



# The Effects of the Russo-Ukrainian Crisis on Petrochemicals

*14<sup>th</sup> International Petrochemical Forum*

May 2023

Tehran

Abbas Maleki



# Contents

---

What is Future?

---

Global Energy Projections

---

The European Gas Markets

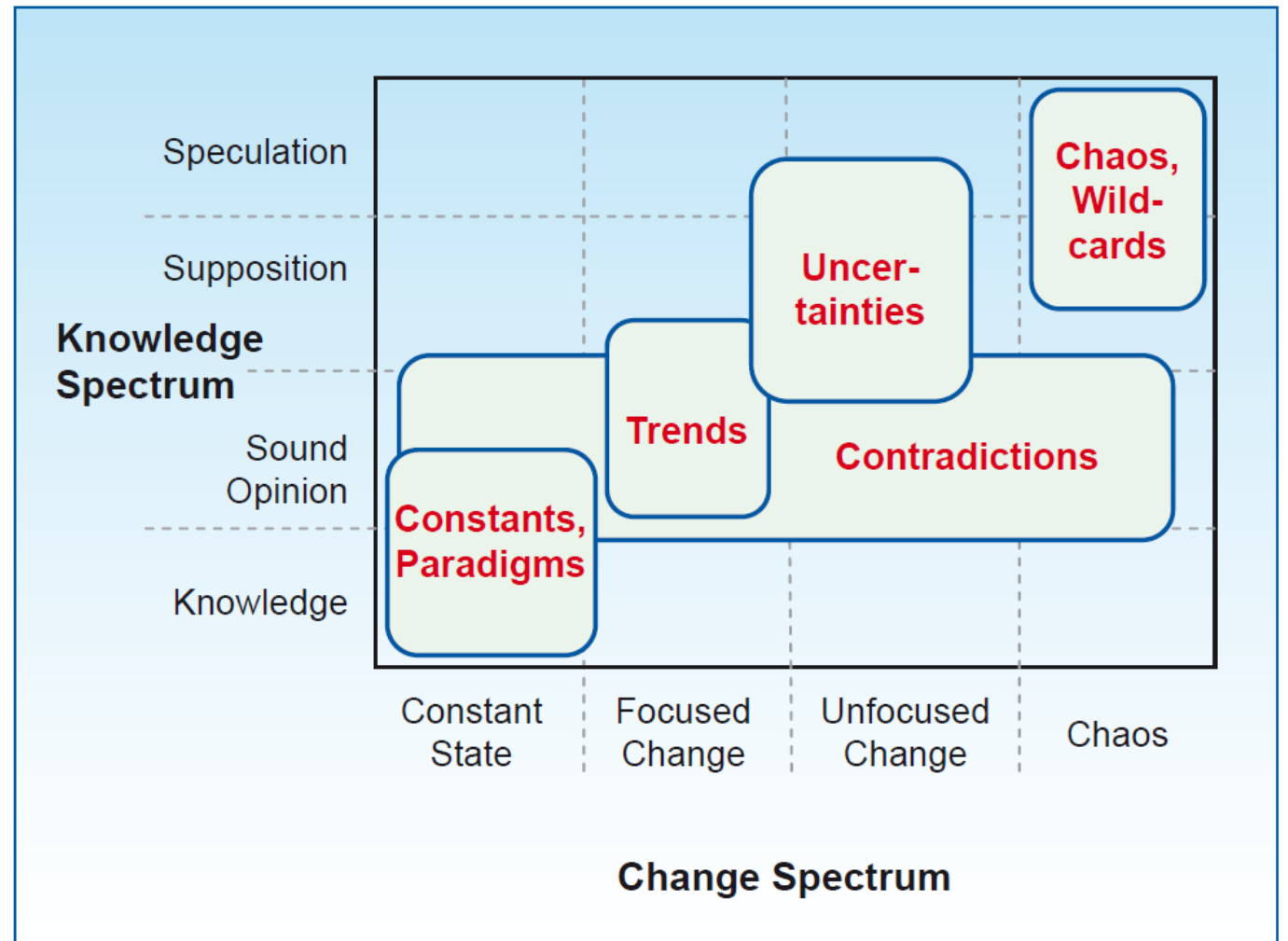
---

Conclusions



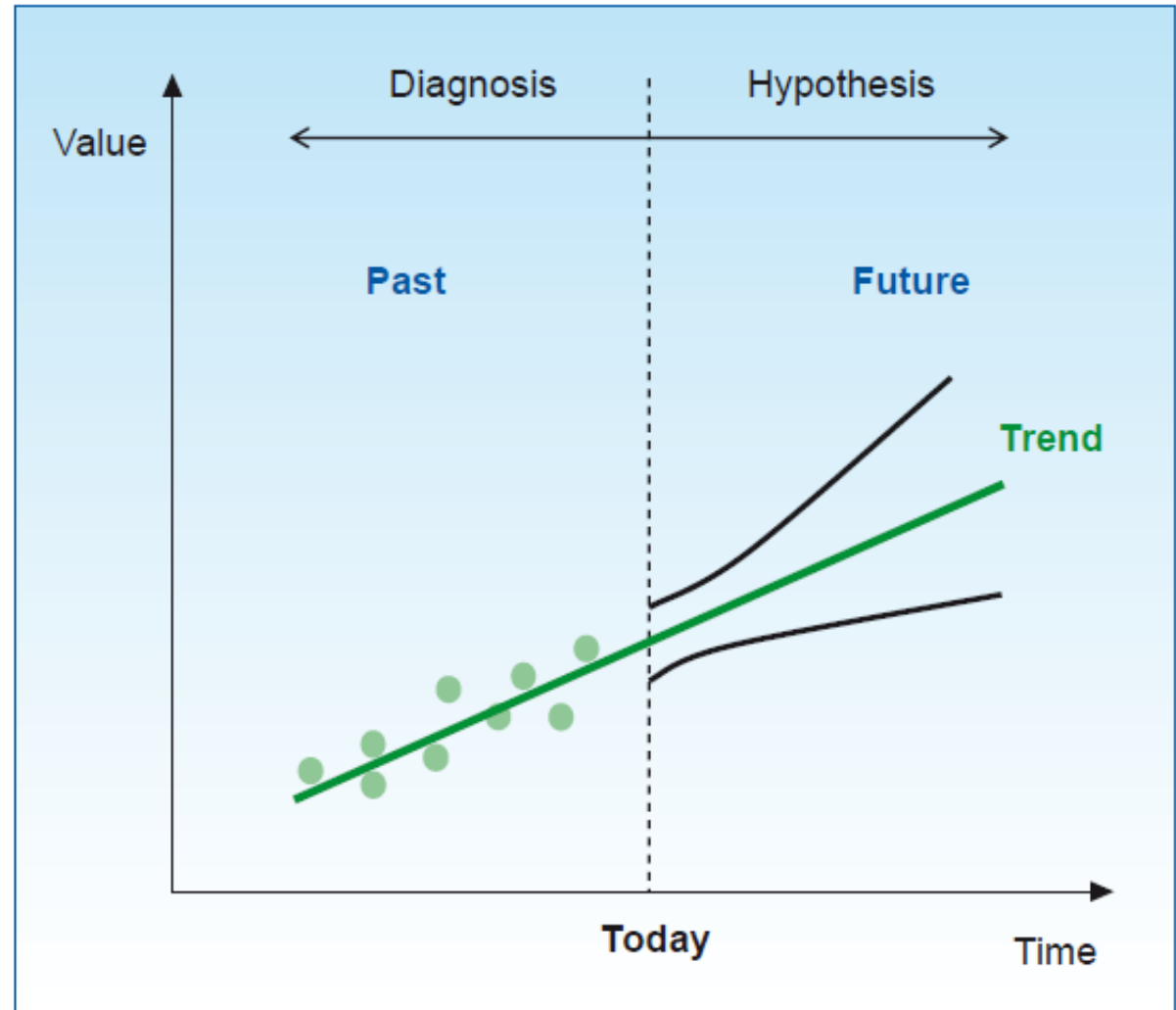
What is future?

# Future Elements



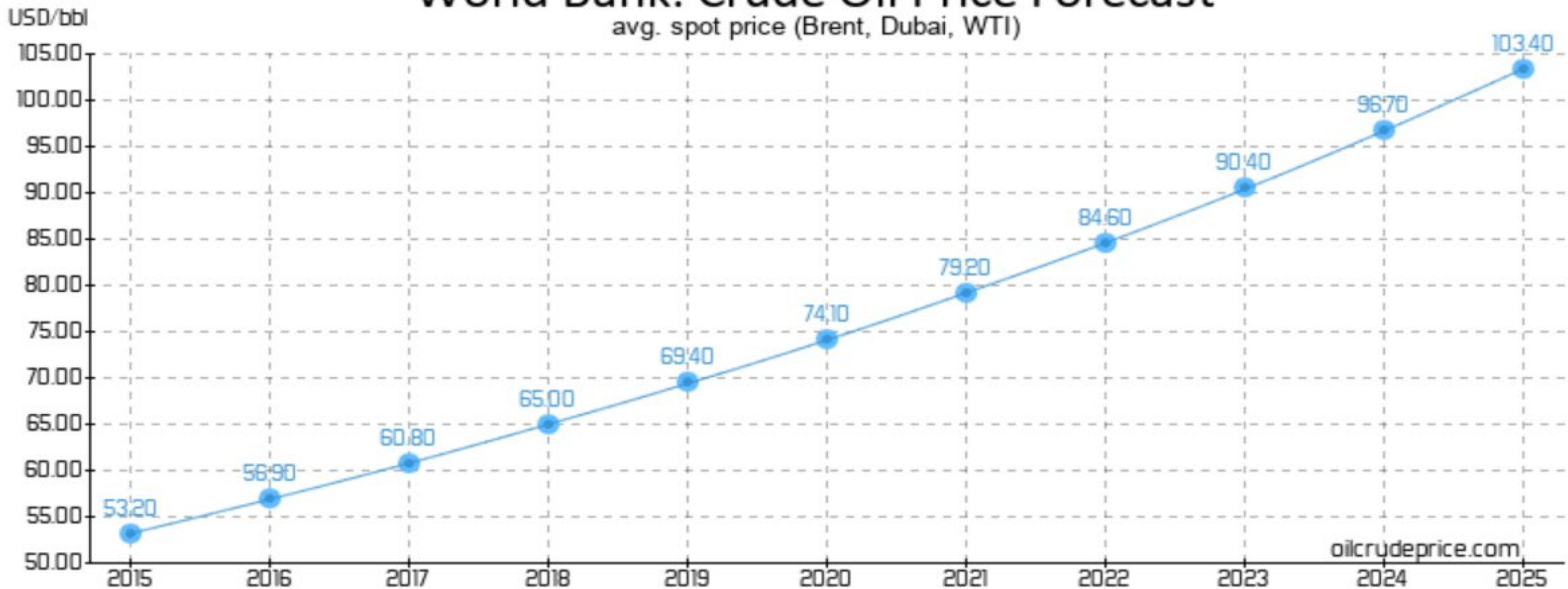
# Trend

---



# World Bank: Crude Oil Price Forecast

avg. spot price (Brent, Dubai, WTI)

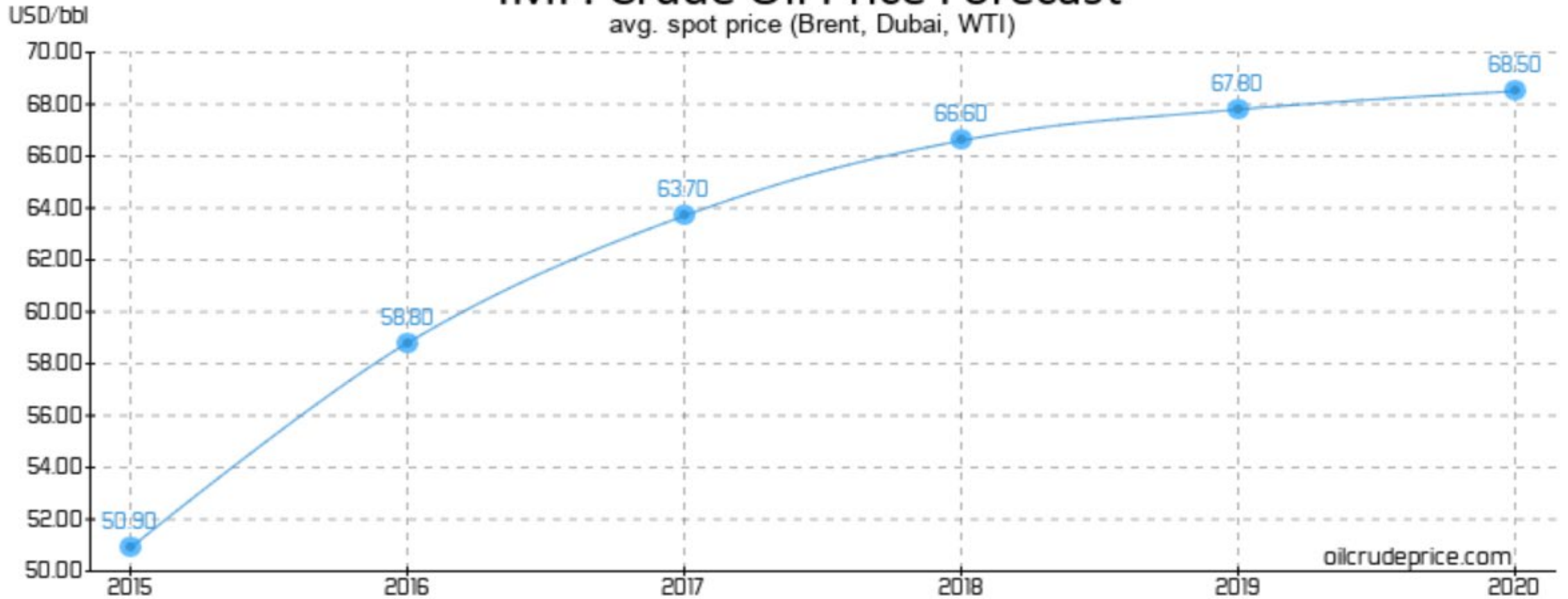


oilcrudeprice.com

2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
53.2	56.9	60.8	65	69.4	74.1	79.2	84.6	90.4	96.7	103.4

# IMF: Crude Oil Price Forecast

avg. spot price (Brent, Dubai, WTI)



oilcrudeprice.com

2015

2016

2017

2018

2019

2020

50.9

58.8

63.7

66.6

67.8

68.5

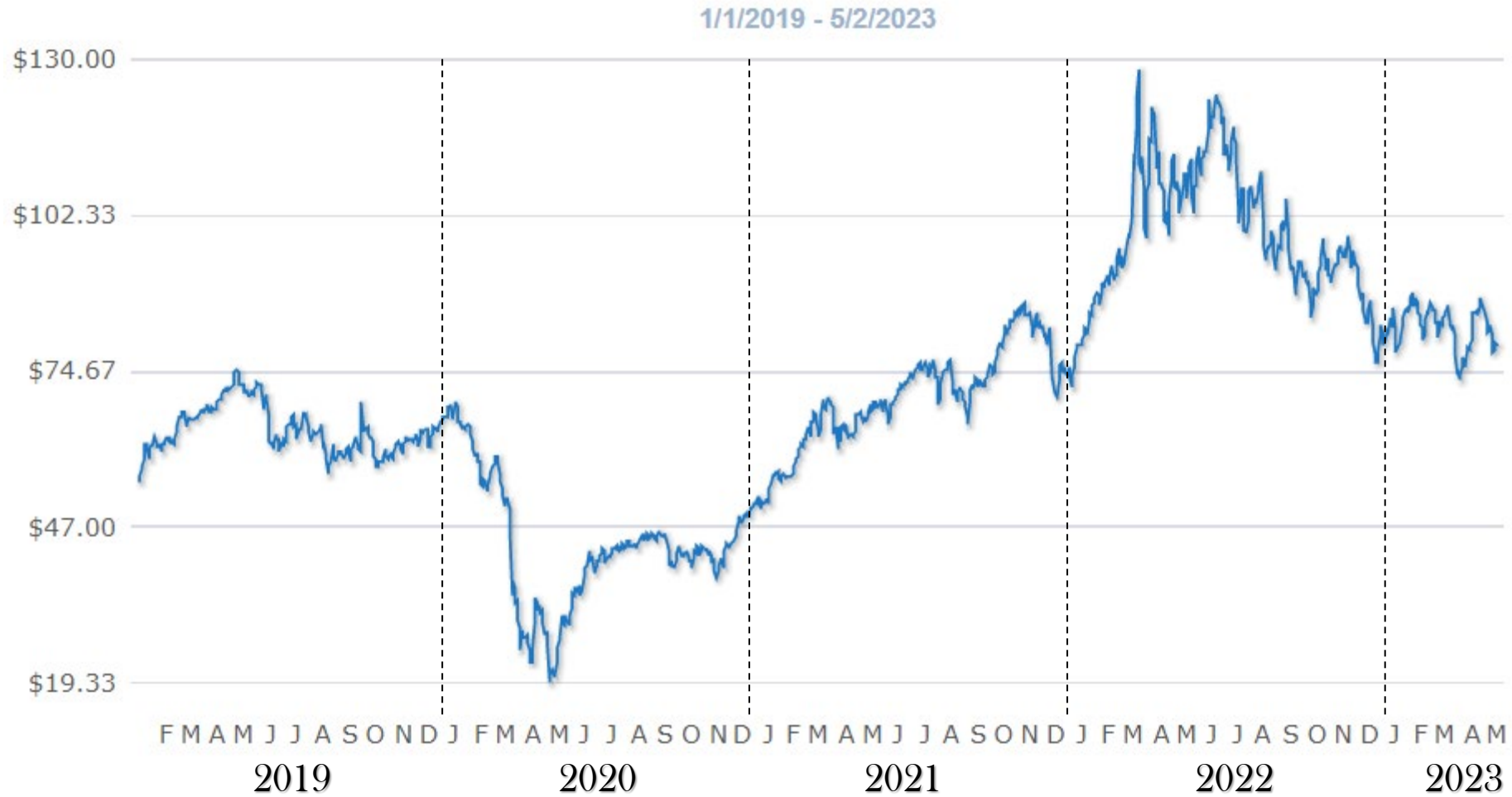


# Oil as the main Energy Carrier



# Brent Crude Oil

price fluctuations from January 2019 to the present: 79.37 \$/b

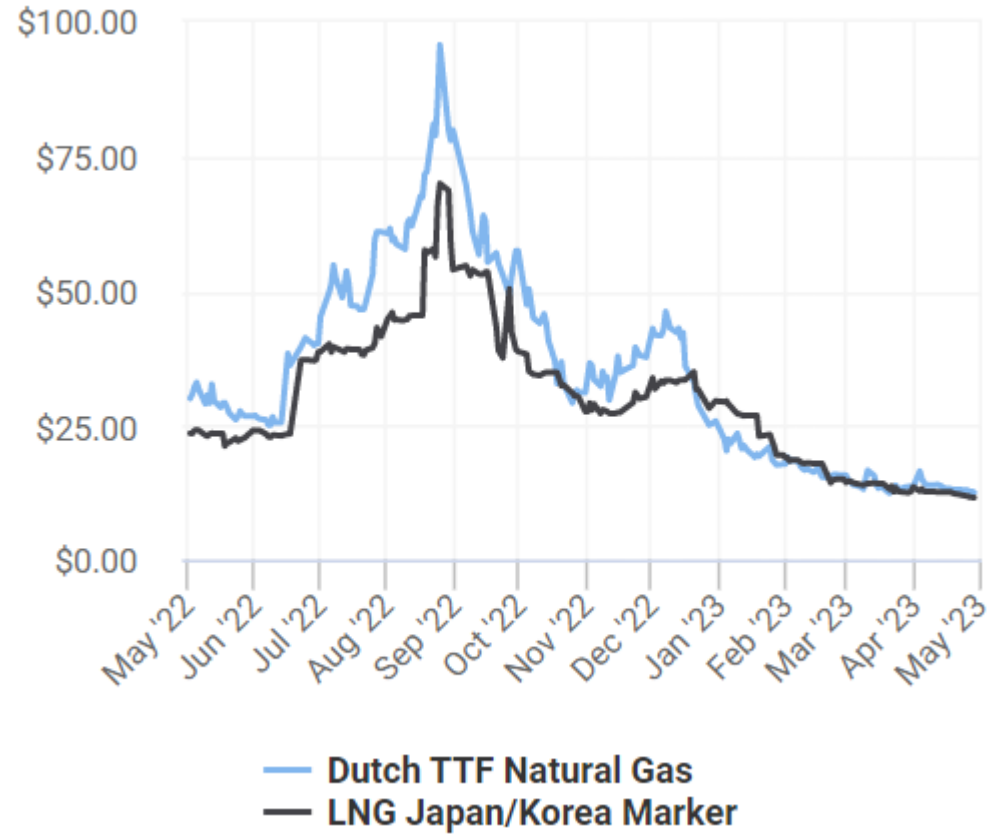


WTI Crude Oil  
price fluctuations from January 2019 to the present: 75.79 \$/b



Natural Gas Henry Hub  
price fluctuations from January 2019 to the present: 2.30 \$/MMBtu





Dutch TTF Natural Gas  
And  
LNG Japan/ Korea Marker  
\$/ Million BTU

 Dutch TTF Natural Gas	12.47	-0.22	-1.71%	(3 Days Delay)
 LNG Japan/Korea Marker	11.55	-0.04	-0.39%	(3 Days Delay)

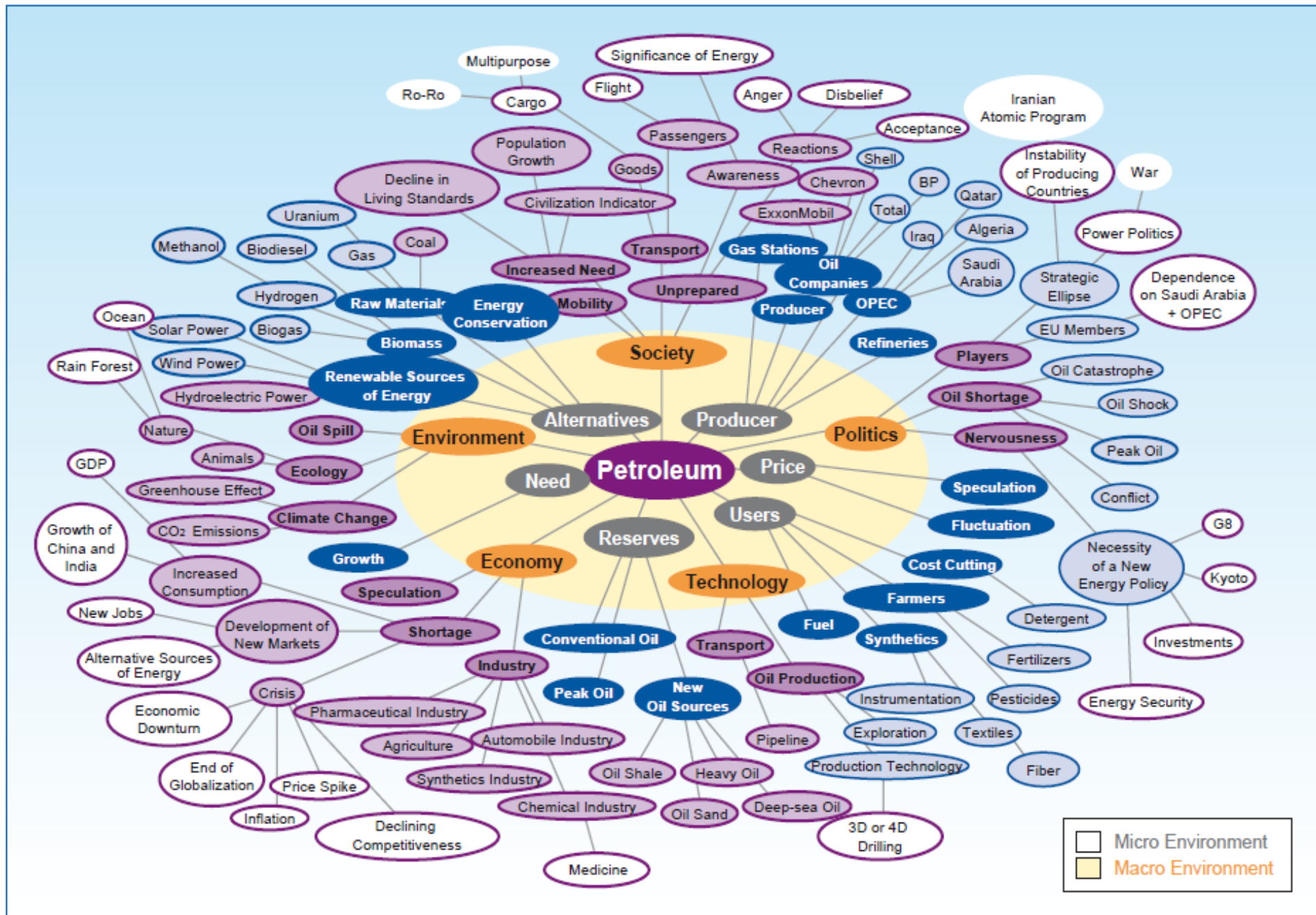
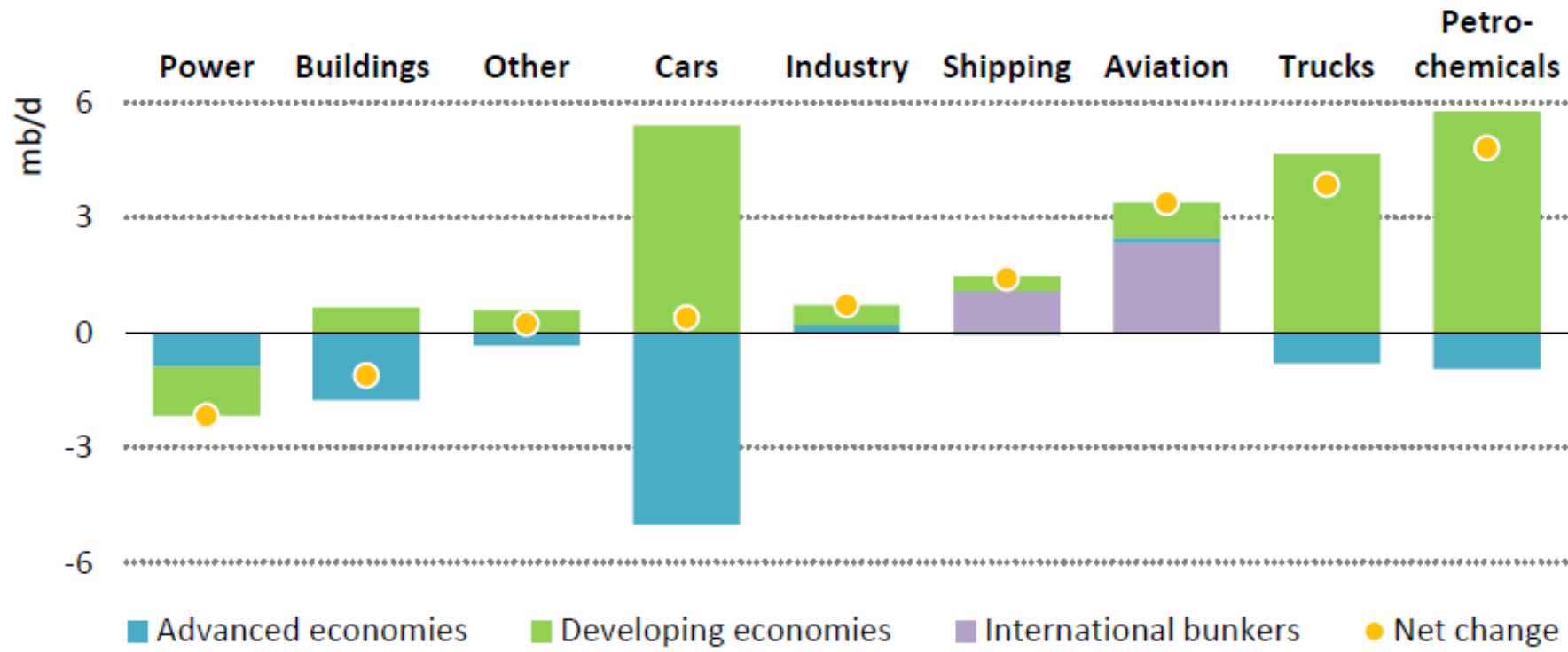


Figure 150 Trend radar diagram: overview of the general situation and relationships



# Change In Global Oil Demand By Sector, 2020-2040

*Petrochemicals, trucks and aviation dominate future oil demand growth*

(Source: WEO, 2022)



# Petrochemicals in Europe

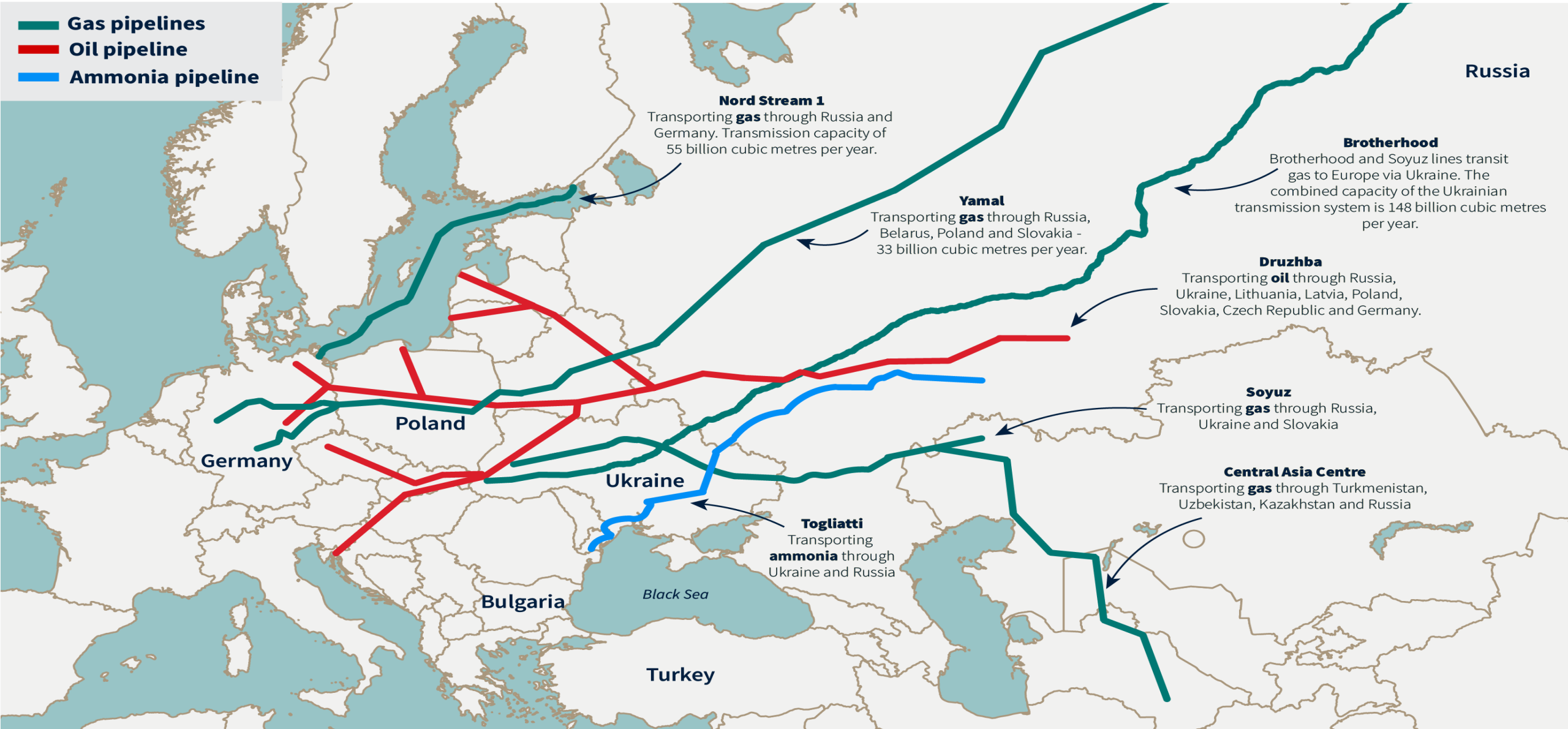
# Petrochemicals in Europe

- War in Ukraine has hit economies badly
  - Pivotal German market as supply from Russian oil and gas
  - Industry's competitiveness have been stopped
- Before the Russian invasion of Ukraine, European production levels were strong and chemical plants were operating at high run rates and healthy margins
- European petrochemicals prices were high
  - Amid market tightness
  - Caused by unplanned stoppages
  - A bounce-back in manufacturing
  - A reduction in imports into Europe caused by low production elsewhere



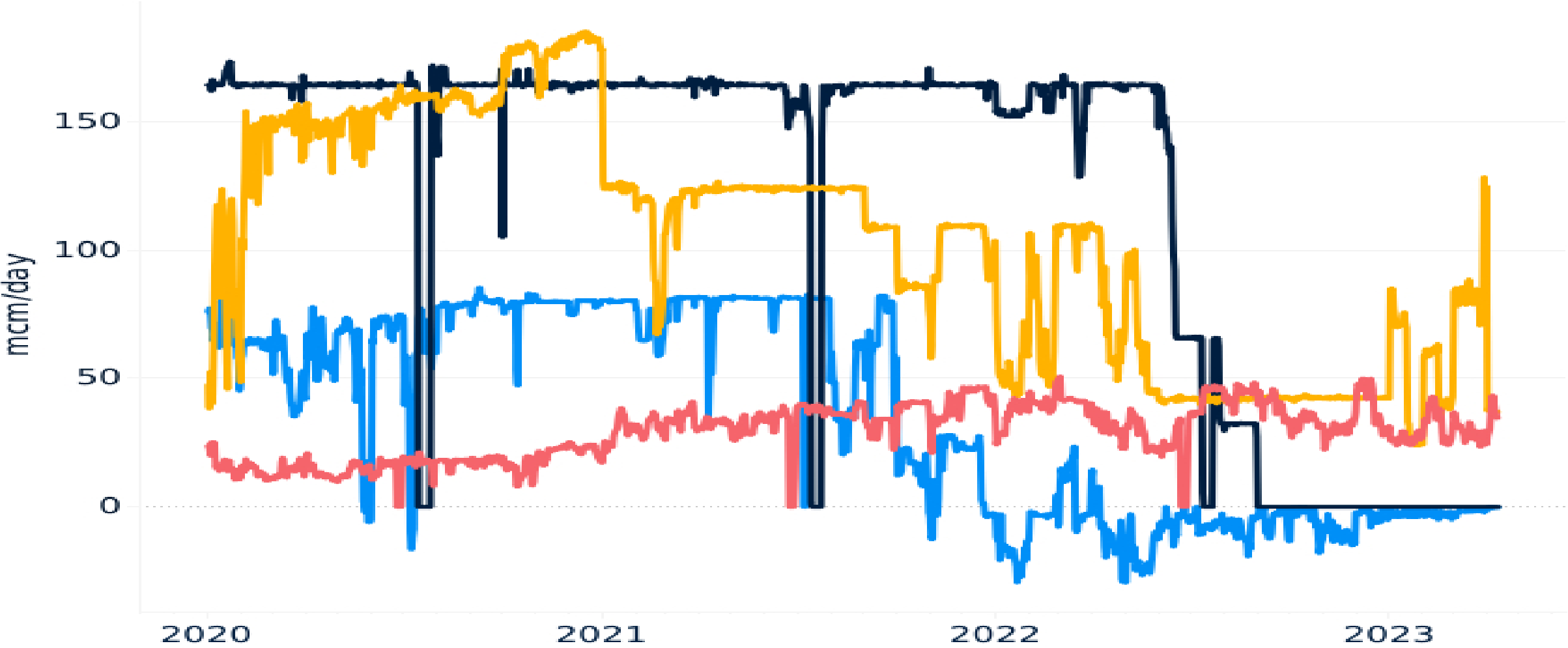
# Oil, gas and ammonia pipelines through Russia into Europe

Selected pipelines from Russia into Europe



# Russian gas flows via Ukraine, Poland and NS1

TurkStream 2      Ukraine      NS1      Yamal (via Pc



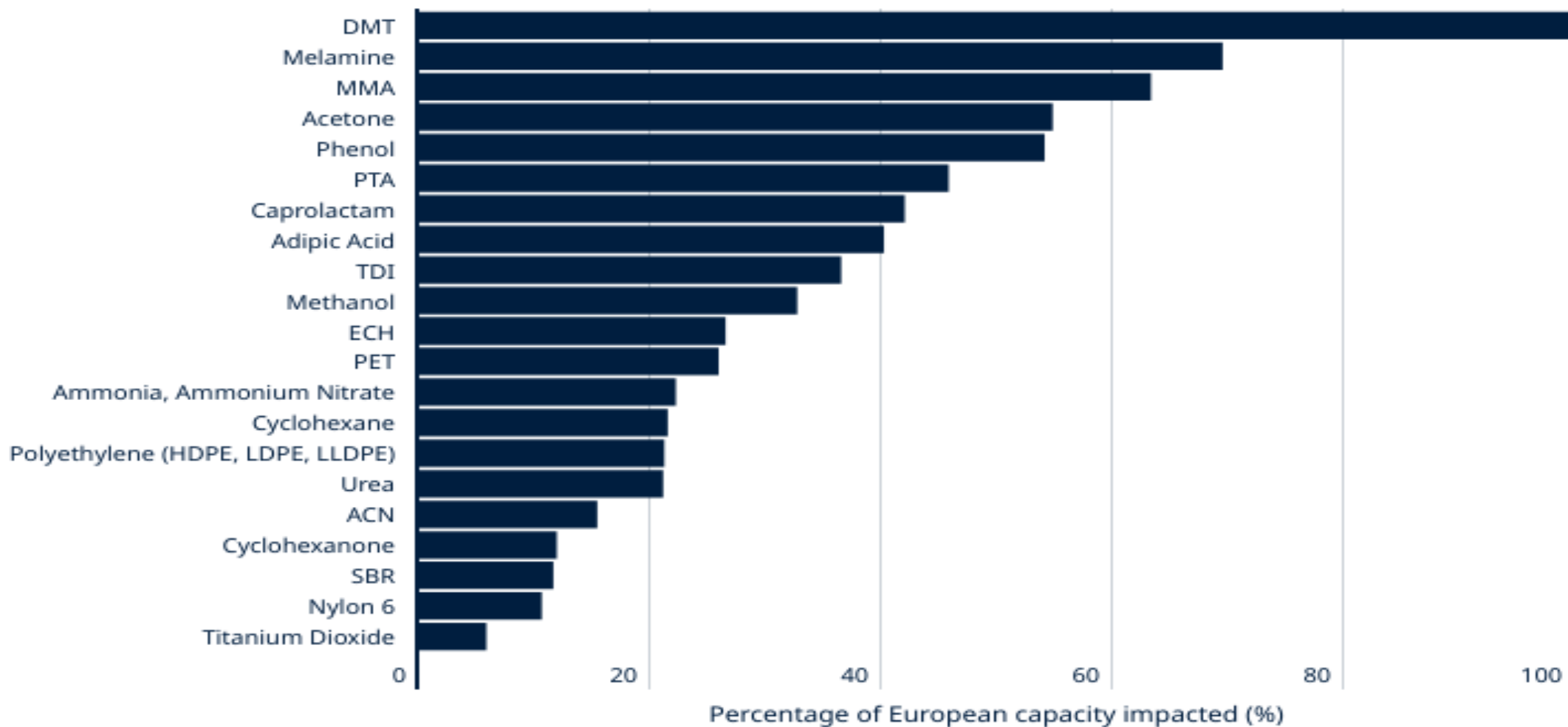
**SOURCE:** European Gas Operators, ICIS (Ukraine - Sudzha and Sokhranivka) NS1 (OPAL and NEL)

# Petrochemicals in Europe II

- Product prices rose faster than naphtha feedstock costs, leading to strong commodity petrochemicals margins
- The situation has reversed from March 2022 as
  - Energy price spike has undermined petrochemicals margins
  - Demand has deteriorated.
- Situation is likely to worsen amid
  - Attrition on demand
  - Leading to the closure of conventional petrochemicals output
  - Potentially a faster transition to greener, low-carbon production
  - Including closed-cycle plastic manufacturing
  - Bio-based feedstocks

## European chemical production impacted by gas costs

Percentage of European production offline or at reduced capacity (updated 10 March 2023)

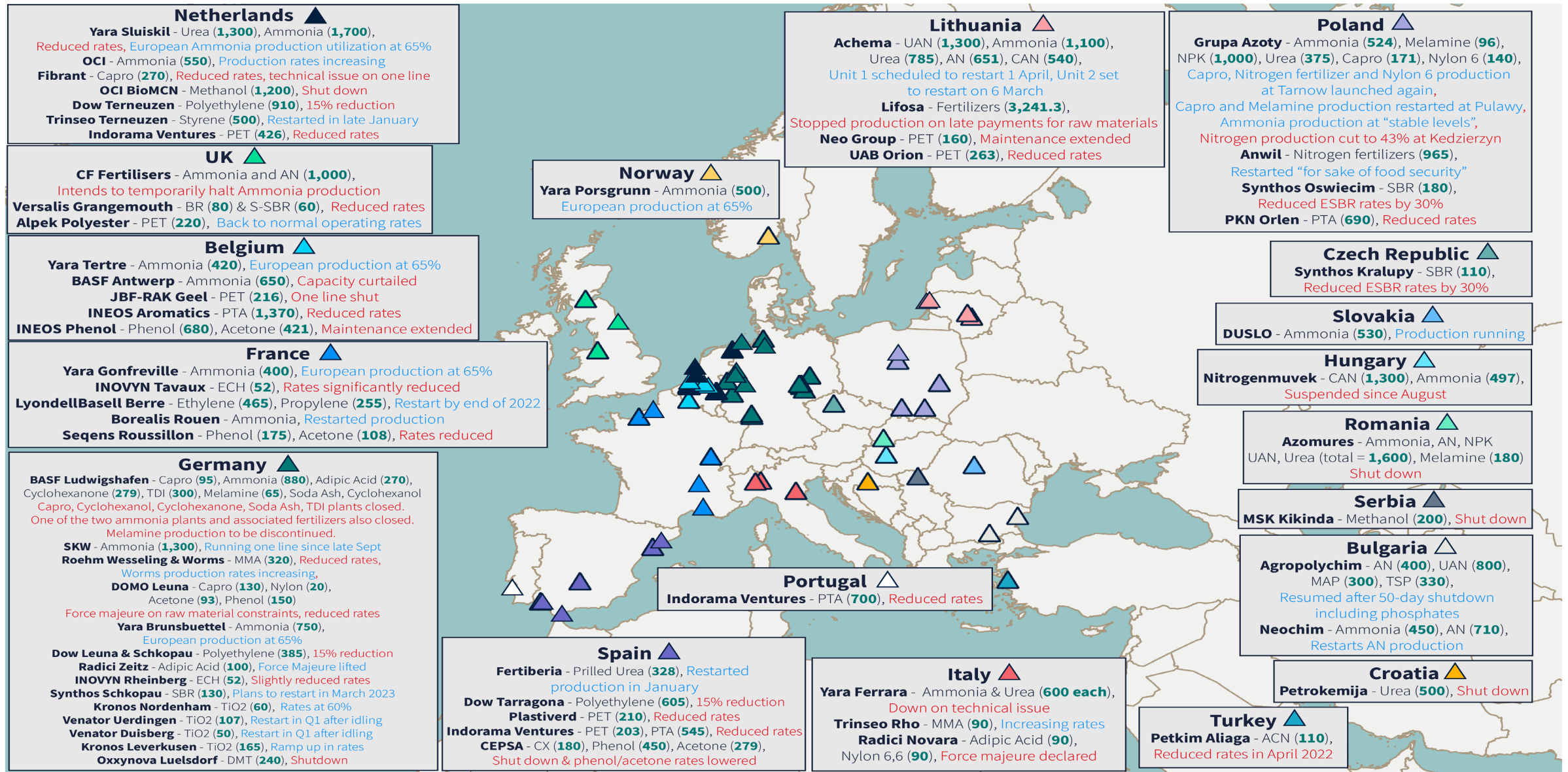


**SOURCE:** ICIS Editorial, ICIS Supply & Demand Database

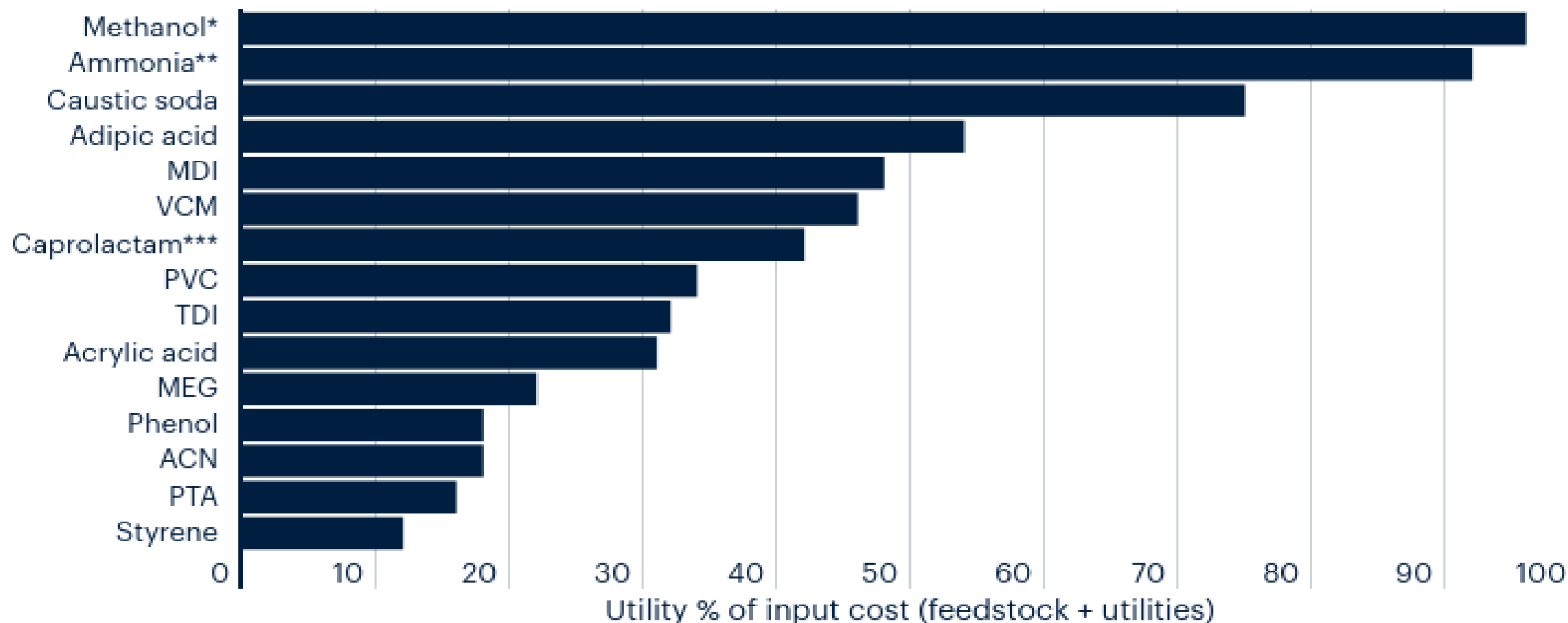
**NOTE:** excludes fertilizers

# European production resumes on lower gas costs

Capacities in '000 tonnes/year put next to product impacted in **green**, plants colour coded by country, updated on 10 March 2023



## Chemicals with most exposure to price of gas & electricity



**SOURCE:** ICIS Margin Analytics

\*around 96% variable cost exposure through natural gas as a feedstock

\*\*around 92% variable cost exposure through natural gas as a feedstock

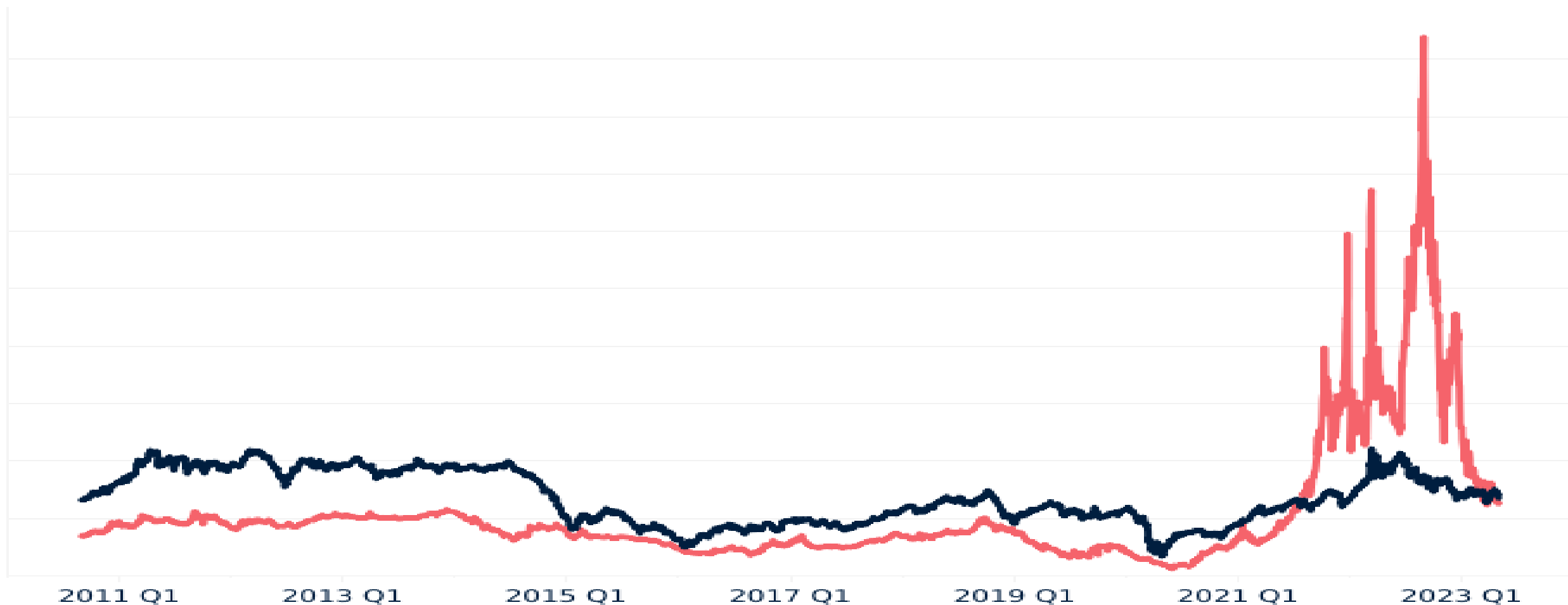
\*\*\*Caprolactam heavily exposed through gas as a feedstock

NOTE: List excludes other fertilizers, melamine and MMA which are not covered by ICIS Margin Analytics

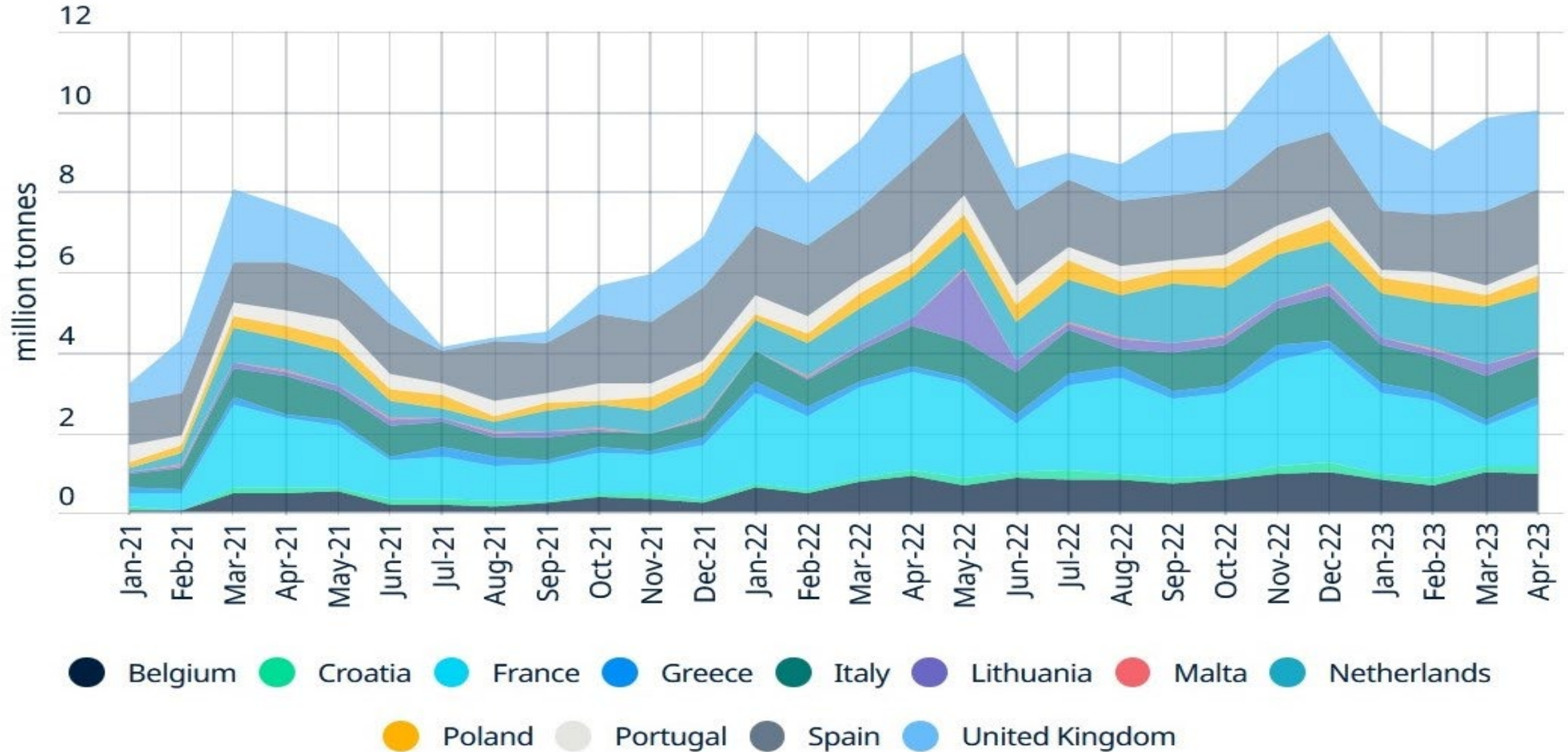
# Natural gas and oil comparison

(updated till 27 April 2023)

- ICIS Brent Month +1 Closing value
- ICIS TTF Price Assessment Month +1 Bid-offer range



# LNG imports to Europe



SOURCE: ICIS LNG Edge (updated till 27 April 2023)



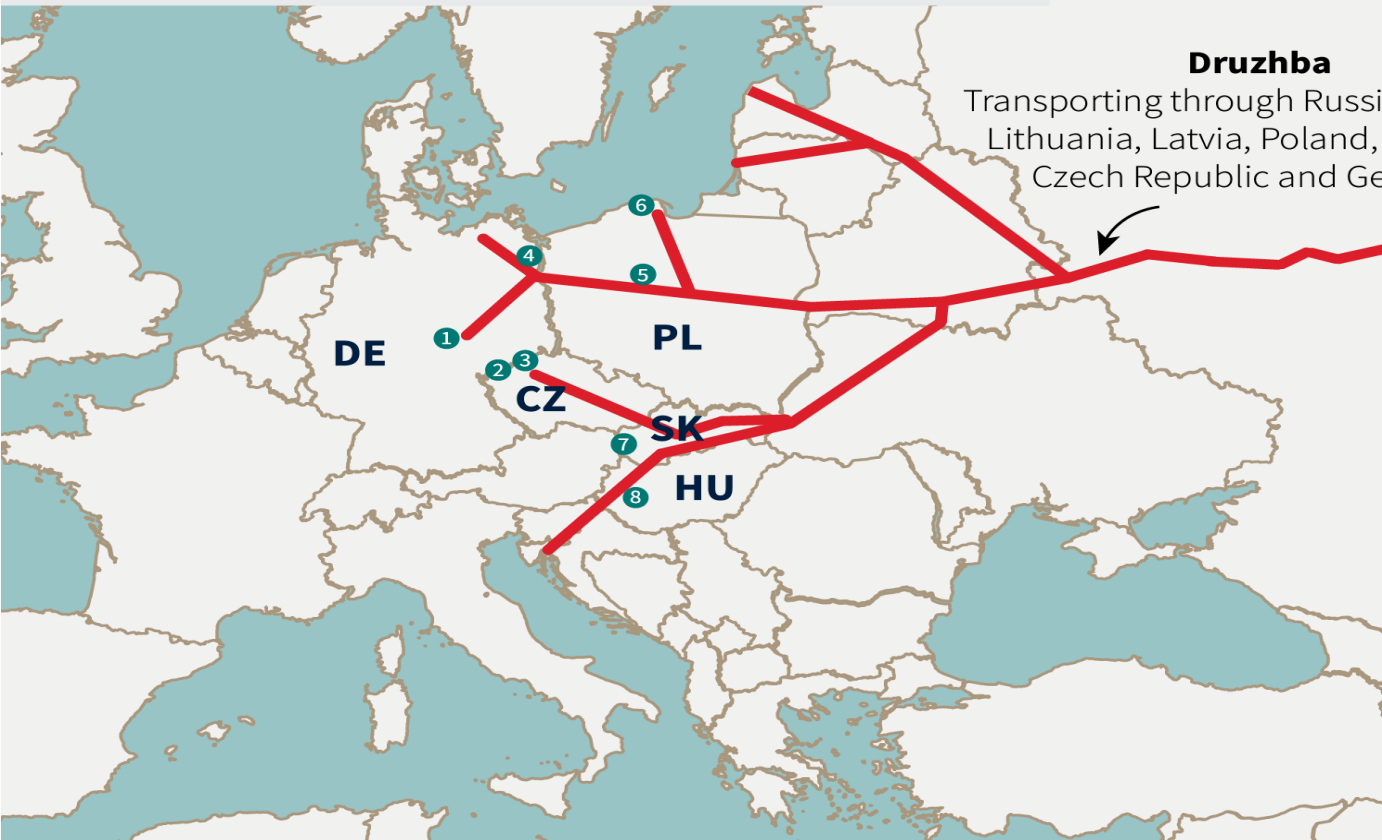
# Refineries which rely on Russian crude oil from the Druzhba pipeline

## Refineries

- 1 = TotalEnergies Raffinerie Mittldeutsch, Leuna, Germany
- 2 = Orlen Unipetrol RPA, Kralupy, Czech Republic
- 3 = Orlen Unipetrol RPA, Litvinov, Czech Republic
- 4 = PCK Raffinerie, Schwedt, Germany
- 5 = PKN Orlen, Plock, Poland
- 6 = Grupa Lotos, Gdansk, Poland
- 7 = Slovnaft (MOL Group), Bratislava, Slovakia
- 8 = MOL Hungarian Oil and Gas Co, Szaazhalombatta

## Ethylene capacities

Site	2021 capacity (kt)	Plant Status
PKN Orlen, Plock	<b>700</b>	No maintenance/shutdown
Orlen Unipetrol RPA, Litvinov	<b>545</b>	No maintenance/shutdown
Slovnaft (MOL Group), Bratislava	<b>240</b>	Maintenance during June-July 2022



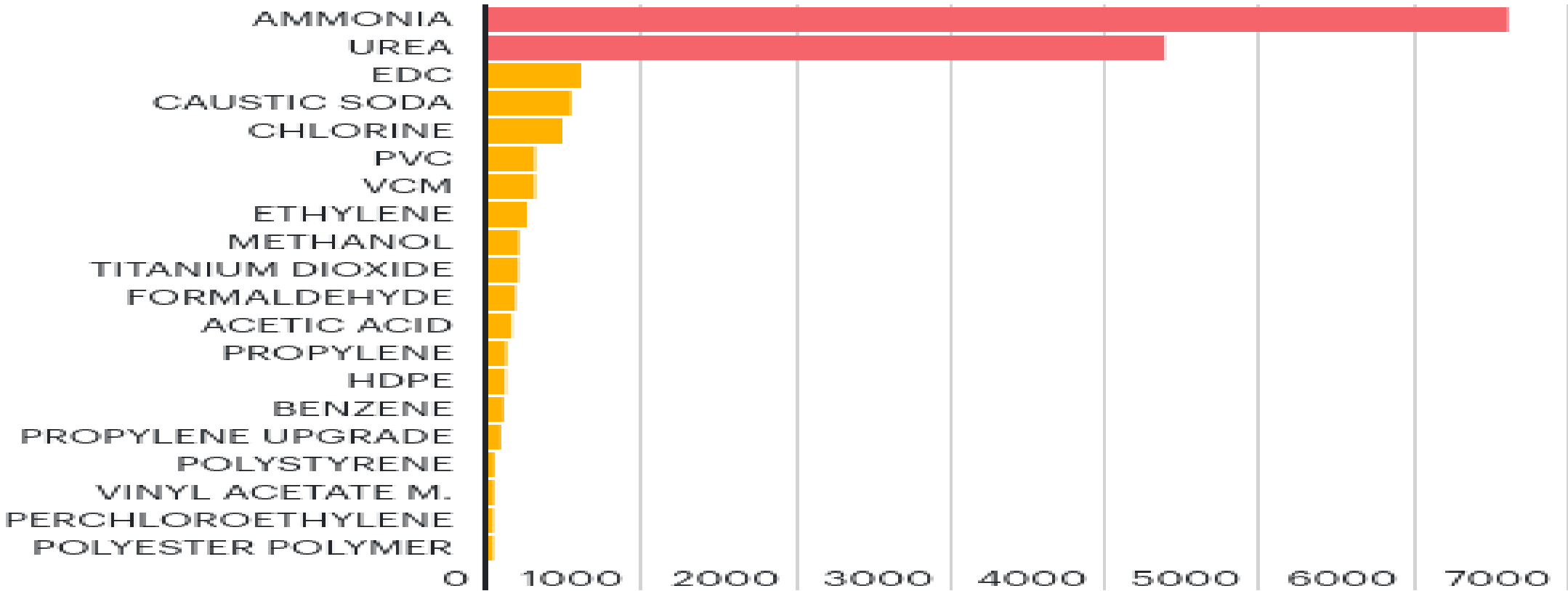
## Russia crude exports to Europe in 2021

Country	2021 imports from Russia (kt)	Total imports (kt)	Russia % of total
Czech Republic	3,417	6,841	<b>50%</b>
Germany	21,956	71,453	<b>31%</b>
Hungary	2,684	3,667	<b>73%</b>
Poland	12,768	21,401	<b>60%</b>
Slovakia	4,735	4,948	<b>96%</b>

**SOURCE:** Global Fossil Infrastructure Tracker, Global Energy Monitor, Ameropa, ICIS  
(Country codes: DE = Germany, PL = Poland, CZ = Czech Republic, SK = Slovakia, HU = Hungary)

# Top 20 fertilisers and petrochemicals produced in Ukraine

*Production capacity in thousand tonnes*

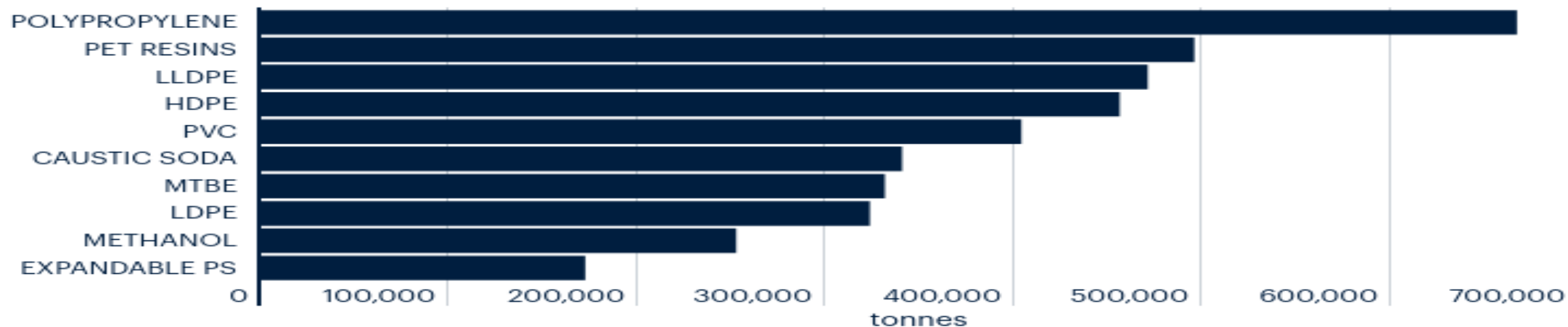


Source: ICIS Supply and Demand Database

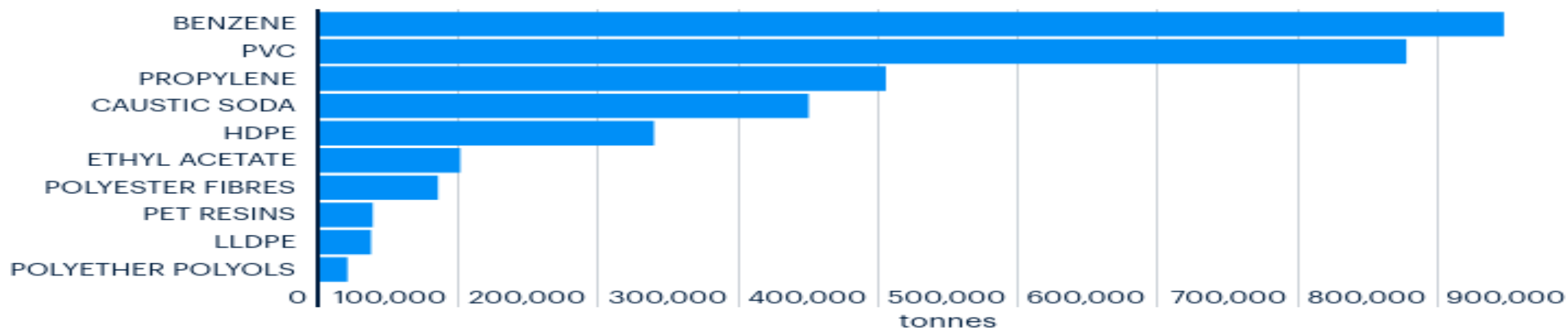
# Top Ukrainian petrochemical imports and exports

Imports and exports between 2017-2021

## Imports



## Exports



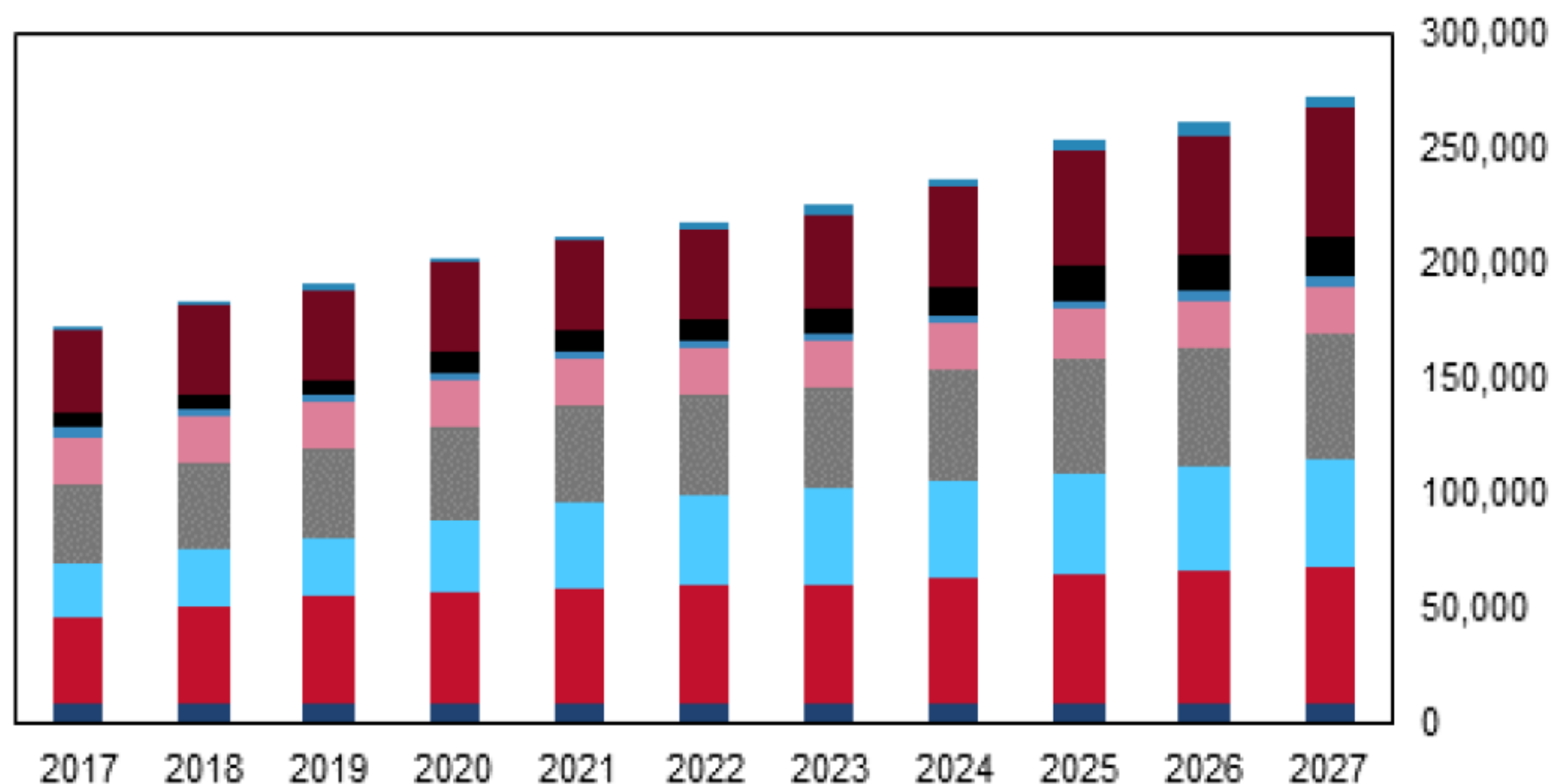
**SOURCE:** ICIS Supply & Demand Database (raw data only)

# Hydrogen Revolution

- Development of a green hydrogen economy offers the prospect of a long-term revival
- Requires significant growth in renewables capacity.
- If achieved over the next decade,
  - Plans for green hydrogen could provide the feedstock for ammonia and methanol production
  - Revive the chemicals chain
- Will be de-linked from the oil and gas sectors

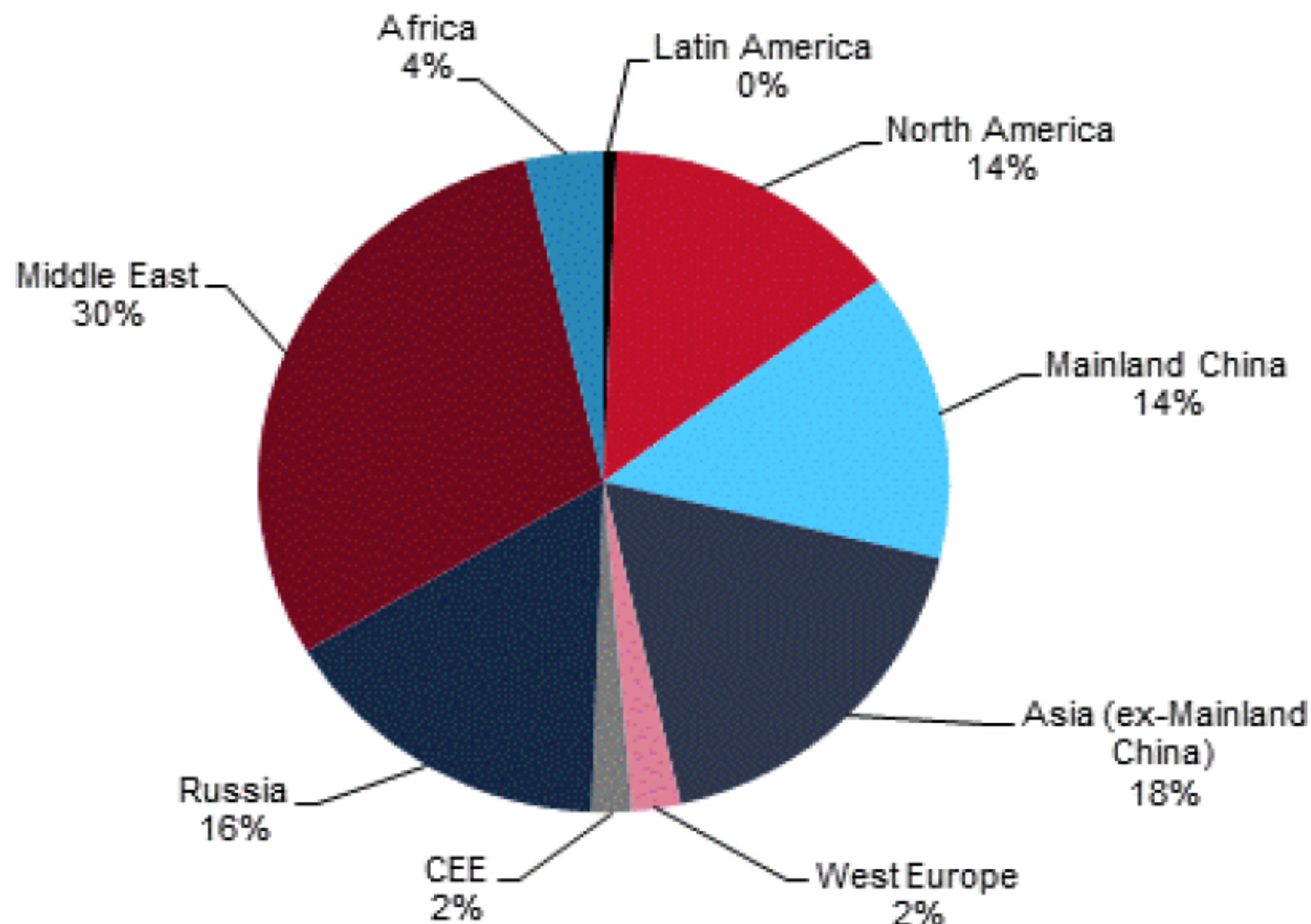
# 54mtpa Of New Ethylene Capacity Due Onstream By 2027

Global - Forecast Cracker Capacity Expansion ('000tpa)



# Middle East Leads Expansion

Contribution To Global Ethylene Expansion By Region (2022-2027)




# Conclusions

- Asia continues to be the leading region for global petrochemicals development
  - Robust investment and growth across all segments
  - Dominated by China
- Middle East and North America host the second- and third-largest petrochemicals project pipelines globally
  - Led primarily by Iran
  - Saudi Arabia
  - U. S.
- Spurred by strong public investment
  - In climate change-related transitions
  - Overall increased focus on government support for net zero objectives

# Conclusions II

- There is increasing focus on
  - Green hydrogen
  - Bio-based feedstock
  - Circular economy in chemicals production
- Moving the industry gradually away from fossil fuels
- Emphasis will remain on natural gas as the feedstock of choice
- Asia hosts the largest share of the global cracker project pipeline, bolstered by activity in key emerging markets:
  - India
  - China
  - South East Asia
- In Europe operations are under threat due to pressures on margins





maleki@sharif.edu