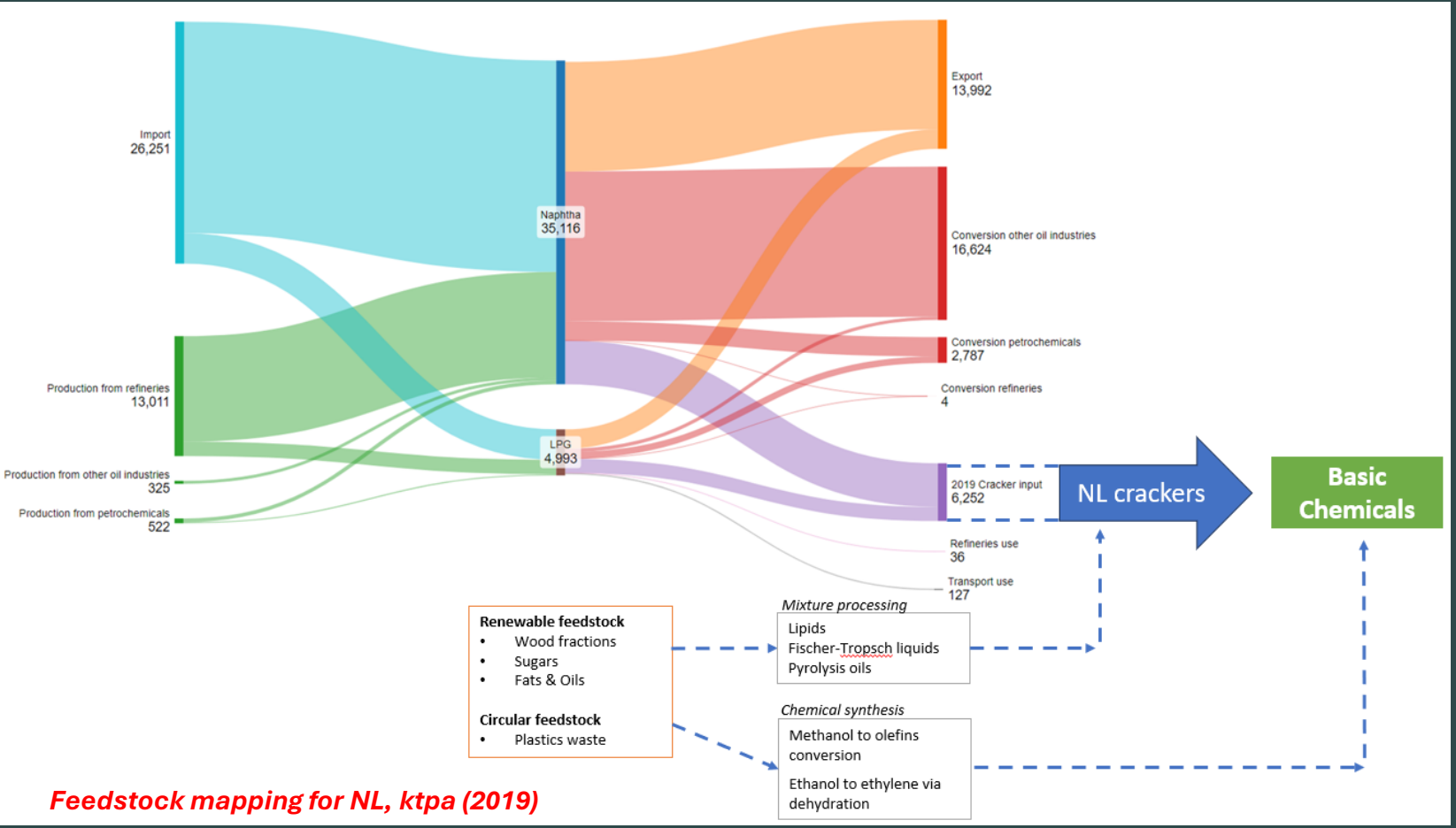


Structured interviews with leading companies

Mapping of flows through product-nodes

- Supply of basic chemicals from **production** of naphtha & LPG and from **import**
- **Import & export** of basic chemicals and intermediates
- Remainder destined for **conversion** to functional chemicals and chemical products

(2) Feedstock options & availability



Feedstock mapping for NL, ktpa (2019)

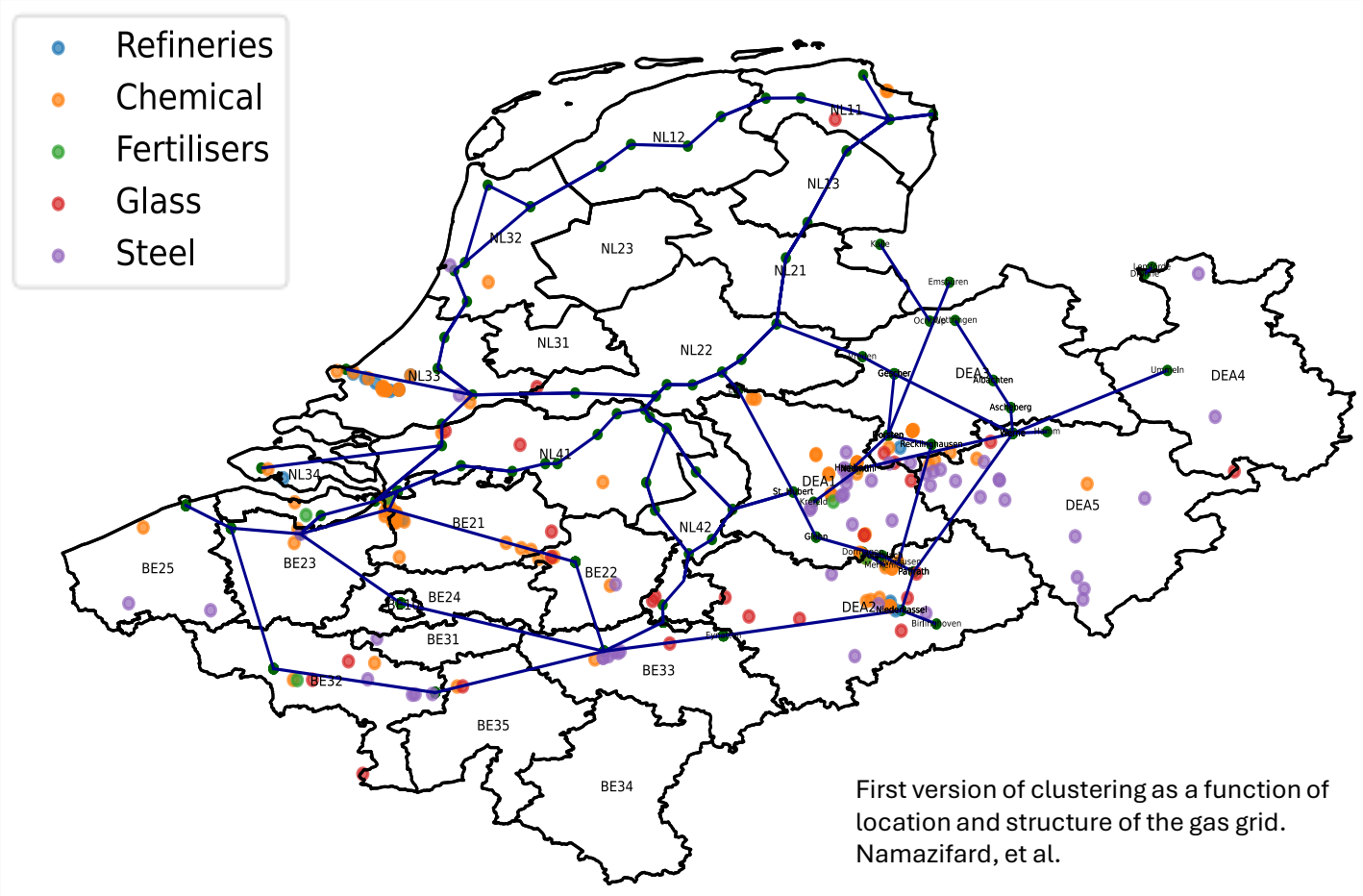
Assess the availability of Naphtha and LPG from refining

Assess the displacement potential of renewable and circular feedstock

- Fats & oils
- Sugars
- Wood fractions
- Plastics waste
- Carbon Dioxide

Unit: kt/year

(3) Energy & feedstock infrastructure and cost



First version of clustering as a function of location and structure of the gas grid. Namazifard, et al.

Assess feedstock and electricity supply

- Mapping of centres for demand and supply
- Optimization modelling for development of infrastructure
- Projection of resource cost for industry in the TCR and impact on certain ‘final product / value chains

(4) Policy & regulatory framework (*workstream not yet started*)

Objectives

- Identify current and future regulations
- Discuss feedstock options for chemicals production
- Assess vulnerability of value chains

APPENDIX

Appendix - First insights from the interviews

Identified benefits of producing in the TCR

- **High population density:**
  - ✓ Availability of **workers**
  - ✓ Chemical products are close to their **consumers**
  - ✓ Abundance of **waste** for a future circular economy
- **High infrastructure density:**
  - ✓ **Waterways** suitable for freight transport
  - ✓ Well developed chemical **pipeline network**
  - ✓ Tightly knit **electrical grid** [1]
  - ✓ **Railway** density is higher than in other European regions[2]
- **Geographical location:**
  - ✓ Proximity to the **ports** of Antwerp and Rotterdam
  - ✓ Comparably cheap electricity from **off-shore windparks available**
  - ✓ Prospect to early connection to **European hydrogen backbone**[3] as well as a **CO_2 infrastructure**[4]
- **Political situation:**
  - ✓ Politically **stable** conditions
  - ✓ **Project risks** are considered to be **lower**
  - ✓ **Smaller interest rates** for borrowed capital
  - ✓ **Schengen** facilitates employment of skilled workers within the TCR
- **Long history of (petro-)chemical industry:**
  - ✓ **Experienced government workers** in admission processes
  - ✓ **Expertise of technical staff** in maintenance of chemical plants
  - ✓ **Proximity** of chemical production sites
  - ✓ **Short distances** and **shared assets**
  - ✓ High level of **integration**
  - ✓ Production **cost reduced**

[1] https://www.vde.com/de/fnn/dokumente/karte-deutsches-hoechstspannungsnetz
[2] https://www.openrailwaymap.org/
[3] https://ehb.eu/page/european-hydrogen-backbone-maps
[4] https://oge.net/de/co2/co2-netz

Appendix - Chemicals production trends in Europe

- With 10.6% decline, the EU27 chemical industry reported the third-largest drop in production in 2023 (Jan-Sep)
- Capacity utilisation in the EU27 chemical industry declined once more and was at 74.1% in the third quarter of 2023
- There is a negative global trade balance of petrochemicals and basic inorganics, the polymers trade balance starts to show decline

➢ Advantaged resources in the Middle East and Asia result in significantly lower cost of local olefins production

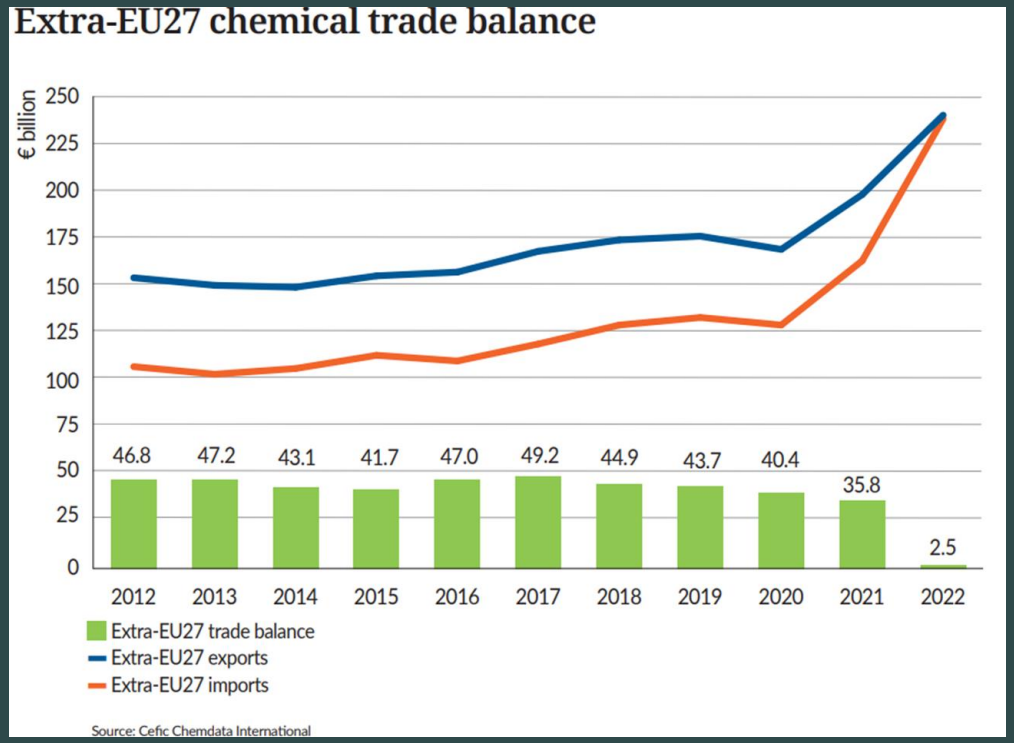
➢ Capacity additions for olefins production in the Middle East and Asia displace European export

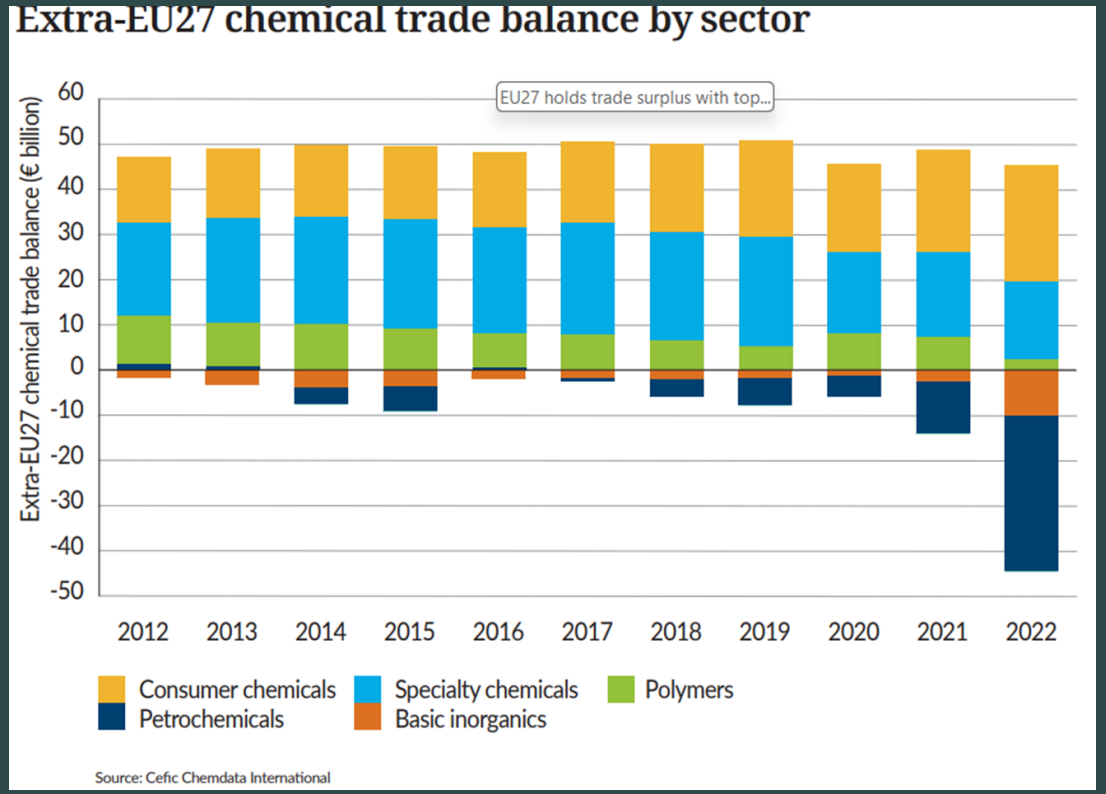
➢ The cost of fossil energy and feedstock in Europe has increased

* See exhibits A, B, C in the appendix

Appendix - Exhibit A

- Europe's chemical trade balance is in decline
- Especially petro- & basic inorganics chemicals (energy intensive) and polymers (first derivatives)

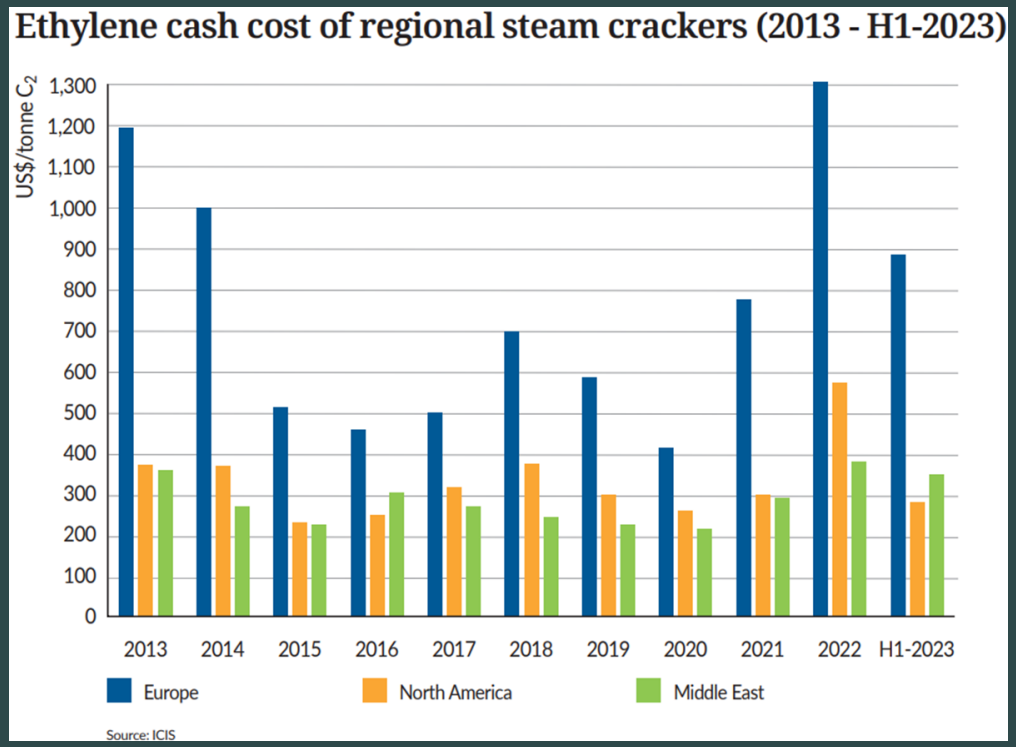


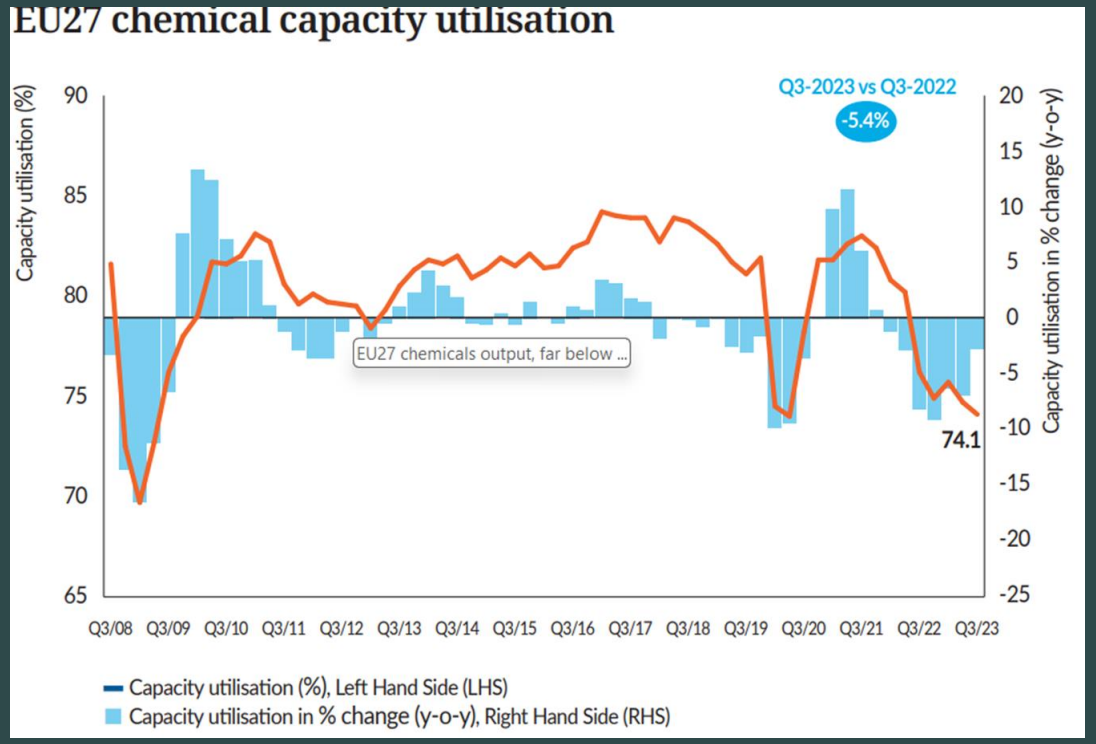


https://cefic.org/a-pillar-of-the-european-economy/facts-and-figures-of-the-european-chemical-industry/

Appendix - Exhibit B

- Cost of Ethylene production in Europe is high compared to Asia and the Middle East
- Capacity utilisation of European chemical industry shows a declining trend

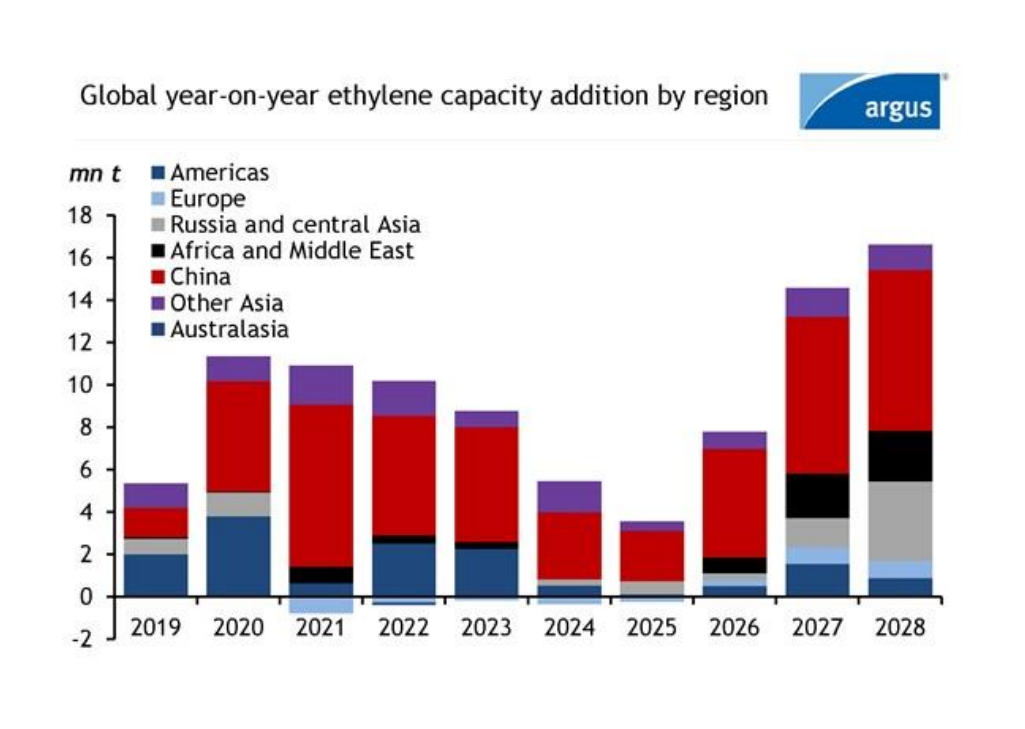


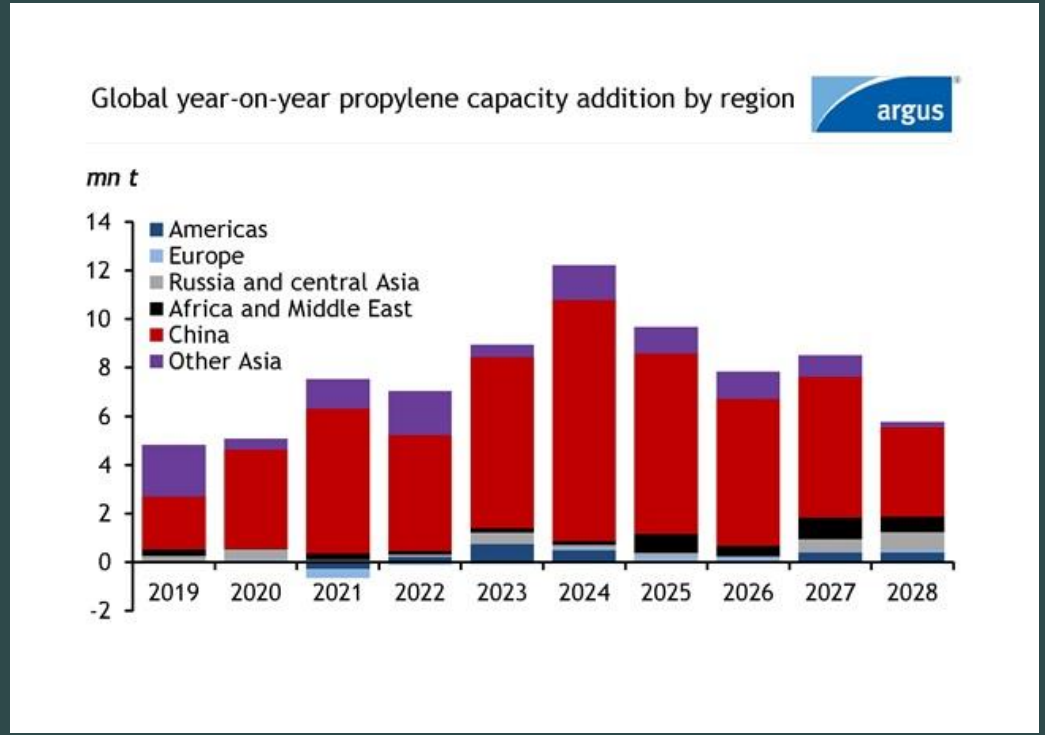


https://cefic.org/a-pillar-of-the-european-economy/facts-and-figures-of-the-european-chemical-industry/

Appendix - Exhibit C

- Planned olefins capacity additions in Middle East, Central Asia and China
- Propylene also from Propane DeHydrogenation





https://www.argusmedia.com/en/news-and-insights/market-opinion-and-analysis-blog/steam-cracker-capacity-addition-relief-in-sight