The Hague Centre
for Strategic Studies

No Fuel, No Fight
The Dutch Fuel Industry and European Military Readiness

Irina Patrahau, Ron Stoop and Lucia van Geuns

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Authors:
Irina Patrahau, Ron Stoop and Lucia van Geuns

Contributors:
Michel Rademaker, Nico Tak, Tom Middendorp and Marit Weurding

Data analytics:
Maria-Antigone Rumpf, Energex Partners

Cover image:
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List of abbreviations

ARA	Amsterdam–Rotterdam–Antwerp
CBAM	Carbon Border Adjustment Mechanism
CEPS	Central Europe Pipeline System
COVA	*Centraal Orgaan Voorraadvorming Aardolieproducten* (Dutch stockholding agency for petroleum products)
e-SAF	Electro-Sustainable Aviation Fuel or Synthetic Sustainable Aviation Fuel
ETS	Emissions Trading System
ETS2	Emissions Trading System 2
EU	European Union
EUMR	Methane Emissions Regulation
F-34	NATO designation for fuel broadly equivalent to Jet A-1 with military additives
FAME	Fatty Acid Methyl Ester
GHG	Greenhouse Gas
HEFA	Hydroprocessed Esters and Fatty Acids
HNS	Host Nation Support
HVO	Hydrotreated Vegetable Oil
IEA	International Energy Agency
Mtpa	Million tonnes per annum
NATO	North Atlantic Treaty Organization
NWE	North-Western Europe
RAPL	Rotterdam-Antwerp Pipeline
REDIII	Renewable Energy Directive III
RFNBO	Renewable Fuels of Non-Biological Origin
RMR	Rhein-Main-Rohrleitungstransportgesellschaft
RRP	Rotterdam-Rijn Pijpleiding
RSOI	Reception, Staging, Onward Movement, and Integration
SAF	Sustainable Aviation Fuel
SFC	Single Fuel Concept
UAE	United Arab Emirates

Executive summary

Fuel shortages in the Netherlands and across the EU could constrain military operations and carry severe economic consequences

The European Union (EU) finds itself in a tense security era with a fuel system designed for market efficiency, not deterrence, mobilisation, or war. At a time when European countries need more fuel for military readiness, they are becoming more dependent on fragile supply chains. The 2026 conflict in the Middle East has exposed this vulnerability. The closure of the Strait of Hormuz and attacks on Gulf refineries and export terminals triggered the largest oil supply disruption in history, drove up prices, and hit a region that had been supplying roughly half of Europe's jet fuel imports.

The central finding of this report is clear: in the event of conflict, neither the Netherlands nor the EU can meet surging military fuel demand while keeping the civilian economy functioning. Serious shortfalls are projected across both the 2030 and 2040 timeframes, arising during the pre-conflict build-up phase and becoming more acute once full-scale war breaks out. The most severe shortfalls affect aviation fuel, which is heavily used by air forces but also by the army under NATO's Single Fuel Concept. Under the conflict scenario examined in this report, the EU could face an aviation fuel deficit of up to 24%. This underscores the fragility of the current supply chain.

The Netherlands faces even greater pressure compared to the rest of Europe given its role as a NATO Host Nation. During a full-scale conflict, up to 35% of Dutch aviation fuel demand and 13% of Dutch road fuel demand would remain unmet. The Netherlands will not only need to supply its own armed forces, but also support allied reception, staging, and onward movement.

Dutch fuel infrastructure would come under strain well before full-scale war begins, and it would likely be an early target for disruption and sabotage. With attacks on critical infrastructure or power outages in the Port of Rotterdam, the fuel system will be severely disrupted, with consequences not just for Dutch consumers but the rest of Europe too.

Fuel shortfalls have direct operational consequences. In a high-intensity conflict, shortfalls of 20-30% would likely curtail sortie generation, degrade manoeuvre tempo, and force commanders to make difficult trade-offs between competing mission priorities, including air defence, deep strike, and sustainment operations.

Insufficient fuel supplies could also force the Dutch government to prioritise military users over civilian consumers. Over time, this could have devastating economic consequences. In the Netherlands, the ambition to preserve the economy limits the extent to which civilian demand can be cut without major consequences. A functioning economy is essential to warfighting because it generates the industrial output, energy supply, transport capacity, and fiscal resources needed to equip, sustain, and replenish armed forces. Without a resilient economic base, militaries struggle to maintain operations, replace losses, and support prolonged conflict.

Europe's shrinking fuel industry is becoming a vulnerability for defence

Even as climate policy gradually changes the fuel mix, liquid hydrocarbons remain indispensable for both military operations and large parts of the civilian economy in the next 10-15 years. This creates a structural mismatch between supply and demand.

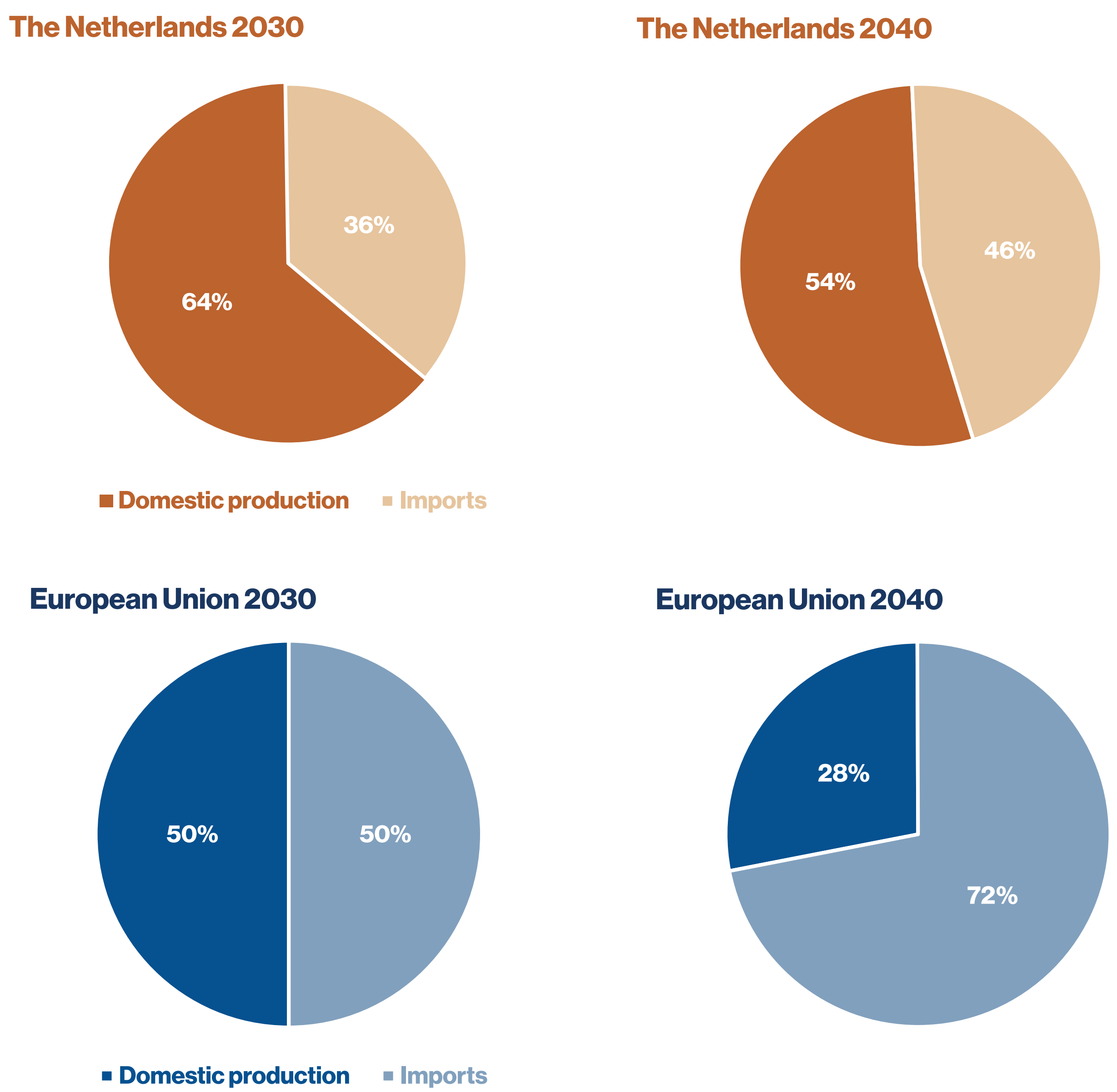
Refining capacity across Europe and in the Netherlands is declining due to three main factors: the change in demanded fuels in light of climate goals, high carbon prices, and decreased competitiveness compared to other regions. Since 2009, Europe has lost more than 20% of its refining capacity. The Netherlands is one of Europe's most important fuel hubs, and its refining capacity is expected to shrink by half by 2040. European production capacity could decrease by 65% in the same timeframe. This process could be further accelerated by rising carbon prices combined with insufficient safeguards against carbon leakage. Refineries are not modular assets that can be turned off and on at will. They produce multiple products simultaneously, and the loss of one plant affects the availability of diesel, jet fuel, gasoline, feedstocks, and petrochemical inputs at the same time.

Alternative fuels will play a growing role, especially in aviation, but they will not replace fossil fuels before 2040. The increasing complex fuel mix towards 2040 may improve resilience by diversifying supply, but it also creates logistics and scaling challenges. Multiple fuel types may need to be sourced, stored, and distributed simultaneously under wartime conditions. Moreover, a part of this emerging industry also depends on imported feedstocks and fuels, bringing an additional supply security concerns in times of conflict.

As a result, the EU is becoming more dependent on imported fuels from regions that may be unstable or contested in wartime (see Figure 1). By 2040, the EU could be forced to rely on imports for 72% of its fuels during a crisis, exposing the Union to global market volatility and geopolitical shocks precisely when resilience matters most.

High import dependency for aviation fuel in peacetime could weaken Dutch and European military readiness

Low domestic production capacity for aviation fuel combined with a high import dependency make it difficult to overcome fuel shortfalls in conflict. Aviation fuel consists of jet fuel and blends of SAF and e-SAF according to policy targets.



Note: The import dependency refers to the fuel and not to feedstocks.
Source: HCSS analysis based on interviews and data from Eurostat, Energex, Concawe, IEA, T&E, EASA, the Dutch SAF Roadmap, Akkoord Duurzame Luchtvaart, ReFuelEU Aviation targets.

Figure 1. Aviation fuel import dependency in 2030 and 2040

Greater import dependency for oil and alternative fuels means Europe would need to rely on fragile maritime trade and external suppliers precisely when those links are most likely to fail. Imports depend on functioning ports, secure shipping lanes, stable trade routes, affordable fuel and external suppliers with spare capacity. All of these can be disrupted in wartime.

Without targeted policy measures, supply chain disruptions and geopolitical risks will become concrete vulnerabilities for Dutch and European defence resilience

This report proposes five policy priorities for the Dutch government, with a strong European and NATO dimension. These complement the European Commission's communication on AccelerateEU in April 2026 to address the fossil energy crisis, including national emergency measures to ensure the availability of jet fuel and diesel, but also structural actions to assess available stocks and refining capacity for transport fuels and increase domestic production of sustainable fuels.[1]

Recommendation 1: Appoint a national fuel security representative to build a civil-military fuel strategy that treats energy resilience as a core security task. The absence of updated oil policy in the Netherlands has left liquid fuel security without clear political ownership. A representative should be tasked by the Ministry of Economic Affairs and Climate (EZK) to develop an integrated liquid fuel strategy. This should bring together ministries of Defence, Economic Affairs and Climate, Infrastructure and Water Management, and industry stakeholders around a shared assessment of risks, demand scenarios, and crisis roles. This strategy should move beyond ad hoc coordination and explicitly incorporate military requirements into energy planning, including refining capacity, storage, import dependency, and infrastructure protection. Doing so would provide political ownership and help ensure that fuel security is treated as a strategic concern. It would also provide the enabling framework to implement the other four recommendations below.

Recommendation 2: Preserve critical refining capacity. If domestic refining capacity is strategically important but commercially unviable under normal market conditions, the Dutch government and the EU should identify the minimum needed capacity and consider targeted mechanisms to keep this capacity operational. This could include capacity payments, long-term contracts, or other instruments that maintain minimum output or surge capability for key products such as diesel and jet fuel. Such measures would not eliminate dependence on imports, but they could reduce exposure to external shocks and prevent the loss of capabilities that would be difficult to rebuild in a crisis. Intervening early can avoid a situation where measures are only considered once key capacity has already been lost.

Recommendation 3: Build resilience into alternative fuel supply chains. Support for alternative fuels should not focus only on emissions reduction, but also on supply security and defence relevance. This means prioritising production pathways, infrastructure investments, demand creation and feedstock choices that reduce dependence on imports and are compatible with military requirements where possible. Policymakers should also assess how alternative fuel supply chains would perform under crisis conditions, including disruptions to electricity, green hydrogen, or imported intermediates.

1 European Commission, *AccelerateEU - Energy Union* (2026), https://energy.ec.europa.eu/document/download/7fac9eea-5717-4182-a368-bd68c427ff4c_en?filename=Communication.pdf.

Recommendation 4: Enhance security measures for critical energy infrastructure. The likelihood of attacks on fuel import, production and distribution capacity has substantially grown over the last years, and it is almost guaranteed in times of conflict. To reduce the impact of potential cyber and physical attacks, a security assessment should be performed to determine whether and when higher security measures are needed around physical energy infrastructure. Clear protocols including roles and responsibilities between the government and industry, standardized incident response protocols, and mechanisms for real-time information sharing and joint investigations.

Recommendation 5: Strengthen EU and NATO coordination on fuel security. Fuel resilience cannot be achieved by member states acting alone. The Netherlands should actively advocate within the EU and NATO for deeper coordination on fuel demand planning, emergency prioritisation, infrastructure protection, and burden-sharing. This should also include clearer mechanisms for joint scenario planning and alignment between civilian and military fuel requirements. In parallel, strategic reserve policies should be reviewed and updated to reflect higher military demand, the risk of long-duration conflict, and product-specific vulnerabilities such as jet fuel and diesel. Finally, this would involve cooperation on effective transport and logistics throughout the EU, especially from the West towards the Eastern Flank. Together, these steps would reduce fragmentation, strengthen Europe's collective response capacity, and give Dutch ministries and industry greater certainty about their role in a crisis.

1. Introduction

The 2026 war in the Middle East has created the world's biggest oil supply disruption in history and exposed the risks of Europe's growing import dependency. The closure of the Strait of Hormuz and attacks on refineries and export terminals in the Gulf sharply increased global oil prices. Half of all European jet fuel imports came from the Middle East.[2] Europe's ability to compensate for the loss in Gulf imports was further inhibited by the fact that additional supplies are rerouted to Asian countries that are also facing severe disruptions.[3]

Fuel underpins both military operations and the civilian society that supports them. Without reliable access to oil products, European air forces, navies, and land forces cannot operate, and the economies that sustain them cannot function. Timely and sufficient delivery of fuels to the theatre of war can ultimately influence the outcome of a conflict. With the changes brought by the energy transition, strategic considerations around military fuel security are shifting fundamentally. Fuel security is a broader challenge than supply availability alone. It spans the entire supply chain, from secure import routes to the resilience of domestic refining capacity, distribution networks, and storage facilities in the face of disruption and conflict.

The compounding effects of a global supply crisis during a full-scale war in Europe could be devastating.

Armed forces are heavily dependent on civilian commercial infrastructure for their fuels – including import terminals, refineries and production plants, pipelines and barges. Domestic production capacity of oil products is expected to significantly decrease, and the market scale of alternative fuels is too small to allow for a replacement of fossil fuels for defence. This leaves a major gap in Europe's own fuel production and creates a fuel supply chain that is vulnerable to disruptions.

The compounding effects of a global supply crisis during a full-scale war in Europe could be devastating. Military operations demand a substantial volume of fuels, especially in the air domain. Civilian consumption may be rationed to ensure military fuel security, but ultimately European economies must continue operating during conflict. Especially in areas located relatively far away from the battlefield, governments will try to fulfil fuel demand for civilian and military activities at the same time.

This report assesses the impact of military escalation on NATO's Eastern Flank on European fuel security, with a focus on the Dutch fuel industry. The Netherlands is the largest import hub and one of the main producers of fossil and alternative fuels in the EU. Dutch companies supply fuels not just to civilian users across the continent but also to their militaries. If a conflict were to erupt, European fuel readiness would largely depend on the ability of Dutch industry to support an increase in domestic production and imports. Europe's refining capacity is likely to shrink under climate goals – through reduction in demand, but also through higher imports due to higher domestic CO_2 costs – but the pace is uncertain and the implications for defence have not been fully assessed.

[2] Aruni Sunil and Patrick McAllister, 'European Jet Fuel Prices Break New Record with Middle East War Escalating', S&P Global, 17 March 2026, https://www.spglobal.com/energy/en/news-research/latest-news/shipping/031726-european-jet-fuel-prices-break-new-record-with-middle-east-war-escalating.

[3] Robert Harvey et al., 'European, African Oil Market Gets Tighter as Asia Buys More', Energy, *Reuters*, 30 March 2026, https://www.reuters.com/business/energy/european-african-oil-market-gets-tighter-asia-buys-more-2026-03-30/.

Throughout this paper, the fuel industry refers to suppliers – importers and producers – of liquid fuels, both oil products like jet fuel and diesel and alternative fuels like sustainable aviation fuels, renewable diesel or synthetic fuels (e-fuels). The refining industry has a broader role than just fuels, also including chemical production, which is essential for defence applications. This has been covered by other reports, such as the PwC study 'Future of refining in the Netherlands' that shows that these refineries produce essential raw materials for several key sectors, including chemicals.[4] Moreover, for consistency, fuel volumes are primarily referred to in tonnes throughout the report.

This report builds storylines of military escalation on two timelines, 2026-2030 and 2030-2040. The storylines provide insights into the fuel supply gaps and governance challenges that are likely to emerge in case of military conflict on the Eastern Flank, with the goal of developing effective interventions to address these. The insights were collected in interviews and closed workshops with stakeholders from the Dutch and European fuel industry, the Ministry of Economic Affairs and Climate, and the Ministry of Defence, and European defence community.

The report builds on previous work by The Hague Centre for Strategic Studies on military fuel readiness since 2025, including 'Securing European Military Fuels in a Tense Security Environment: Supply, Distribution and Storage'; 'European Military Fuel Readiness: The Role of Alternative Fuels in Military Logistics'; and 'Alternative fuels in European defence: Pathways for transforming military readiness'.[5]

It is organized as follows. Section two introduces the role of Dutch industry in Europe's fuel security today and the industry's outlook towards 2040. Section three explores fuel logistics for defence and outlines the escalation ladder for a military conflict on the Eastern Flank. In section four, storylines for military conflict and their impact for fuel security in 2030 and 2040 are presented. Finally, section five includes the main conclusions and policy recommendations.

This analysis was conducted during the tensions in the Middle East (January-April 2026). The report focuses on structural vulnerabilities in European fuel supply security. Given the rapidly evolving nature of global energy markets, the authors recommend that the most recent developments are monitored closely and taken on board together with this analysis.

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4 PwC, *Future of Refining in the Netherlands* (2024), https://vemobin.nl/wp-content/uploads/2025/03/241127-Vemobin_Future-of-Refining_Final_Report_vSTC3-4.pdf.

5 Ron Stoop and Irina Patrahau, *Securing European Military Fuels in a Tense Security Environment: Supply, Distribution and Storage* (2025), https://hcss.nl/wp-content/uploads/2025/04/Securing-European-Military-Fuels-in-a-Tense-Security-Environment-HCSS-2025-v2.pdf; 'European Military Fuel Readiness: The Role of Alternative Fuels in Military Logistics', *HCSS*, n.d., accessed 19 January 2026, https://hcss.nl/report/european-military-fuel-readiness-the-role-of-alternative-fuels-in-military-logistics/.

2. The Netherlands as Europe's energy gateway

This section introduces the Dutch role in European fuel security, discussing the centrality of the Amsterdam-Rotterdam-Antwerp (ARA) cluster for imports and refining, and the way in which distribution is arranged towards the rest of Europe. The second part of this section describes the outlook of liquid fuel supply and demand until 2040.

Main takeaways

- **The Netherlands punches above its weight in Europe's fuel supply:** Although it ranks only sixth in EU oil consumption, it is the EU's third largest refiner. Together, the Netherlands and Belgium have refining capacity roughly equal to Germany's, where the largest capacity is located.
- **The Amsterdam-Rotterdam-Antwerp (ARA) hub is a key node in European fuel logistics:** Rotterdam and Antwerp together handle two thirds of European seaborne fuel throughput, feeding over 1,500 kilometres of pipelines and the Rhine barge network to supply domestic and European inland markets.
- **European refining capacity is shrinking, leading to a higher import dependence:** Refinery closures across Germany, the UK and Italy left European countries more reliant on refineries in the Middle East and North Africa.
- **Strategic fuel stocks are not geared to military needs:** The emergency reserves held under EU and IEA rules can only be released under specific economic conditions, and military consumption is not explicitly among them. Moreover, most EU countries hold the bulk of their emergency reserves in crude, making their utility for aviation dependent on available refining capacity and connection to air bases. Some jet fuel stocks also lack pipeline connections, limiting their practical value in a European-level crisis.

2.1. Dutch industry's role in European energy security

European oil consumption is led by transport and industry

More than a third of the European Union's (EU) energy mix consists of petroleum products.[6] This demand is mostly driven by the aviation, maritime, road transport and industrial sectors. Overall, road transport requires the most oil products: the sector made up about 50% of EU members' total combined oil consumption in 2023, of which 65% consists of diesel, and 25% is created by gasoline consumption.[7] In 2025, aviation and shipping each represented 12% of final energy consumption in transport, much lower than road transport with about 75%.[8] Large European manufacturing sectors, such as the chemical industry, also use significant volumes of oil products.[9]

Germany is Europe's biggest oil consumer, with an annual demand representing almost 20% of the EU's final annual consumption.[10] To compare, the Netherlands ranks as the sixth largest oil consumer in the EU, with 5.5%.[11]

The ARA region leads the European refinery landscape

The Netherlands is the third largest player in the European refining sector, after Germany and Italy.[12] There are five refineries in the Netherlands, including facilities operated by Shell, BP, ExxonMobil, Vitol, and TotalEnergies (see Table 1). Together, they account for about 65 million tonnes per year (mtpa). Additionally, ExxonMobil and TotalEnergies each operate a refinery in Antwerp, which together add a little over 32 mtpa.[13] Together, the Netherlands and Belgium – also known as the ARA region – have a refining capacity as large as Germany's, the European leader.

6 Energy mix refers to available energy sources, others being natural gas, renewable energy, nuclear energy and solid fuels. See European Commission. Eurostat, *Energy in Europe*, Energy in Europe (Publications Office of the European Union, 2026), https://data.europa.eu/doi/10.2785/0794090.

7 Eurostat, 'Oil and Petroleum Products - a Statistical Overview', 4 May 2025, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Oil_and_petroleum_products_-_a_statistical_overview.

8 Eurostat, 'Final Energy Consumption in Transport - Detailed Statistics', 2025, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Final_energy_consumption_in_transport_-_detailed_statistics.

9 'Chemicals', IEA, accessed 3 April 2026, https://www.iea.org/energy-system/industry/chemicals.

10 'Securing European Military Fuels in a Tense Security Environment: Supply, Distribution and Storage', *HCSS*, n.d., accessed 20 March 2026, https://hcss.nl/report/securing-european-military-fuels-in-a-tense-security-environment-supply-distribution-and-storage/.

11 Eurostat, 'Oil and Petroleum Products - a Statistical Overview', 2025, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Oil_and_petroleum_products_-_a_statistical_overview.

12 FuelsEurope, *Statistical Report 2025* (2025), https://www.fuelseurope.eu/publications/publications/statistical-report-2025.

13 FuelsEurope, *Statistical Report 2025*.

Table 1. Overview of Dutch and Belgian refineries and their production capacity

2026	barrels per day	million tonnes per year
The Netherlands		
Shell	425.000	21.16
BP	400.000	19.91
ExxonMobil	201.000	10.01
TotalEnergies	147.000	7.32
Vitol	120.000	5.98
TOTAL CAPACITY	**1.293.000**	**64.38**
Belgium		
ExxonMobil	307.000	15.29
TotalEnergies	338.000	16.83
TOTAL CAPACITY Netherlands and Belgium	**1.938.000**	**96.50**

The refining capacity in the Netherlands is split into several products derived from crude oil.[14] In 2022-2025, the largest share of crude oil was refined into diesel and gas oil (25-27%). This was followed by gasoline (19-24%), then naphtha (12-16%), followed by fuel oil (15-16%), and finally kerosene, which has accounted for between 9-12% over these years. The exact share of products derived from crude oil depends partly on the type of crude used.

Refineries typically process blends of different crude oils to optimise their output – or product slate – and align production with market demand.[15] However, the overall product distribution is largely determined by the boiling ranges of the various hydrocarbons. For example, kerosene falls within a specific boiling range during the refining process.[16] In practice, the share of kerosene can be adjusted to some extent, but only within narrow limits, typically varying by a few percentage points around a baseline of roughly 10% of crude input.

Over the past decades, the European refinery sector has significantly shrunk, with refineries closing specifically in Germany, the UK and Italy (see Figure 2 and Box 1). Europe's refining capacity, including the UK, Norway and Switzerland, decreased since 2009 by more than 20% (175 mtpa), due to 28 refineries closing or transforming to biorefineries.[17] As of 2026, it stands at around 610 mtpa.[18]

14 COVA, 'Centraal Orgaan Voorraadvorming Aardolieproducten', COVA, accessed 17 March 2025, https://cova.nl/.

15 'Refining Crude Oil - Inputs and Outputs - U.S. Energy Information Administration (EIA)', accessed 3 April 2026, https://www.eia.gov/energyexplained/oil-and-petroleum-products/refining-crude-oil-inputs-and-outputs.php.

16 Wan Nazihah Liyana Wan Jusoh et al., 'Crude Oil Yield Estimation: Recent Advances and Technological Progress in the Oil Refining Industry', *Sensors (Basel, Switzerland)* 25, no. 17 (2025): 5511, https://doi.org/10.3390/s25175511.

17 FuelsEurope, *Statistical Report 2025*.

18 FuelsEurope, *Statistical Report 2025*; Grace McGrory and Stuart Harratt, 'More Workers at Lindsey Oil Refinery to Lose Their Jobs', BBC, 30 March 2026, https://www.bbc.com/news/articles/c98my7gj90yo; Offshore Technology, 'Shell Plans to Close Wesseling Oil Refinery in Germany', 2024, https://www.offshore-technology.com/news/shell-wesseling-germany/; 'UK's Grangemouth Refinery Stops Processing Crude', Argus Media, 2025, https://www.argusmedia.com/en/news-and-insights/latest-market-news/2683019-uk-s-grangemouth-refinery-stops-processing-crude.

The main European refining hubs are concentrated in Western Europe: Germany, the ARA cluster and Italy currently host significant refineries for the European supply chain.[19] Despite being well-integrated, Dutch refineries have also shown a decrease in refining capacity. Since overall refining capacity in North-Western Europe (NWE) is declining, the strategic relevance of these strongly integrated – and therefore expected to be resilient – refineries will most likely increase the upcoming years.

Refining capacity in Europe has decreased by 22% since 2009, increasing import dependency on diesel and jet fuel

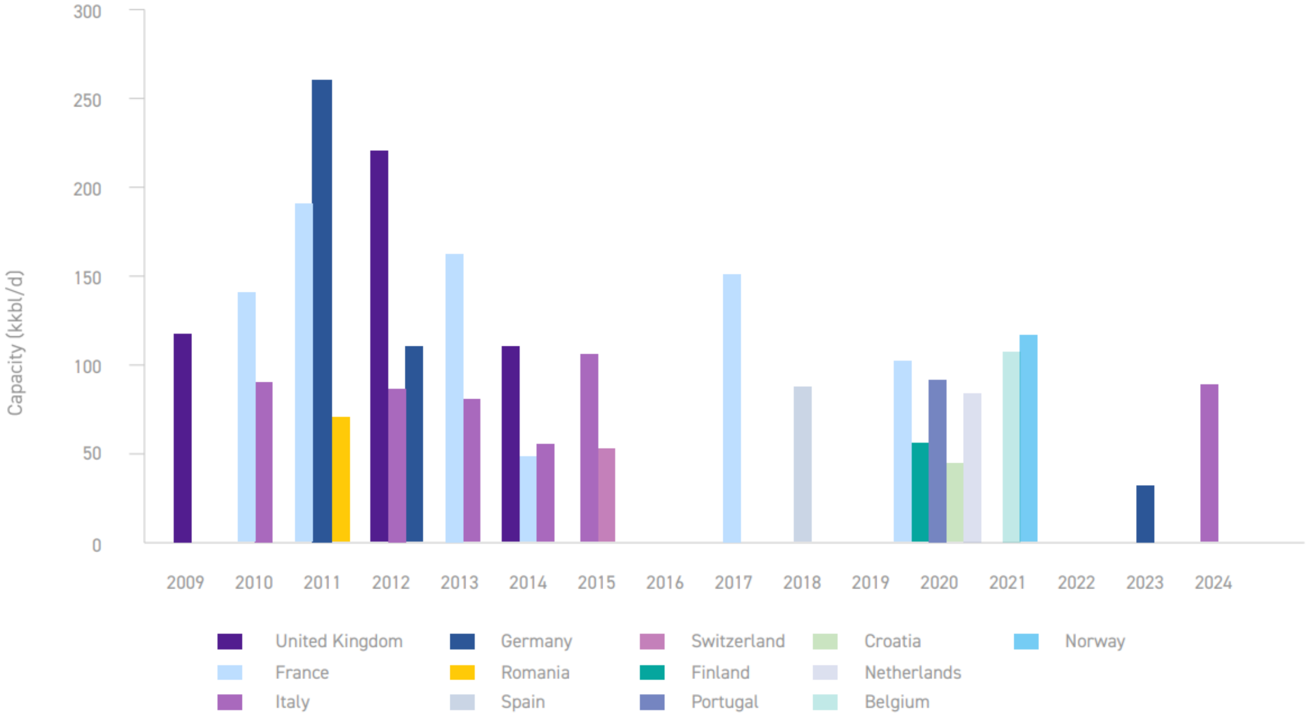


Figure 2. Refinery capacity closures in Europe since 2009. Source: Concawe and FuelsEurope[20]

The shrinking refinery sector in NWE is partially motivated by EU policies that aim to lower Europe's carbon emissions to combat climate change impacts. Such policies include the Renewable Energy Directive and the ReFuelEU package, which mandate the increase of alternative fuel consumption.[21] Industrial users must shift over time to low-carbon fuels to avoid having to pay for carbon emissions costs and compliance penalties. Consequently, fossil fuel refineries within Europe, which have to price in their emissions, become less competitive in fossil fuel refining activities compared to non-EU refineries.[22] Therefore, the commercial sector is more likely to increase imports of refined products from cheaper areas like the Middle East and North Africa, which further disadvantages the position of European refineries. This is also an energy security vulnerability, as discussed in Box 1 and section 2.2.

19 FuelsEurope, *Statistical Report 2025*.

20 FuelsEurope, *Statistical Report 2025*.

21 Amaar Khan, 'European Refineries Must Adapt to Survive: Panel | Latest Market News', 1 October 2025, https://www.argusmedia.com/en/news-and-insights/latest-market-news/2737762-european-refineries-must-adapt-to-survive-panel.

22 Andy Walker, 'Refining a New Strategy - European Refineries Must Contend with Higher Emissions Costs', *Energex*, 21 March 2025, https://energex.partners/refining-a-new-strategy-european-refineries-must-contend-with-higher-emissions-costs/.

Low-carbon fuels are gaining increasing attention on the European market. This includes Sustainable Aviation Fuels (SAF), which can meet a small part of the demand for jet fuel in Europe. In 2024, SAF consumption across the EU represented a modest 2.71% of jet fuel, of which a substantial percentage is imported from outside the EU.[23] Five member states accounted for 99% of all SAF supplies at European airports, Amsterdam Schiphol Airport receiving the largest single delivery.[24] Renewable diesel (Hydrotreated Vegetable Oil, HVO) represented about 5% of all Dutch road transport diesel consumption in 2024.[25]

Box 1: The UK's shrinking refining sector exposes the country to global supply shocks

Over the last five decades, the UK's oil refining sector has contracted sharply, falling from 18 refineries in the 1970s to four operating sites after the closures of Grangemouth and Lindsey in 2025.[26] The decline reflects a mix of structural and policy pressures: weaker long-term expectations for domestic demand as the UK moves toward net zero, persistently high energy and carbon costs that have eroded the competitiveness of British plants, and uneven access to decarbonisation opportunities. In some cases, company-specific financial problems have accelerated the trend. Lindsey's refinery closure followed the insolvency of Prax Group, with reported losses, maintenance disruption and problems linked to a major financing arrangement all cited as contributing factors. Further closures of the two remaining refineries would impact the UK's energy security.[27]

The shrinking of refining capacity has created a more import-dependent and more exposed fuel system in the UK. With fewer domestic refineries, the UK is less able to absorb external shocks through its domestic base, making it more reliant on international supply chains for products such as diesel and jet fuel.[28] That vulnerability was thrown into sharp relief during the Middle East war in 2026, when disruption around the Strait of Hormuz raised fears of acute jet fuel shortages across Europe. In April 2026, the IEA warned that Europe had about six weeks of jet fuel left unless a substantial share of lost Middle Eastern imports could be replaced, noting that the region had previously relied on the Middle East for around 75% of its jet fuel imports.[29] For the UK, this illustrated the broader strategic risk of refinery decline: not only higher exposure to price spikes and shipping disruption, but a reduced capacity to cushion the economy, transport system and wider energy security from geopolitical shocks. While UK airlines are yet to see concrete supply disruptions, governmental measures are set in place to dampen the impact of a potential shortage on consumers and broader economic competitiveness.[30]

23 Eurostat. 'From Ambition to Reality: Securing Europe's Aviation Fuel Supply with Sustainable Aviation Fuel', *Airbus Protect*, n.d., accessed 22 April 2026, https://www.protect.airbus.com/blog/securing-europes-aviation-fuel-supply-with-saf/.

24 European Union Aviation Safety Agency, *ReFuelEU Aviation Annual Technical Report 2025 - 2024 in Review* (2025), https://www.easa.europa.eu/en/document-library/general-publications/refueleu-aviation-annual-technical-report-2025.

25 Stefan Bakker and Saeda Moorman, *Renewable Fuels in High Blends in Road Freight Transport* (Netherlands Institute for Transport Policy Analysis (KiM), 2025), https://english.kimnet.nl/site/binaries/site-content/collections/documents/2025/10/01/renewable-fuels-in-high-blends-in-road-freight-transport/renewable-fuels-in-high-blends-in-road-freight-transport-en-def.pdf.

26 Tom Hewitt, *The Future of the Oil Refining Sector* (2025), https://commonslibrary.parliament.uk/research-briefings/cdp-2025-0235/.

27 Hewitt, *The Future of the Oil Refining Sector*.

28 Ian King, 'CNBC's UK Exchange Newsletter: Britain's Jet Fuel Crunch — and How We Got Here', CNBC, 15 April 2026, https://www.cnbc.com/2026/04/15/uk-jet-fuel-kerosene-diesel-refineries-import-supply-chain.html.

29 Theo Leggett and Jemma Crew, 'Europe Has "Maybe Six Weeks of Jet Fuel Left", Energy Boss Warns', BBC, 16 April 2026, https://www.bbc.com/news/articles/czjw2kz0l22o.

30 'Jet Fuel and Travel Plans: What You Need to Know', GOV.UK, 24 April 2026, https://www.gov.uk/government/news/jet-fuel-and-travel-plans-what-you-need-to-know.

ARA as the energy gateway to Europe

Import

The European fuel supply chain is highly import dependent. In 2024, EU member states collectively imported 793.441 thousand tons of oil and petroleum products, about 60% of which is crude oil.[31] The rest consists of oil products such as diesel and jet fuel.

After the boycott on Russian oil, EU members diversified their supply chains to new suppliers. In 2025, the main suppliers of crude and refined oil products were the United States, Norway and Kazakhstan.[32] Russian supplies of jet fuel and diesel were replaced in significant proportions by imports coming through the Strait of Hormuz, including Saudi Arabia, United Arab Emirates (UAE), Kuwait and Qatar (Figure 3). Box 2 discusses the impacts of the war in the Middle East on the EU's supply of diesel and jet fuel.

Europe replaced Russian imports of diesel and jet fuel with imports from the Gulf, intensifying its vulnerability to maritime chokepoint closures and regional conflicts

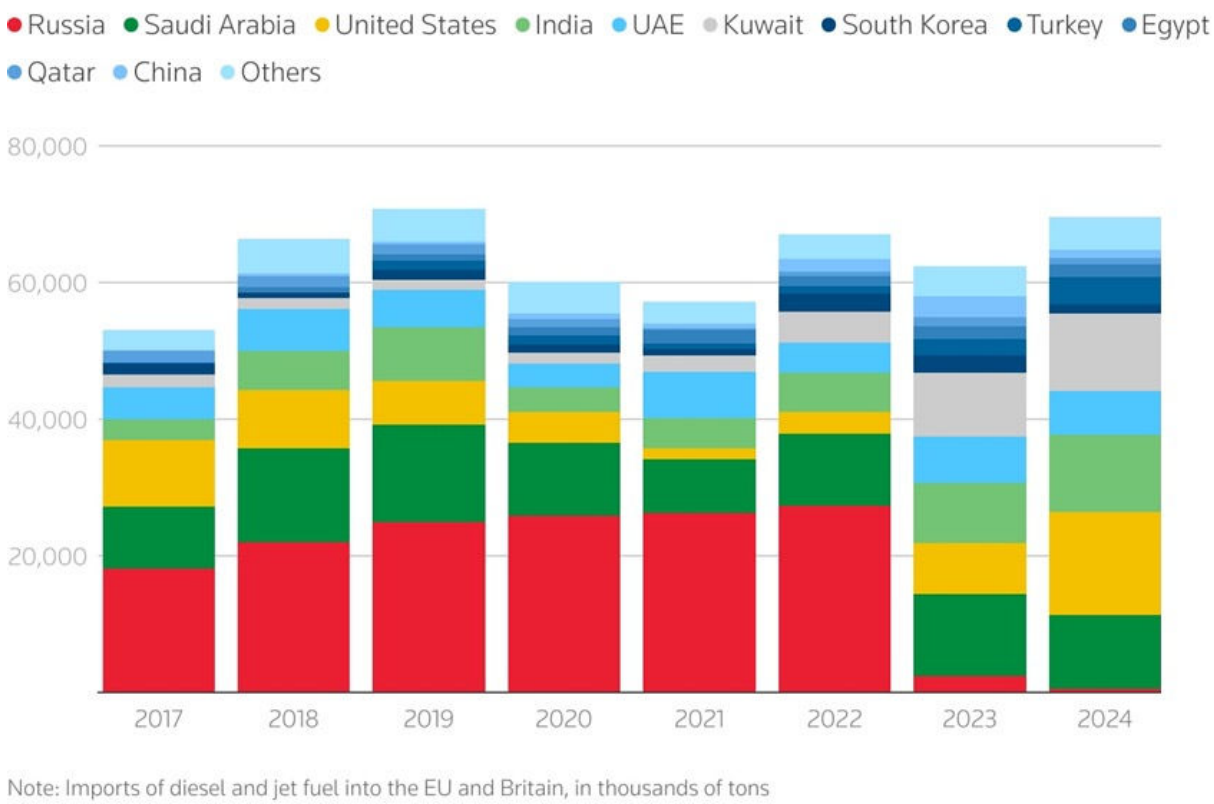


Figure 3. European diesel and jet fuel imports. Source: Reuters[33]

[31] Eurostat, 'Imports of Oil and Petroleum Products by Partner Country', Eurostat, 2022, https://doi.org/10.2908/NRG_TI_OIL.

[32] Eurostat, 'EU Imports of Energy Products - Latest Developments', 2026, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_imports_of_energy_products_-_latest_developments.

[33] Ron Bousso, 'EU Russia Sanctions Add Fuel to Red-Hot Global Diesel Market', *Reuters*, 28 July 2025, https://www.reuters.com/markets/commodities/eu-russia-sanctions-add-fuel-red-hot-global-diesel-market-2025-07-28/.

The most critical import hub in the European fuel supply chain is the Amsterdam-Rotterdam-Antwerp (ARA) cluster. Two thirds of the cargo loading in Europe is organized in just the two ports of Rotterdam and Antwerp. The Port of Rotterdam carries most of the onshoring activity, followed by Antwerp and then Amsterdam. Rotterdam is also the Netherlands' most important import location for oil products. Additionally, the surrounding area of Rotterdam is considered critical for the aggregation and blending of crude oil imports.

Due to the ARA region's strategic location, the hub is not only central to European imports but also plays an important role in European exports to global markets, highlighting its economic significance.

Distribution

After being imported or refined in the Rotterdam industrial cluster, oil can be efficiently distributed towards other European countries via existing (cross-border) pipeline systems (see Figure 4). Overall, the Port of Rotterdam grants access to over 1500 kilometres of pipelines to transport liquid products like crude oil and products.[34] For the commercial sector, the critical backbone consists of the RMR (*Rhein-Main-Rohrleitungstransportgesellschaft*), RRP (*Rotterdam-Rijn Pijpleiding*), and the RAPL (Rotterdam-Antwerp Pipeline). The Central Europe Pipeline System (CEPS) is the largest military infrastructure in Europe, and it also flows via Rotterdam (see section 3 for more detail).

The Netherlands is an energy gateway for Europe, with more than 1500 km of pipelines connected in the Port of Rotterdam

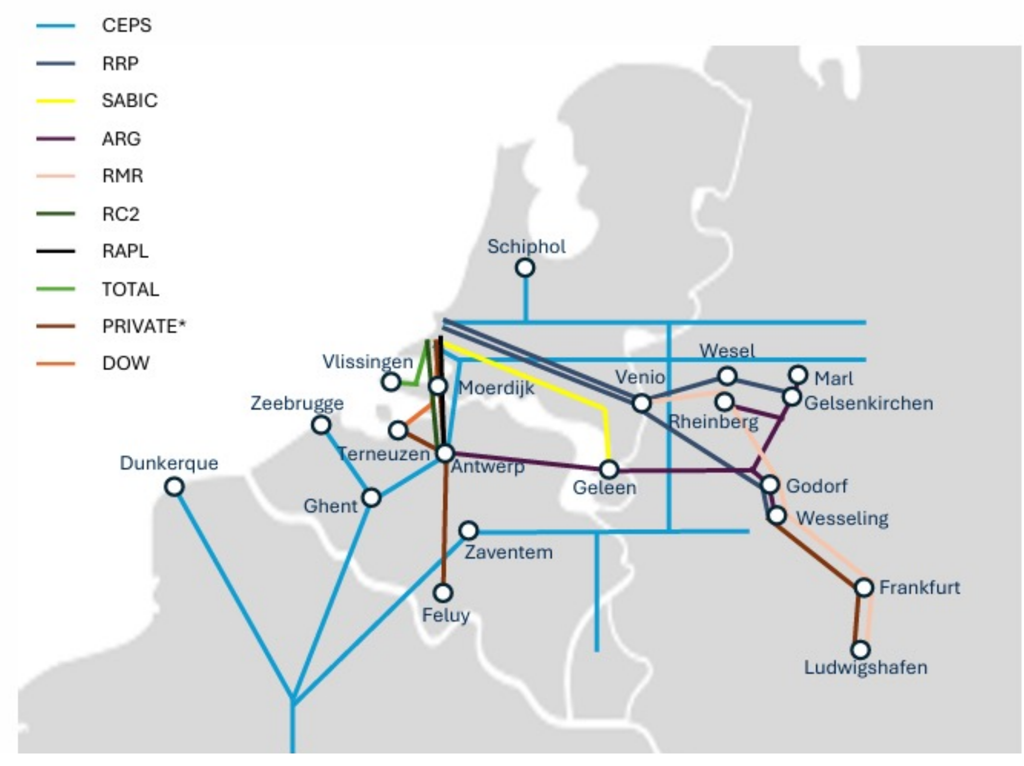


Figure 4. Dutch pipeline integration. Source: Energex

34 'Pipeline Network | Port of Rotterdam', accessed 17 March 2026, https://www.portofrotterdam.com/en/logistics/connections/intermodal-transportation/pipeline-network.

Inland water routes also play a vital role for the Netherlands' role as a distribution hub in Europe. They are the second largest export modality of oil products from the Netherlands, after pipelines. Large rivers like the Rhine (see Figure 5) allow for transportation via barges, which is the cheapest way to transfer oil products from coastal hubs to inland markets like Germany and Switzerland.[35] Among the Rhine countries, the Netherlands represents over 50% of all the liquid cargo vessels transporting via the Rhine, highlighting the country's fundamental position in the supply chain.[36] When water is low (or very high) in the Rhine river, however, barge transport has to significantly reduce or stop altogether. In 2018, historically low water levels led to shipment disruptions on the Rhine and major cost increases for German consumers.[37] This is further explored in section 4.4.

The Rhine waterway route is the second largest oil export route from the Netherlands, but it is constrained by water levels

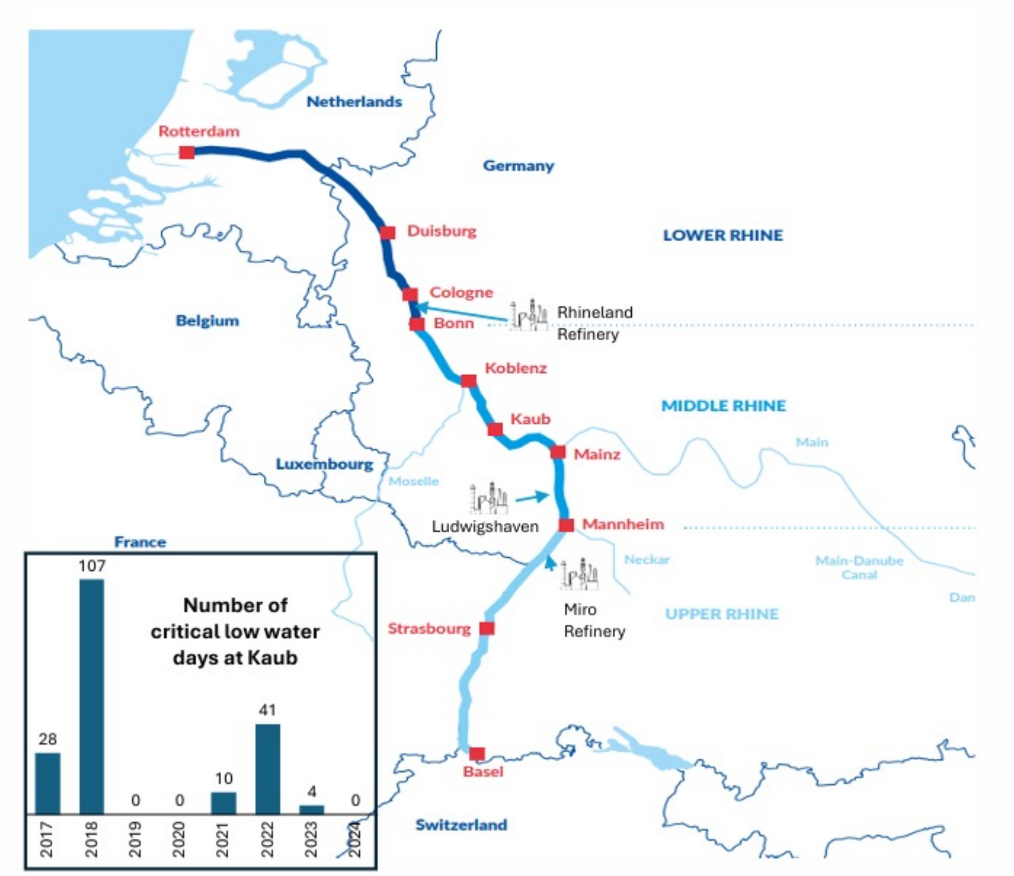


Figure 5. The Rhine waterway route. Source: Energex

35 'Low Rhine River Water Levels Disrupt Petroleum Product Shipments to Parts of Europe - U.S. Energy Information Administration (EIA)', accessed 3 April 2026, https://www.eia.gov/todayinenergy/detail.php?id=37414.

36 '6. CARGO FLEETS', *CCNR - Observation Du Marché*, n.d., accessed 3 April 2026, https://inland-navigation-market.org/chapitre/6-cargo-fleets-2/?lang=en.

37 'Low Rhine River Water Levels Disrupt Petroleum Product Shipments to Parts of Europe', U.S. Energy Information Administration (EIA), 2018, https://www.eia.gov/todayinenergy/detail.php?id=37414.

Some of the fuels exported to neighbouring countries are used for domestic consumption and others exported to further destinations in other European states, pointing to the importance of the Netherlands not just as a hub for North-Western Europe but also other European states.

Storage

Considering the EU's high import dependence regarding crude and oil products and deteriorating geopolitical events, there is a significant need for storage locations within its borders. The Netherlands and France have the largest volumes of storage capacity in the EU, both for commercial and strategic purposes.

In order to ensure continuation in times of crises, the International Energy Agency (IEA) instructs countries to have stocks equivalent to 90 days of imports to support itself, and the EU mandates its member states to hold stocks sufficient for at least 61 days of inland consumption. In the Netherlands, COVA (*Centraal Orgaan Voorraadvorming Aardolieproducten*) manages the reserves.

Neither the IEA nor the EU specify the actual mix of crude and oil product stocks: this is left to the discretion of countries.[38] As a result, emergency stocks can be unbalanced. For example, many EU countries hold significant volumes of crude, but much less kerosene.[39] More than half of the Dutch strategic stocks are crude, followed by about a third diesel and much less jet and gasoline.[40]

Crude stocks are only useful if there is sufficient local refining capacity to turn that crude into product. Without sufficient refining capacity, crude stocks might not help in easing price pressures on oil products. Moreover, these strategic stocks are meant for continuation of economic activities (e.g., market stabilization) and are not automatically available for the military.

Lastly, the location of these stocks determines to how fast supplies can be utilised and in which quantities. Many strategic stocks are held in salt dome caverns more than 1 km underground.[41] These can be relatively difficult to access in a short period of time, especially if other disruptions are also happening at the same time (e.g., low Rhine levels, road closures, attacks on critical infrastructure). Terminals that store kerosene in the ARA cluster mostly lack a connecting pipeline for kerosene output, which means these stocks are only accessible via railways and roads, limiting efficient transportation abilities.[42]

38 'Oil Security and Emergency Response - About', IEA, accessed 3 April 2026, https://www.iea.org/about/oil-security-and-emergency-response.

39 Eurostat, 'Emergency Oil Stocks Statistics', accessed 3 April 2026, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Emergency_oil_stocks_statistics.

40 COVA, 'Centraal Orgaan Voorraadvorming Aardolieproducten'.

41 COVA, 'Centraal Orgaan Voorraadvorming Aardolieproducten'.

42 Energex

Box 2: The 2026 Middle East conflict and its impact on the oil market

The blockade of the Strait of Hormuz and attacks on energy infrastructure between Israel and the United States and Iran in 2026 created the largest oil shock ever recorded according to the International Energy Agency.[43] A quarter of seaborne oil trade transits the Strait, with supplies from Saudi Arabia, the United Arab Emirates (UAE), Iran, Iraq, Kuwait, Qatar and Bahrain.[44] While about 25% can be rerouted via pipelines in Saudi Arabia and the UAE, the rest is blocked by the conflict.[45]

This has significant consequences for global oil markets and for Europe. The conflict has decreased available volumes on the market, leading consumers to scramble for supplies at higher prices (Figure 6). Most of the oil passing through the Strait of Hormuz was destined for Asian countries. Countries that are hit the hardest include Vietnam, Japan, South Korea and Singapore, who imported 60-75% of their crude through the strait.[46] Knock-on vulnerabilities are also emerging in California, who has become strongly dependent on South Korean jet fuel due to its sharp decline in domestic capacity.[47] Two refineries that closed less than a year before the war in the Middle East erupted.[48] Another vulnerable country is Australia because of its high import dependency. The country closed six out of eight domestic refineries over the last two decades, among others due to difficulties to compete with refineries in Asia.[49]

The oil price in North-West Europe sky-rocketed since the 2026 war in the Middle East, with jet fuel experiencing the highest increase

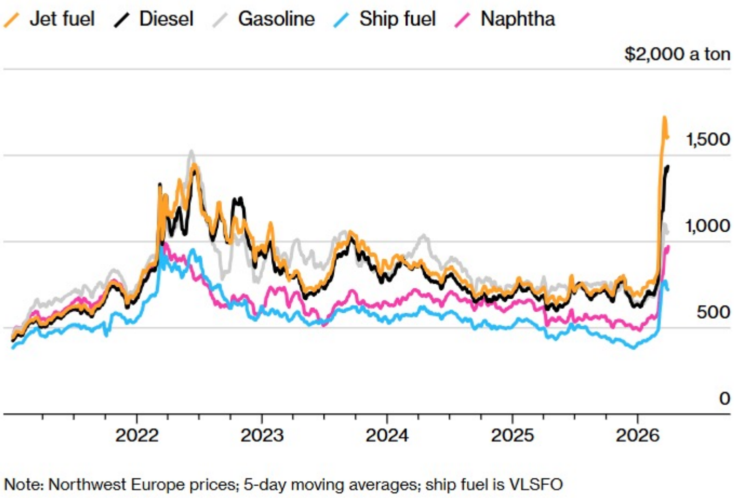


Figure 6. Brent Price Outlook. Figure from Bloomberg, 2026[50]

43 International Energy Agency, *Oil Market Report* (2026), https://www.iea.org/reports/oil-market-report-march-2026.

44 'Strait of Hormuz', IEA, 2026, https://www.iea.org/about/oil-security-and-emergency-response/strait-of-hormuz.

45 IEA, 'Strait of Hormuz'.

46 Moutaz Altaghlibi, 'Oil Market - The Ripple Effects of Strait of Hormuz Closure', ABN AMRO, 2026, https://www.abnamro.com/research/en/our-research/oil-market-monitor-the-ripple-effects-of-strait-of-hormuz-closure.

47 Eunice Bridges and John Huber, 'California Fuel Imports Soar after Refinery Closures', Argus, 27 April 2026, https://www.argusmedia.com/en/news-and-insights/latest-market-news/2819382-california-fuel-imports-soar-after-refinery-closures.

48 Bridges and Huber, 'California Fuel Imports Soar after Refinery Closures'.

49 Josie Harvey, 'Import Nation: How Australia Went from Eight Oil Refineries to Two', SBS News, 11 June 2026, https://www.sbs.com.au/news/article/australia-oil-refineries-closures-fuel-imports/2b5gw0wt4.

50 Jack Wittels, 'Europe Has Enough Jet Fuel For Coming Weeks as Stocks Pressured', *Bloomberg*, 2026, https://www.bloomberg.com/news/articles/2026-03-31/europe-has-enough-jet-fuel-for-coming-weeks-as-stocks-pressured.

Box 2: The 2026 Middle East conflict and its impact on the oil market (cont.)

Europe's imports of oil products, notably diesel and jet fuel, have been significantly affected. Half of Europe's jet fuel imports came from the Gulf region, which is difficult to replace from other imports in a tight market. It is also difficult to quickly expand production domestically, as the product slate of each refinery differs based on technology and on the types of crudes brought in. Short-term measures like the release of strategic reserves and the ease of US sanctions on Russian and Iranian oil are relieving some of the pressure, but the effect can only be mitigated for a limited time.[51] Reserves have been drained within the first four weeks of the crisis, with storage levels below seasonal averages at the end of March.[52] Moreover, shipments from the Gulf have been on the way up to late April, with potential shortages expected to arise afterwards.

The long-term impact depends on the length of the conflict and the ability of oil producers in the Gulf to recover after the attacks. This analysis was conducted during the tensions in the Middle East (January-April 2026), so the situation remains rapidly evolving. Generally, even if the Strait of Hormuz reopens in the short-term, it could take months for the market to be stable again due to the needed recovery time of the damaged refineries. The crisis therefore exposes the vulnerability of Europe's fuel system, even in a period of relative peacetime in European territory.

In response, the European Commission released in April 2026 AccelerateEU. The communication outlines measures to address this fossil energy crisis, including national emergency measures to ensure the availability of jet fuel and diesel, but also structural actions to assess available stocks and refining capacity for transport fuels and increase domestic production of sustainable fuels.[53] It also refers to a reassessment of the Oil Stocks Directive with a view to expand specifications of oil products in strategic storage.

2.2. Industry development towards 2040

Starting in 2027, binding targets require significant emissions reductions, the progressive integration of alternative fuels in the energy mix, and the decrease in fossil fuel consumption (see Figure 7). The paragraphs below detail the EU regulations and the expected industrial developments until 2040.[54]

51 Altaghlibi, 'Oil Market - The Ripple Effects of Strait of Hormuz Closure'.

52 Wittels, 'Europe Has Enough Jet Fuel For Coming Weeks as Stocks Pressured'.

53 European Commission, *AccelerateEU - Energy Union*.

54 The timeline 2040-2050 was excluded from the analysis due to the difficulties in predicting long-term developments.

Decarbonisation and climate regulations in the European Union and the Netherlands bring uncertainty for the fuel industry's outlook from 2027 onwards

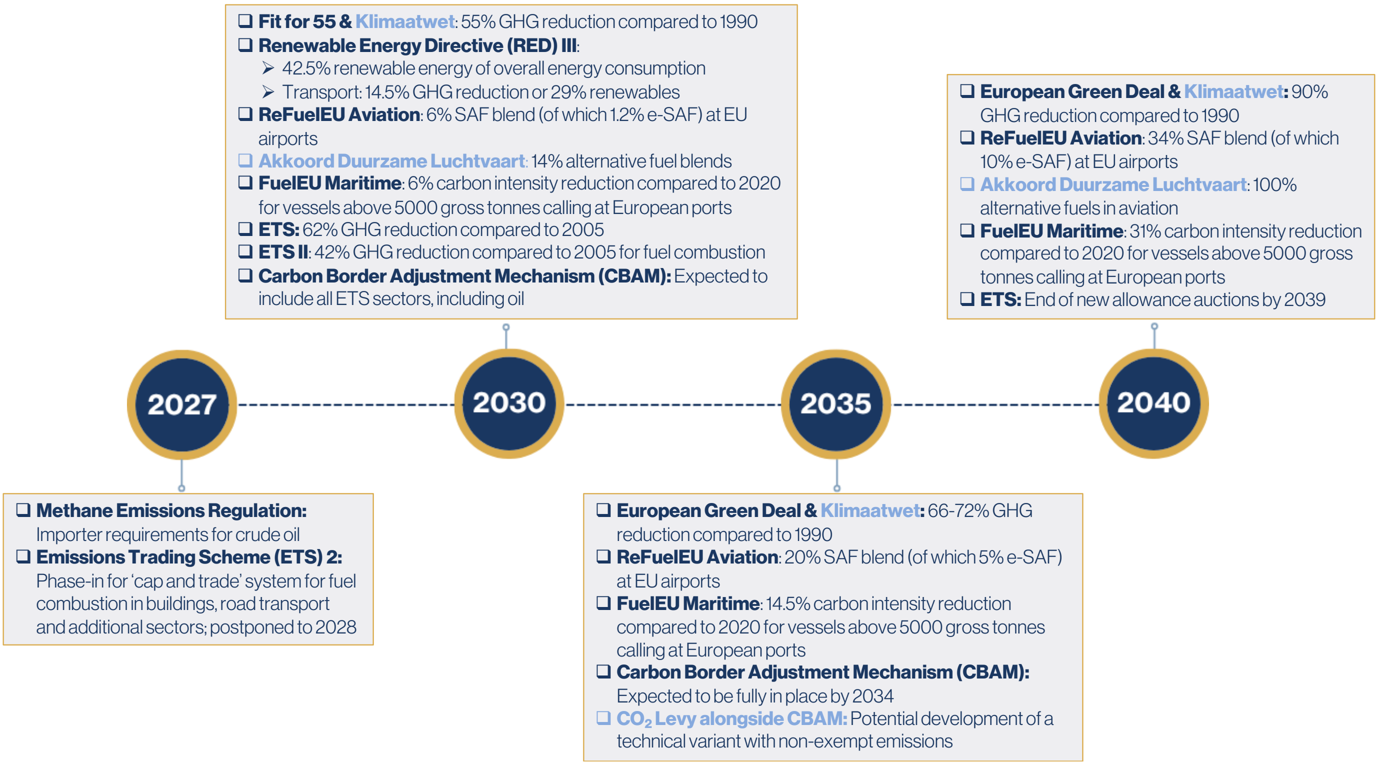


Figure 7. Decarbonisation and climate regulations 2027-2040 in the European Union and the Netherlands

Outlook 2027-2030

Demand: Jet fuel and diesel relatively stable

The demand for diesel is expected to decline slightly by 2030 across Europe and in the Netherlands. The rising market penetration of electric vehicles is driving a long-term reduction in gasoline and diesel demand for small vehicles, whereas for freight vehicles there are limited scalable alternatives to diesel meaning demand will be more resilient in the medium-term. This means that diesel demand will remain relatively stable in the coming four years.

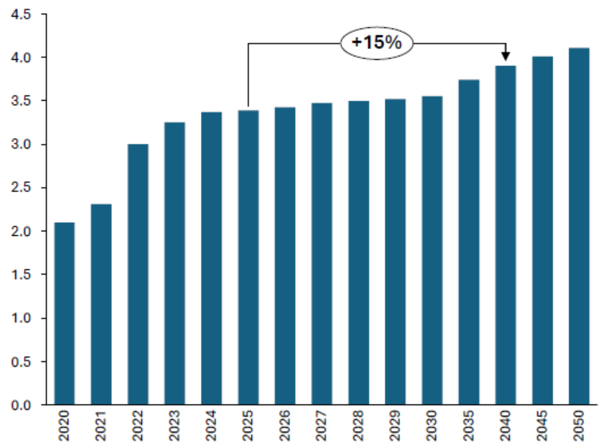
When it comes to HVO that can be blended with diesel without limit under goals of the Third Renewable Energy Directive (RED III), the consumption is expected to increase significantly by 2030. Fastmarkets expects a fourfold increase in European HVO demand in 2030 to 16 mtpa.[55]

Jet fuel consumption in both the Netherlands and the EU is expected to slightly increase by 2030 in line with global aviation trends (see Figure 8). A robust jet fuel demand outlook continues to underpin jet (and sustainable aviation fuels (SAF)) supply requirements to major airports such as Schiphol and Frankfurt, elevating Netherlands' importance as a major import, blending and distribution centre.

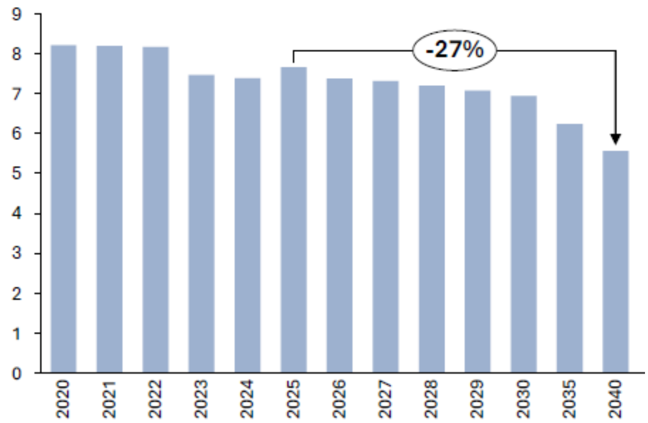
55 'Fastmarkets Launches European Hydrotreated Vegetable Oil (HVO) FOB Amsterdam, Rotterdam, Antwerp Outright and Premium Prices: Pricing Notice', *Fastmarkets*, 30 April 2026, https://www.fastmarkets.com/insights/fastmarkets-launches-european-hydrotreated-vegetable-oil-hvo-fob-amsterdam-rotterdam-antwerp-outright-and-premium-prices-pricing-notice/.

Aviation fuel demand keeps growing in the Netherlands, while the electrification of transport reduces diesel consumption especially after 2030

Dutch aviation fuel (jet & SAF) demand outlook



Dutch diesel demand outlook



Note: Both graphs are measured in million tonnes per year (mtpa)
Source: Energex, 2025

Figure 8. Dutch diesel and jet fuel demand outlook. Source: Energex

The Netherlands is also emerging as a hub for SAF within Europe. The Dutch aviation sector committed to 14% blends of alternative fuels into kerosene by 2030 under the *Akkoord Duurzame Luchtvaart*, which is more than double the European ambition.[56] More than half of expected production capacity in Europe is located within Dutch territory. By 2030, the Netherlands is expected to become a net exporter of SAF, producing four times more than the Dutch ambition of a 14% blend.[57] If all announced projects materialize, the EU will also have a surplus of SAF compared to 2030 civilian goals.[58] The market outlook expects a change by 2040 in the EU as a net importer of SAF, as explained below.

Supply: Domestic capacity dependent on Methane Emissions Regulation

The piece of legislation that could have the largest impact on the fuel industry in the short term is the Methane Emissions Regulation (EUMR). Adopted in 2024, the EUMR imposes strict requirements on European imports of crude oil and natural gas starting in January 2027. In its current form, the regulation would disqualify up to 90% of global crude oil from being imported into Europe.[59] While technology is available to abate 80-90 % of total upstream emissions globally, its widespread deployment is estimated to cost about $80 billion, apart from the time required for implementation, accreditation and additional regulatory uncertainty.[60]

56 *Ontwerpakkoord Duurzame Luchtvaart* (2019), https://www.eerstekamer.nl/overig/20190327/ontwerpakkoord_duurzame_luchtvaart/document.

57 Deloitte, *SAF Roadmap - The Netherlands* (2025), https://www.deloitte.com/nl/en/Industries/energy/perspectives/sustainable-aviation-fuel-roadmap.html.

58 European Union Aviation Safety Agency, *European Aviation Environmental Report 2025* (2025), https://www.easa.europa.eu/en/domains/environment/eaer.

59 Wood Mackenzie, *EU Methane Emissions Regulation – Analysis of Market Impacts* (2026), https://www.fuelseurope.eu/publications/publications/eu-methane-emissions-regulation-analysis-of-market-impacts.

60 Gustaw Szarek et al., 'The True Cost of Methane Abatement', McKinsey, 2024, https://www.mckinsey.com/industries/oil-and-gas/our-insights/the-true-cost-of-methane-abatement-a-crucial-step-in-oil-and-gas-decarbonization.

The decision to implement such technologies is highly dependent on upstream oil producers around the world, who so far have not taken all the necessary steps to fulfil European requirements under the EUMR. At the moment of writing, the weakening of the EUMR regulation is being debated in the EU.[61]

Moreover, the second Emissions Trading System (ETS2) is expected to begin its phase-in period in 2027 or 2028, applying to additional sectors that the original ETS does not cover, including fuel suppliers.[62] The success of this instrument is closely related to the effectiveness of the Carbon Border Adjustment Mechanism (CBAM), which is expected to include oil from 2030, but clear arrangements have yet to be made. If CBAM becomes operational in the oil sector too, fuel imports could be taxed more stringently to allow European producers to compete, even with the increased obligations of the ETS2.

In a conflict situation, this loss of refining capacity can hamper the supply of fuel for the military.

Paired with the structural trend of declining refining capacity in Europe, the EUMR and an uncoordinated application of ETS2/CBAM could further accelerate refinery closures without a robust set of alternatives for Europe's security of supply. Considering that oil demand is expected to remain stable on the short-term – up to at least 2030 - the EUMR would force European suppliers to replace domestic production with the import of ready-made oil products like jet fuel and diesel. This would create a structural price increase in oil for European consumers as well as a heightened import dependency. In a conflict situation, this loss of refining capacity can hamper the supply of fuel for the military.

Outlook 2030-2040

Demand: Progressive increases in alternative fuels, especially in aviation

After 2030, progressively stringent fuel blending mandates come into force and carbon prices are expected to increase towards 2039, when new ETS allowance auctions end.[63] Emissions reductions increase from a GHG reduction of 55% in 2030 compared to 1990, to 90% in 2040, according to European climate goals.[64]

Diesel demand in the Netherlands and the EU is expected to decrease by about 35% between 2026 and 2040 as pressure increases for freight vehicles look to substitute more away from high-emitting fuels as well as passenger cars. A part of the remaining demand for liquid fuels will be fulfilled by HVO.

The consumption of jet fuel starts decreasing as well, driven primarily by blending targets and efficiency gains (see Figure 9). The requirements for SAF blending at EU airports are growing to 20-34% between 2035 and 2040.[65] By 2040, aviation fuel is expected to comprise 66% jet fuel, 24% SAF and 10% e-SAF, according to ReFuelEU aviation mandates.

61 'Europese Met*haanregels Dreigen Te Worden Afgezwakt Nog Voor Ze van Kracht Zijn - Brusselse Nieuwe', accessed 22 April 2026, https://brusselsenieuwe.nl/europese-methaanregels-dreigen-te-worden-afgezwakt-nog-voor-ze-van-kracht-zijn/.*

62 Juan Fernando Lopez Hernandez, *Revision of the EU Emissions Trading System* (European Parliamentary Research Service, 2026), https://www.europarl.europa.eu/RegData/etudes/BRIE/2026/782615/EPRS_BRI(2026)782615_EN.pdf.

63 Hernandez, *Revision of the EU Emissions Trading System*; European Commission, 'ReFuelEU Aviation', accessed 4 February 2026, https://transport.ec.europa.eu/transport-modes/air/environment/refueleu-aviation_en.

64 'EU's Climate Law Presents a New Way to Get to 2040', European Commission, 2025, https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1687.

65 European Commission, 'ReFuelEU Aviation'.

The Netherlands has higher domestic ambitions than the EU to blend jet fuel with SAF by 2030

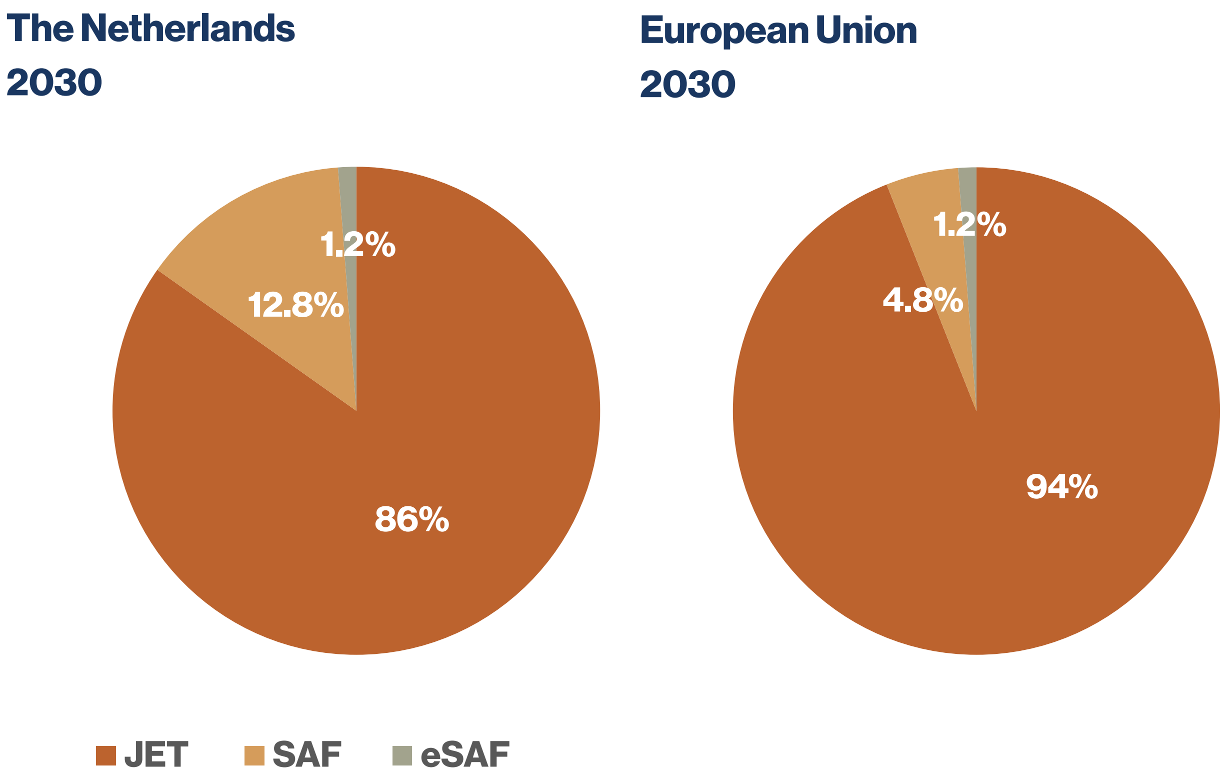


Figure 9. Expected civilian consumption of Jet Fuel & SAF in 2030 based on the Akkoord Duurzame Luchtvaart and ReFuelEU targets

Supply: Significant reductions in domestic production and higher imports

Refining capacity across Europe is declining due to three main factors: the change in demanded fuels in light of climate goals, high carbon prices, and decreased competitiveness compared to other regions. Europe's refining capacity is at the highest risk of closures in the world due to growing costs and uneven playing field compared to other regions creating an unfavourable investment environment.[66]

By 2040, the European production capacity could decrease by 65% if all emissions reductions policies are strictly followed.[67] This process could be further accelerated by rising EU ETS carbon prices combined with insufficient safeguards against carbon leakage. As refiners are required to pay more for their emissions, operating costs are likely to increase, reducing profit margins and making sites less competitive against producers in regions with weaker carbon constraints. For older or less efficient refineries, these added costs could accelerate decisions to reduce output, defer investment, or close capacity altogether.

66 Alan Gelder et al., 'Global Refinery Closure Outlook to 2035', Wood Mackenzie, 2025, https://www.woodmac.com/news/opinion/global-refinery-closure-outlook-2035/.

67 S&P Global, *Study on the Potential Evolution of Refining and Liquid Fuels Production in Europe* (2025), https://www.concawe.eu/publication/study-on-the-potential-evolution-of-refining-and-liquid-fuels-production-in-europe/.

While carbon pricing is intended to drive decarbonisation, there is a risk that, without viable low-carbon alternatives or adequate safeguards against carbon leakage, it could lead to a faster contraction of domestic refining capacity than policymakers anticipate, with implications for energy security, industrial resilience, and defence readiness.

Within Europe, refineries differ in their competitive positioning. Key factors determining this include the size and complexity of the refinery, its connection to petrochemical and gasification plants or other refineries, feedstock accessibility and its integration in both local and export markets.

While Dutch refineries benefit from advantages like geographic location or complex production processes, they are also more affected by more stringent costs than in other European countries. In the Netherlands, refineries have always had an attractive geographical position by the North Sea and connected to the Rhine corridor, becoming key suppliers for other European countries. Moreover, ownership impacts the resilience of a refinery. Unlike the broader European trend of divestment, major oil companies have held onto their Dutch refining assets, viewing them as core to their supply chains and operations. At the same time, structurally elevated electricity prices and a long-standing national CO_2 levy – which has now been lifted – have consistently added to the cost burden facing energy-intensive industries in the Netherlands.[68]

The production of alternative fuels is expected to grow towards 2040, largely pushed by European blending mandates. It is expected that Hydroprocessed Esters and Fatty Acids (HEFA) SAF and HVO will be the main type of alternative fuel blended into jet fuel and road fuel by 2035-2040, respectively. This is because of two reasons. First, the production of Fatty Acid Methyl Esters (FAME) is expected to stagnate and eventually decline because its main feedstocks are increasingly constrained by EU sustainability rules (e.g., crop-based oils), and the chemical composition of the FAME-based fuels limits the amount that can be blended into fossil fuels. Under RED III, policy support is shifting away from conventional biodiesel toward advanced biofuels, Renewable Fuels of Non-Biological Origin (RFNBO), and fuels with stronger greenhouse-gas savings. As a result, FAME faces a regulatory mismatch with the fuels most favoured in the EU's long-term decarbonization framework.[69] Second, capital expenditures are slowing down the development of the e-fuel market, which is expected to grow significantly after 2035-2040. ReFuelEU Aviation requires a 10% synthetic fuel (e-SAF) blending in 2040, pointing to an expected increase in e-fuel consumption. There are no specific e-diesel targets.

A significant part of HEFA SAF and HVO fuels will likely be imported. Fastmarkets expects shortfalls of 7-10 mt HVO out of the 16 mt demanded fuel.[70] This dependence concerns feedstocks needed to produce these fuels in Europe, as well as the final products themselves. The challenge is compounded by the influx of low-priced Chinese products onto global markets, which can undercut European producers and weaken the business case for investing in EU-based capacity. As a result, Europe could find itself reliant on external suppliers both for the raw materials needed for production and for the finished alternative fuels, further eroding

68 *'Electricity Costs for Large Industrial Consumers: An In-Depth Comparative Analysis of the Netherlands, Germany, France and Belgium', E-Bridge, 2024, https://e-bridge.com/portfolio-items/electricity-costs-for-large-industrial-consumers-an-in-depth-comparative-analysis-of-the-netherlands-germany-france-and-belgium/.*

69 European Union Aviation Safety Agency, *European Aviation Environmental Report 2025*.

70 'Fastmarkets Launches European Hydrotreated Vegetable Oil (HVO) FOB Amsterdam, Rotterdam, Antwerp Outright and Premium Prices'.

industrial competitiveness and strategic resilience. These ongoing trends point to a high likelihood of import dependence for HEFA SAF and HVO.

In the long-term, post 2040, e-fuels might become more attractive than HEFA SAF and HVO from the perspective of strategic autonomy. This is due to Europe's ability to produce them domestically and the scalability of production being independent from imported feedstocks.[71]

The declining domestic capacity and uncertain development of domestic alternative fuels will make Europe more import dependent in the coming decades, which is a notable vulnerability for supply security.

The fuel supply chain is prone to shocks due to geopolitical events and maritime chokepoint disruptions. The Russian invasion of Ukraine led to an oil boycott from EU member states. To overcome the loss of Russian oil, the Union diversified its supply chain with imports from states like Qatar, Kuwait, Saudi Arabia, South Korea and the United States. Despite this diversification, maritime trade routes can prevent on-time delivery to Europe. Maritime chokepoints include the Strait of Hormuz, the Bab El Mandeb Strait, and the Strait of Malacca, and they are vulnerable to a wide range of risks from geopolitical rivalries to piracy and armed robbery, terrorist attacks and climate hazards.[72] The more distance fuels have to travel, the higher the vulnerability to disruption underway.

The fuel supply chain is prone to shocks due to geopolitical events and maritime chokepoint disruptions.

[71] Irina Patrahau et al., *European Military Fuel Readiness: The Role of Alternative Fuels in Military Logistics* (The Hague Centre for Strategic Studies, 2025).

[72] Benedetta Girardi et al., *What the Indo-Pacific Means to Europe: Trade Value, Chokepoints, and Security Risks* (2023), https://hcss.nl/wp-content/uploads/2023/11/What-the-Indo-Pacific-means-to-Europe-Trade-Value-Chokepoints-and-Security-Risks-HCSS-2023.pdf.

3. Fuel logistics for defence

European and NATO armed forces are dependent on fuel for their operations, both in peacetime and conflict. The sections describe a hypothetical escalation towards full-scale conflict with Russia and what this means for fuel logistics, and explain the setup of European military fuel supply chains.

Main takeaways

- **Military escalation would strain the Dutch fuel system even before full-scale conflict:** The Netherlands would be responsible for supplying Dutch armed forces but also other Allies, according to NATO's Host Nation Support principle. This would put significant pressure on Dutch fuel infrastructure and make it a target for disruption.
- **A full-scale conflict could force competition between military and civilian fuel needs:** If Article 5 were invoked, military fuel demand would rise sharply, potentially forcing governments to choose between NATO requirements and domestic supply.
- **Jet fuel and diesel dominate NATO demand:** F-34 kerosene remains the backbone of military fuel consumption under NATO's Single Fuel Concept. Alternative fuels such as SAF and HVO show technical potential, but for now their operational role remains limited.
- **NATO's pipeline network stops in Germany, creating a major logistical constraint:** Beyond that point, fuel supply to the Eastern Flank depends on slower and more vulnerable transport by road and rail.

3.1. Military escalation on the Eastern Flank

This section provides a hypothetical overview of increasing escalation that could lead from a tense situation with Russia as seen in 2026 to a full-scale conflict on the Eastern Flank. This sequence of events serves as a basis for understanding military fuel demand in different escalation phases, starting from a relatively peaceful situation to a buildup in tensions and full-scale conflict. Simultaneously, this hypothetical overview also advances preparational logistics to prevent a significant impact on the civilian economy.

Starting point: The new normal?

Early signs of NATO's military buildup have been noticeable for some time and NATO's 2022 Strategic Concept states that 'The Euro-Atlantic area is not at peace'.[73] Russian hybrid activities have intensified across Europe, with risks for critical energy and digital infrastructure. Increasing numbers of attacks are taking place on undersea cables, railroads (Germany and Poland), electricity networks and digital management systems of fuel infrastructure. For instance, in 2024, the Estlink 2 and several other internet cables in the Baltic Sea were sabotaged, with NATO suspecting a tanker carrying Russian oil.[74] At this stage, rather than seeking direct military confrontation, these hybrid activities seem aimed at exposing vulnerabilities of future NATO mobilization: disruption of management and pipeline systems in the Rotterdam area delay preparatory planning for expanded fuel transport to the Eastern Flank. NATO has increased its military presence and activity along the eastern flank in response to Russia's aggression in Ukraine.[75]

Early signs of NATO's military buildup have been noticeable for some time.

Buildup of tensions & the Netherlands as host nation

Increasing political tensions and acts of aggression in the cyber and hybrid domains will lead to intensified military presence and activity near NATO's Eastern Flank. The buildup of NATO troops, equipment and stocks on the Eastern Flank intensifies, together with a progressive concentration of Russian land and air assets in proximity to the borders. Allies increase the frequency of large-scale exercises, enhance air policing and maritime patrols in the Atlantic, the Baltic Sea Region, the North Sea and the Black Sea Region. Cyber and hybrid attacks on European critical infrastructure are more aggressive than ever, leading to enhanced surveillance and coordination with industry players and infrastructure operators.

As NATO Allies are pre-positioning equipment, munition, and personnel along the borders, the Netherlands and the other transit countries provide Host Nation Support (HNS). When NATO forces operate on and from the territory of an allied country, they require logistical and operational support.[76] The host nation is responsible for facilitating this, ensuring that allied forces can move through its territory and reach their designated operational areas.[77]

For the Netherlands, this role is particularly important. Like in the civilian domain, the Netherlands serves as a major transit point in the military logistics chain, meaning it provides significant host nation support to allied forces.[78] This is largely due to its strategic infrastructure, including a key entry point to the Central European Pipeline System (CEPS) located in Rotterdam, as well as several air bases and inland pipeline connections that link to the rest of Europe.[79] In this phase, the Ministry of Defence expands procurement of fuel for aviation, maritime and land forces to increase deliveries to military bases.

73 NATO, *NATO Strategic Concept 2022* (n.d.), accessed 27 February 2026, https://www.nato.int/content/dam/nato/webready/documents/publications-and-reports/strategic-concepts/2022/290622-strategic-concept.pdf.

74 Essi Lehto et al., 'NATO to Boost Baltic Sea Presence after Cables Broken', *Reuters*, 27 December 2024, https://www.reuters.com/world/europe/estonias-navy-protect-baltic-sea-power-cable-2024-12-27/.

75 NATO, 'Strengthening NATO's Eastern Flank', 2025, https://www.nato.int/en/what-we-do/deterrence-and-defence/strengthening-natos-eastern-flank.

76 *NATO Logistics Handbook* (NATO, 2012), https://www.nato.int/docu/logi-en/logistics_hndbk_2012-en.pdf.

77 'NATO's Role in Logistics', Site Name Seo, accessed 3 April 2026, https://www.nato.int/en/what-we-do/deterrence-and-defence/natos-role-in-logistics.

78 Ministerie van Algemene Zaken, 'The Netherlands and NATO - NATO - Government.Nl', onderwerp, Ministerie van Algemene Zaken, 25 April 2024, https://www.government.nl/topics/nato/the-netherlands-and-nato.

79 Ministerie van Defensie, 'Pipeline Network - Defence Pipelines - Defensie.Nl', onderwerp, Ministerie van Defensie, 4 April 2022, https://english.defensie.nl/topics/defence-pipelines/pipeline-network.

Following the Netherlands' role in NATO operations, the country will likely find itself a target for strategic interference from Russian attacks. Port management systems could be targeted by DDoS attacks, drones and ballistic missiles, forcing manual procedures and slowing transport processes. Cyber- and physical attacks on the electricity network affect not only public services but also refineries, who must temporarily shut off operations. Pipeline nodes experience temporary shutdowns following targeted disruptions, directly affecting jet fuel availability for air bases at a time when sortie rates should be increasing. Russian actors could initiate GPS spoofing along inland waterways such as the Rhine corridor, hampering with navigation data. This could trigger the redistribution of transport from waterways to road infrastructure, intensifying traffic along key corridors.

Full-scale conflict

Following the Netherlands' role in NATO operations, the country will likely find itself a target for strategic interference from Russian attacks.

As soon as Russia launches an armed attack against a NATO country on the Eastern Flank, Article 5 of the NATO Charter is activated. Once this happens, "each Ally is obliged to assist the attacked Ally or Allies by taking such action as it deems necessary to respond to the situation".[80] The NATO Force Model assumes three tiers of readiness to ensure rapid mobilization in time of crisis.[81] A force of about 300,000 troops is split into three timelines – 0-10 days of readiness; 10-30 days; and 30-180 days.[82] The United States, Canada and Great Britain begin their full RSOI (Reception Staging, Onward movement, and Integration) operation into Europe.

NATO operational commands start requesting additional jet fuel and diesel supply, but global oil markets suffer significant distress and affect Europe's security of supply. Oil producers start choosing whether to supply NATO or Russia with additional fuels, or to prioritise domestic demand. As seen in 2026, countries may consider closing their borders to keep supplies for their citizens.

The Amsterdam-Rotterdam-Antwerp (ARA) cluster serves as a gateway for incoming forces and materiel. Rotterdam is hosting most of the equipment and fuel shipments. From there, supplies move eastward via pipeline systems, inland waterways, and road convoys. These channels are inherently dual-use, supporting both civilian and military domains.

The impact of the continuing military demand on the civilian sector becomes increasingly visible: fuel prices spike, there are shortages at petrol stations, and constant traffic caused by military convoys. Western fuel supply chains start showing signs of exhaustion. Infrastructure degradation, continuous peak demand, and repeated (hybrid) interference slow replenishment cycles. In the Netherlands and other Western European countries, domestic pressure intensifies. Long queues at petrol stations, high prices for flights and power outages are becoming commonplace and affect internal cohesion. The long-term implications of active conflict become increasingly visible, and political debate revolves around the balance between alliance solidarity and domestic stability. Continued prioritisation of military flows will cut supplies for civilian use in the Netherlands and the rest of Europe. The ultimate effect becomes strongly dependent on the length of this conflict.

80 NATO, 'Collective Defence and Article 5', accessed 27 February 2026, https://www.nato.int/en/what-we-do/introduction-to-nato/collective-defence-and-article-5.

81 NATO, 'NATO Force Model', 2025, https://www.nato.int/en/what-we-do/deterrence-and-defence/nato-force-model.

82 NATO, 'Pre-Summit Press Conference', 2022, https://www.nato.int/en/news-and-events/events/transcripts/2022/06/27/pre-summit-press-conference; NATO, 'NATO Force Model'.

3.2. **Military fuels & infrastructure**

Main military fuels: Jet fuel & Diesel

Armed forces in NATO countries use several types of fuel. The most common is F-34, which is a type of kerosene primarily used for aviation.[83] It is also sometimes used for land vehicles and base generators.[84] F-34 accounts for most military fuel consumption. It is mainly used by aircraft, which together make up the bulk of military fuel demand. The second most important fuel is diesel, designated F-54 in NATO.[85] It is mainly used for land vehicles and sometimes for maritime purposes, and it is interchangeable with commercial diesel sold on the retail market.[86] For naval use, the primary fuel is marine fuel, designated F-76, which is used in ships, naval vessels, and onboard generators.[87]

Within NATO, the 'Single Fuel Concept' (SFC) establishes that, when mandated, all systems could run on F-34, creating a single, unified supply chain and improving resilience if other fuel supplies, such as diesel, become unavailable.[88] Due to this policy, most NATO land-based vehicles are not only able to run on diesel or gasoline, but also on jet fuel.

The entire military domain uses fuel for operations, but the nature of this use differs between different types of operations. The navy, air force, and army demand fuel for their training and missions, whereas military bases use fuels for logistics such as transportation, or heat and electricity. During war time, military fuel demand will rise significantly. The increase in demand would be most significant for kerosene for air operations and diesel for land-based vehicles like tanks.

Most of these fuels contain additives to improve performance and protect equipment. These additives can help prevent corrosion, enhance performance in extreme temperatures or improve thermal stability. Overall, NATO uses a standardised system of fuel types and designations to ensure compatibility and efficiency across different military systems, as seen in Table 2.[89]

83 Standards Council of Canada, 'Aviation Turbine Fuel (Military Grades F-34, F-37 and F-44) | Standards Council of Canada', 9 July 2024, https://scc-ccn.ca/standards/notices-of-intent/canadian-general-standards-board-cgsb/aviation-turbine-fuel-military-2.

84 Standards Council of Canada, 'Aviation Turbine Fuel (Military Grades F-34, F-37 and F-44) | Standards Council of Canada'.

85 Standards Council of Canada, 'Aviation Turbine Fuel (Military Grades F-34, F-37 and F-44) | Standards Council of Canada'.

86 *NATO Logistics Handbook*.

87 *NATO Logistics Handbook*.

88 NATO Science and Technology Organization, 'The Single Fuel Concept and Operation Desert Shield/Storm', *NATO Science and Technology Organization*, 1997, https://www.sto.nato.int/document/the-single-fuel-concept-and-operation-desert-shield-storm/.

89 Standards Council of Canada, 'Aviation Turbine Fuel (Military Grades F-34, F-37 and F-44) | Standards Council of Canada'.

Table 2. NATO military variants of jet fuel and diesel. Source: HCSS, 2025[90]

NATO F-code	Common Name / Equivalent	Primary Application(s)
F-34	JP-8 (Civilian Jet A-1 with additives)	Aviation, land vehicles, some generators under the Single Fuel Policy.[91] It contains both icing inhibitor (S-1745) and lubricity improving (S-1747) additives. F-34 = F-35 + additives.
F-35	Civilian Jet A-1	Aviation.[92]
F-37	JP-8 with increased thermal stability	Aviation, where extra thermal stability is required. Contains the additive S-1749 for thermal stability.[93]
F-40	JP-4	Wide cut type aviation turbine fuel for use in land based military aircraft gas turbine engines. Contains the Fuel System Icing Inhibitor (S-1745) and the Lubricity Improving Additive (S-1747). It serves as an emergency substitute for F-34/F-35 but is rarely used. Mostly for training purposes.[94]
F-44	JP-5	Naval aviation / carrier-based aircraft with a higher flash point than F-34/F-44, making it suitable for shipborne operations with high fire risk. Contains additives S-1745 and S-1747.[95]
F-54	Diesel (middle distillate, similar to civilian EN 590 / ASTM D975)	Land vehicles (compression ignition engines), some marine use. Interchangeable with commercial diesel.[96]
F-63	Arctic diesel (cold-climate diesel)	Land vehicles in very cold climates. Contains the additive S-1750, which enhances lubricity and ignition performance.[97]
F-65	M1 Fuel Mix	F-54 diesel blended with kerosene aviation fuel meant for low temperatures.[98]
F-75	Naval distillate fuel with low pour point	Compression ignition engines, naval gas turbines and ships' boilers for steam raising.[99] Has a low pour point.[100]
F-76	Naval distillate fuel (marine diesel)	Primary naval fuel. Ships, naval vessels, shipboard generators[101] Contains lubricity improver additive (R655) and antioxidant additive (AO-37).[102]
F-77	Also known as fuel residual	A naval residual fuel used for boiler steam raising for certain ships. May also be used in slow speed diesel engines.[103]

90 Patrahau et al., *European Military Fuel Readiness: The Role of Alternative Fuels in Military Logistics*.

91 Standards Council of Canada, 'Aviation Turbine Fuel (Military Grades F-34, F-37 and F-44) | Standards Council of Canada', 9 July 2024, https://scc-ccn.ca/standards/notices-of-intent/canadian-general-standards-board-cgsb/aviation-turbine-fuel-military-2.

92 'Chapter 15: Fuels, Oils, Lubricants and Petroleum Handling Equipment', in *NATO Logistics Handbook* (1997), https://www.nato.int/docu/logi-en/1997/lo-15a.htm.

93 Standards Council of Canada, 'Aviation Turbine Fuel (Military Grades F-34, F-37 and F-44) | Standards Council of Canada'.

94 *NATO Logistics Handbook* (NATO, 2012), 101, https://www.nato.int/docu/logi-en/logistics_hndbk_2012-en.pdf.

95 Standards Council of Canada, 'Aviation Turbine Fuel (Military Grades F-34, F-37 and F-44) | Standards Council of Canada'.

96 *NATO Logistics Handbook*, 101–2.

97 *NATO Logistics Handbook*, 102.

98 Jill M Bramer, *U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND – GROUND VEHICLE SYSTEMS CENTER*, n.d.; 'NATO Logistics Handbook: Chapter 15: Fuels, Oils, Lubricants and Petroleum Handling Equipment', October 1997, https://www.nato.int/docu/logi-en/1997/lo-1511.htm.

99 'NATO Logistics Handbook: Chapter 15: Fuels, Oils, Lubricants and Petroleum Handling Equipment', October 1997.

100 *NATO Logistics Handbook*.

101 *NATO Logistics Handbook*, 102.

102 Environmental Protection Agency, *Chemicals of Potential Concern (COPCs) Recommendations Fuel Additives Red Hill Bulk Fuel Storage Fuel Facility* (2016), https://www.epa.gov/sites/default/files/2016-07/documents/red_hill_navy_fuel_additives_list.pdf.

103 'NATO Logistics Handbook: Chapter 15: Fuels, Oils, Lubricants and Petroleum Handling Equipment', October 1997.

Alternative fuel options for the military

Even though the current system mainly relies on fossil fuels, the energy transition has led to a gradual shift toward alternative fuels. For systems that use liquid fuels, this mostly involves so-called drop-in fuel solutions. A drop-in fuel is an alternative fuel that can be used in existing infrastructure and vehicles with little or no modification, meaning it can be introduced without major changes for the user.

For jet fuel, there are currently two main alternatives, each with its own timeline: Sustainable Aviation Fuel (SAF) and synthetic Sustainable Aviation Fuel (e-SAF).[104] SAF is currently mostly made from sources such as used cooking oils and animal fats, which are processed into a fuel suitable for military use.[105] It is already being used in small quantities, both for civilian and military purposes. At present, SAF is typically blended in at low amounts. In 2024, 0.6% of SAF was blended in jet fuel in the EU.[106] E-SAF is another alternative, produced using a carbon source combined with green hydrogen and converted through chemical processes into a synthetic aviation fuel.[107] Even when the e-SAF industry expands in line with policy targets, it will only represent 10% of total aviation fuel by 2040.[108]

Both SAF and e-SAF have been successfully tested in military systems.

Both have been successfully tested in military systems.[109] While there are concerns about fuel quality and potential corrosion effects, especially for SAF, some tests results suggest that performance of e-SAF can match or even exceed that of conventional F-34 fuel.[110]

For diesel, alternatives include biodiesel produced through the FAME process and diesel produced via the HVO process.[111] Both are already available on the commercial market and can be used in land vehicles. While HVO is almost identical to fossil diesel and can be used without limitation, FAME-type biodiesels are chemically different. This brings concerns about FAME meeting specific military requirements, particularly regarding corrosion and long-term stability.[112] Some biodiesel fuels can degrade over time, changing their properties and potentially making them unsuitable for prolonged storage or use in military systems.[113]

104 'What Is Sustainable Aviation Fuel and Why SAF Matters', LanzaJet, 28 August 2025, https://www.lanzajet.com/news-insights/what-is-saf.

105 'The Basics of SAF Technology | The HEFA Process', *SkyNRG*, n.d., accessed 3 April 2026, https://skynrg.com/sustainable-aviation-fuel/technology-basics/.

106 '0.6% SAF Blended in Jet Fuel during 2024: EASA', *SAF Investor*, n.d., accessed 3 April 2026, https://www.safinvestor.com/news/148911/easa-saf/.

107 'What Is E-Sustainable Aviation Fuel (e-SAF)? | e-SAF vs SAF | Topsoe', accessed 3 April 2026, https://www.topsoe.com/blog/e-saf-offers-much-promise-in-sustainable-aviation-fuels.

108 *'Regulation (EU) 2023/2405 of the European Parliament and of the Council of 18 October 2023 on Ensuring a Level Playing Field for Sustainable Air Transport (ReFuelEU Aviation)', 2023, https://eur-lex.europa.eu/eli/reg/2023/2405/oj/eng.*

109 Patrahau et al., *European Military Fuel Readiness: The Role of Alternative Fuels in Military Logistics*.

110 Susan van Dyk, 'Sustainable Aviation Fuels Are Not All the Same and Regular Commercial Use of 100% SAF Is More Complex', Sustainable Aviation Fuels, *GreenAir News*, 1 February 2022, https://www.greenairnews.com/?p=2460.
'We Tested a Tried-and-True Engine on 100% Sustainable Aviation Fuel. It Passed with Flying Colors.', accessed 3 April 2026, https://www.rtx.com/en/prattwhitney/newsroom/news/2024/07/03/tried-and-true-engine-sustainable-aviation-fuel.

111 'Unlocking Flexibility in Fuel Choices', Https://Www.Perkins.Com/en_GB/Company/Sustainability/Comparison-of-Hvo-and-Diesel.Html, accessed 3 April 2026, https://www.perkins.com/en_GB/company/sustainability/comparison-of-hvo-and-diesel.html.

112 Wenbo Ai et al., 'The Impact of Various Factors on Long-Term Storage of Biodiesel and Its Prevention: A Review', *Energies* 17, no. 14 (2024), https://doi.org/10.3390/en17143449.

113 Vikram Mittal and Elliot Lim, 'Aligning Advances in Biodiesel Technology with the Needs of the Defense Community', *Eng* 5, no. 4 (2024): 2709–27, https://doi.org/10.3390/eng5040142.

In the maritime sector, using biodiesels or sustainable methanol as a fuel for commercial ships is becoming common practice. However, this area is still in an early stage of development in the defence sector and has not yet been widely adopted.[114]

Overall, while alternative fuels are increasingly being introduced, their use remains limited and subject to technical and operational constraints.

Military fuel infrastructure

Military fuel infrastructure in Europe consists of several transport and storage systems, including pipelines, inland waterways with barges, and deliveries by rail and truck.[115] From these networks, fuel is distributed onward to operational areas or theatres of war. In addition, there are various types of fuel storage, such as storage facilities connected directly to pipelines, storage sites designated for military use, and commercial fuel reserves.[116]

Together, this system ensures that fuel can either be imported into Europe and transported inland or moved from production sites within Europe to where it is needed. The main method of transporting fuel from Western Europe toward the east is through the Central European Pipeline System (CEPS).[117] This is the largest NATO pipeline network, spanning multiple countries, and it was built during the Cold War to provide a resilient fuel transport system in case of conflict along the Iron Curtain.[118] These pipelines are owned by NATO and connect the critical entry points of Antwerp and Rotterdam with airbases in the Netherlands and, among others, French hubs like Marseille and Dunkirk, and strategic airbases in Germany.

Despite the specific appointment to solely transport the most critical fuel, namely jet fuel, CEPS currently lacks proper access to Eastern Europe. Since it was constructed during the Cold War, the Central European Pipeline System does not extend beyond western Germany on its eastern side. This means that while fuel can be efficiently transported to that point, alternative modes of transport such as rail, road, or inland waterways are required to move fuel further east, for example toward potential frontlines in Eastern Europe. Inland waterways are vulnerable to low water levels, as discussed in section 2.1. Moreover, rail transport in Central and Eastern Europe is vulnerable to disruption because key corridors often depend on ageing infrastructure, limited redundancy, and congested cross-border links.[119]

As a result, the final part of the supply chain is more complex and alternative logistics options will have to be developed to ensure provision of fuel during large-scale military operations.

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114 'Decarbonization Perspectives for Navies', accessed 3 April 2026, https://www.dnv.com/expert-story/maritime-impact/Decarbonization-perspectives-for-navies/.

115 'NATO Pipeline System', Site Name Seo, accessed 3 April 2026, https://www.nato.int/en/what-we-do/deterrence-and-defence/nato-pipeline-system.

116 NATO, 'Central Europe Pipeline System (CEPS)', accessed 3 April 2026, https://www.nato.int/en/what-we-do/deterrence-and-defence/central-europe-pipeline-system-ceps.

117 NATO, 'Central Europe Pipeline System (CEPS)'.

118 NATO, 'Central Europe Pipeline System (CEPS)'.

119 European Union Agency for Railways, 'Substantial Time Savings for Passenger and Freight Cross-Border Rail Possible If Technical and Operational Issues Are Solved', 12 December 2022, https://www.era.europa.eu/content/substantial-time-savings-passenger-and-freight-cross-border-rail-possible-if-technical-and.

4. The impact of military escalation on fuel security

This section outlines the main fuel supply challenges in time of conflict and compounding risks associated with critical energy infrastructure failure and import disruptions. It ends by discussing governmental interventions for mitigate these challenges, each with their pros and cons.

Main takeaways

- **Fuel supply shortfalls are likely under both crisis scenarios:** Both tension buildup and active conflict generate significant fuel shortfalls, with the Netherlands facing bigger shortfalls than the EU as a whole because of its role as fuel production and distribution hub and its commitment to keeping the civilian economy running as long as possible.
- **Import dependency grows towards 2040, creating further challenges in overcoming shortfalls:** Having to raise imports to more than 50% of supply during peacetime exposes the Netherlands and the EU to global market volatility and supply disruptions.
- **Supply disruption risks could compound these shortfalls:** Additional shocks, such as trade chokepoints, power outages in the ARA region, pipeline sabotage and drought-related disruption to inland waterways, would further weaken supply. These risks affect both jet fuel and diesel.
- **Mitigating options involve clear trade-offs:** Emergency measures like import increases and civilian rationing can bridge gaps quickly, but they carry political and market risks. Structural fixes like maintaining domestic refining capacity and expanding alternative fuel production could increase fuel security but require more resources and time to be effective.
- **Even if the shortfall is overcome, the fuel must still be brought to the right place at the right time:** The European fuel infrastructure suffers from inadequate storage and distribution capacity between West and East. In a crisis, limited storage near key military sites and the fact that the CEPS pipeline ends in Germany would force heavier reliance on road, rail and barges. This could strain military mobility, complicate civilian supply, and increase logistical burdens further as more fuel types enter the system. Ultimately, this will impede the ability of NATO allies to effectively wage war in a conflict situation.

4.1. **Assumptions for storylines**

The storylines below function as a stress-testing exercise that assesses the robustness of Dutch and European fuel systems under escalating military demand conditions on two time-lines (2026-2030 and 2030-2040). They are based on a set of assumptions explained below. These were developed based on desk research, and during interviews and closed workshops with stakeholders from the Dutch and European fuel industry, the Ministry of Economic Affairs and Climate, and the Ministry of Defence, and European defence community.

First, despite current volatility in geopolitical relations between the US and Europe, the study assumes that the US, Canada and the UK will honour the existing agreements regarding Article 5 of the NATO Charter and send troops and supplies to Europe in case of conflict.

Second, the storylines assume that armed forces' dependency on liquid fuels will remain for the upcoming 20 years at least, considering the median age of main equipment items of most Western militaries. Fossil fuels – especially jet fuel and diesel with different additives specs – are the dominant fuels used in across the air, land and sea domains. At the same time, alter-native fuels like HEFA SAF, HVO, and e-fuels are technically possible to blend as drop-in fuels. It is assumed that by 2040 there will not be a complete replacement of fossil for alternative fuels in the military domain, but small percentages will be used after 2030 in line with ReFuel Aviation goals (see section 2.2).

Finally, the implications for fuel security are built on demand and supply assumptions based on desk research of sources from Eurostat for baseline 2024 data, the Dutch SAF Roadmap, the Dutch Emissions Authority, *Kennisinstituut voor Mobiliteitsbeleid* (KiM), the International Energy Agency, Concawe, European Union Aviation Safety Agency (EASA), Transport & Environment (T&E), and Energex. The assumptions were developed in conversations with energy and defence specialists from the Netherlands and Europe.

The fuel industry outlook relies on the assumptions in Table 3, in line with the assessment in section 2.2 above. These assumptions are inherently uncertain and strongly dependent on the policy developments and competitive position of different European refineries and alternative fuel producers. Refining capacity could undergo larger declines depending on carbon costs and EUMR obligations. Alternative fuel producers may develop at a slower pace if they cannot compete with other countries where feedstocks are more widely available (used cooking oils in China) or cheaper to produce (green hydrogen in Canada, Australia or Morocco).

Table 3. Industrial outlook assumptions

Category	Assumption	Sources
Aviation fuel: Commercial demand	• 2030: Aviation fuel demand in the Netherlands and the EU increases by 1,5% between 2024 and 2030. • 2040: Aviation fuel demand in the Netherlands and the EU increases by 10% between 2030 and 2040. • The make-up of aviation fuel in the Netherlands is calculated based on targets under the Akkoord Duurzame Luchtvaart (2030) and ReFuelEU Aviation (2040), and in the EU based on ReFuelEU Aviation for 2030 and 2040.	International Energy Agency, Energex, Akkoord Duurzame Luchtvaart, ReFuelEU Aviation
Road fuel: Commercial demand	• 2030: Road fuel demand in the Netherlands and in the EU decreases by 2% between 2024 and 2030. • 2040: Road fuel demand in the Netherlands and in the EU decreases by 35% between 2024 and 2040. • The make-up of road fuel is dominated by road diesel, with increasing percentages of HVO blends. HVO demand grows four-fold between 2024 and 2030 in the Netherlands and the EU.	International Energy Agency, Energex, Dutch Emissions Authority, Kennisinstituut voor Mobiliteitsbeleid, Fastmarkets
Refining capacity	• Refining capacity decreases by 50% in the Netherlands and by 65% in the EU between 2024 and 2040.	Concawe
Alternative fuels production capacity	• 2030: 60% and 50% of announced SAF and e-SAF projects materialise in the Netherlands and the EU. HVO production capacity is the same as in 2024 in the Netherlands and the EU. • 2040: All announced SAF and e-SAF projects materialise in the Netherlands and the EU. HVO production increases by 25% compared to 2024 in the Netherlands and the EU.	Energex, EASA, T&E, the Dutch SAF Roadmap
Imports and exports	• 2030: Exports of jet fuel and road diesel are the same as in 2024 in the Netherlands and the EU. Imports of jet fuel and road diesel grow to match the increase in consumption and export levels. The Netherlands and the EU are net importers of HVO. The Netherlands is a net exporter of SAF, the EU is a net importer. • 2040: Exports of jet fuel and diesel decrease by 35% in 2040 compared to 2024. Imports of jet fuel and road diesel grow to match domestic demand and export levels. The Netherlands and the EU are net importers of HVO. The Netherlands is a net exporter of SAF, the EU is a net importer. The Netherlands and the EU are net importers of e-SAF in 2040.	Concawe

The assumptions for fuel demand in the storylines are summarised in Table 4.

Table 4. Military demand assumptions

Storyline	Fuel demand assumption
Peacetime	• Military consumption: 5% of commercial demand in peacetime.
Buildup of tensions	• Commercial demand (domestic demand and exports) is the same as peacetime in the Netherlands and the EU. • Military consumption 12% of commercial demand in peacetime. • Military stock build: 20 days of military consumption in conflict.
Conflict	• Commercial demand (domestic demand and exports) is the same as peacetime in the Netherlands. Commercial demand in the EU reduced by 25% compared to peacetime. • Military consumption: 60% of commercial jet demand in peacetime; 20% of commercial diesel demand in peacetime.

4.2. **Fuel security in conflict in 2030 and 2040**

The storylines of military escalation for both jet fuel and diesel and both timelines follow a similar pattern by design. As tensions escalate, the logistical buildup increases and fuels being bought and placed in storage. In this period, a supply shortfall is expected. The immediate shock of the full-scale conflict will be slightly mitigated by this buildup of stocks. After the first 20 days of the conflict, when both military and a part of commercial stocks will likely be depleted, the pressure on fuel supply will grow exponentially. The storylines reveal five key observations.

1. Supply shortfalls are expected both during the escalation of tensions and in conflict

Across all storylines, fuel supply pressures emerge before the outbreak of full-scale war. Even during the escalation phase, when military tensions rise and armed forces begin preparing for possible conflict, fuel demand increases enough to create shortfalls. These shortfalls deepen further once conflict begins (see Figure 10 and Figure 11). In both 2030 and 2040, the most severe deficits occur after the assumed 20-day buffer stock has been exhausted, at which point the system becomes much more dependent on current production, imports, and available logistics capacity.

This shortfall is more pronounced in the Netherlands than at the European level. This reflects the Netherlands' dual role as both a consumer and a strategic energy hub for Europe. As a NATO Host Nation, the Netherlands would not only need to fuel its own armed forces, but also support the reception, staging, and onward movement of allied forces across Europe. This creates much higher effective demand than in countries that are primarily supplying their own military and civilian markets.

A second reason is that the Dutch and broader European response assumes civilian demand is protected for as long as possible, especially in the early phases of a crisis. In other parts of Europe, civilian consumption is expected to fall more sharply during conflict, by roughly 25%, which helps free up fuel for military use. In the Netherlands, the ambition to preserve economic functioning limits the extent to which civilian demand can be cut without major consequences. This matters because a functioning economy is itself a strategic asset in wartime. It provides the industrial output, energy services, transport capacity, labour productivity, and fiscal base needed to equip, sustain, and replenish military operations. Without that economic resilience, armed forces will struggle to endure a prolonged conflict.

2. Shortfalls are significantly larger for aviation fuel than for road fuel

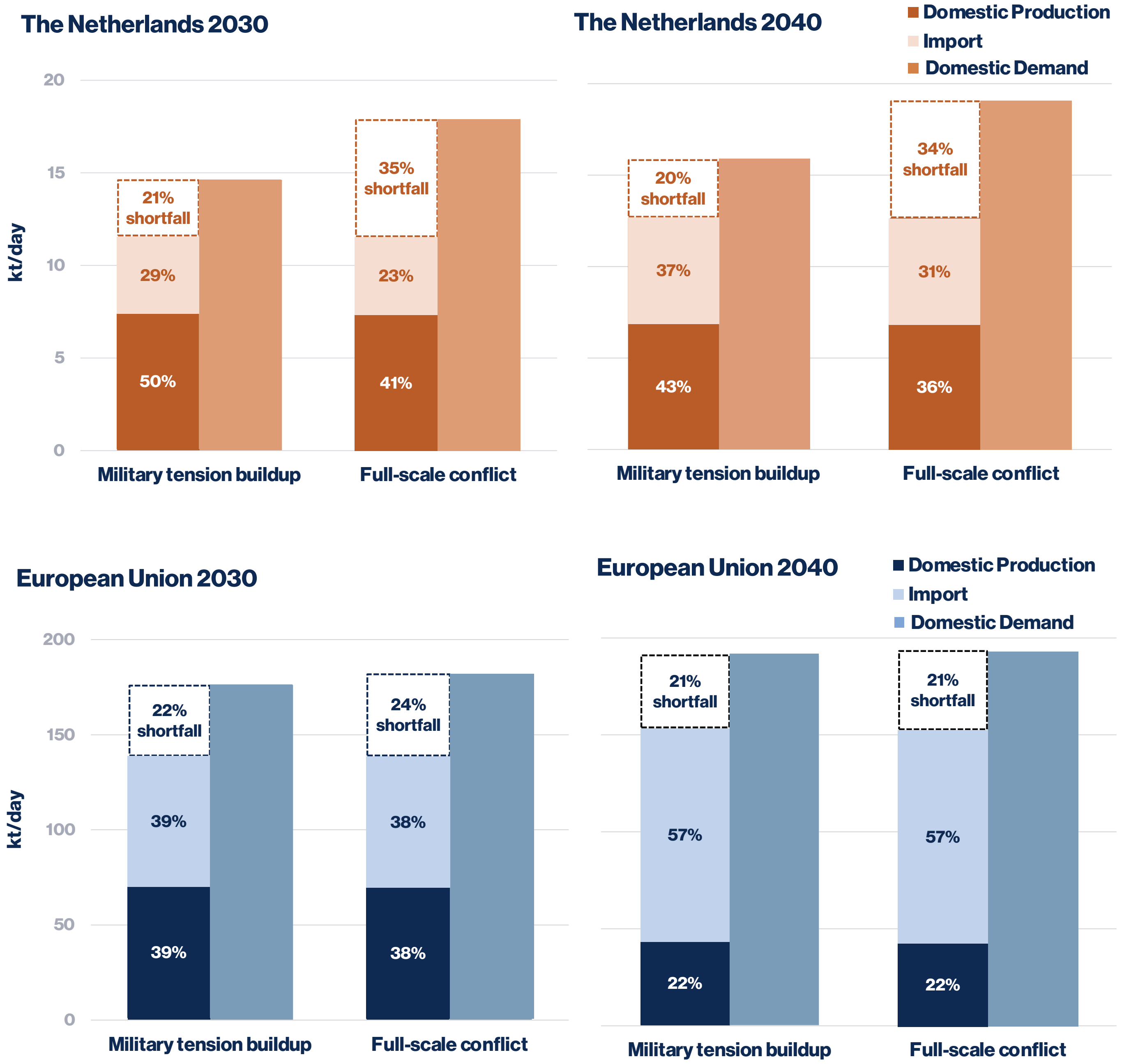
The most severe shortfalls occur in aviation fuel. As discussed in section 3, jet fuel is the key military fuel across multiple domains: it is essential for air operations and, under NATO's Single Fuel Concept, also plays an important role in land operations. Road fuel demand – specifically diesel and HVO – will also increase in conflict, by about 20% compared to civilian time. At European level, this increase will likely be offset by the decrease in civilian consumption close to the battlefield, leading to a supply surplus of about 10%. In the Netherlands, road fuel will continue being used, leading to shortfalls of 12-13%.

This makes military demand for aviation fuel structurally more difficult to absorb than might be expected from civilian consumption patterns alone. In the civilian fuel market, where road fuel demand is much larger and aviation fuel consumption is only around half that level. In peacetime, this means fuel systems are more heavily oriented toward road fuel, specifically diesel. In wartime, however, military requirements shift the balance. Air power becomes highly fuel-intensive, and the strategic importance of aviation fuel rises disproportionately. As a result, even when road fuel markets appear relatively manageable, jet fuel can become the decisive bottleneck.

After the first 20 days of conflict, once buffer stocks have been used, it becomes increasingly difficult to maintain both domestic consumption and exports at peacetime levels. At that stage, governments and NATO are likely to face explicit prioritisation choices. These may include decisions between military and civilian users, between domestic consumption and allied support, or between different military missions such as air defence, deep strike, logistics support, and sustainment. In practice, this means that aviation fuel shortfalls are likely to translate quickly into operational constraints.

Military conflict in Europe will trigger aviation fuel shortfalls: The EU will only meet 22% of its aviation fuel demand through domestic production in 2040

Low domestic production capacity for aviation fuel combined with a high import dependency in the EU and the Netherlands make it difficult to overcome fuel shortfalls in conflict

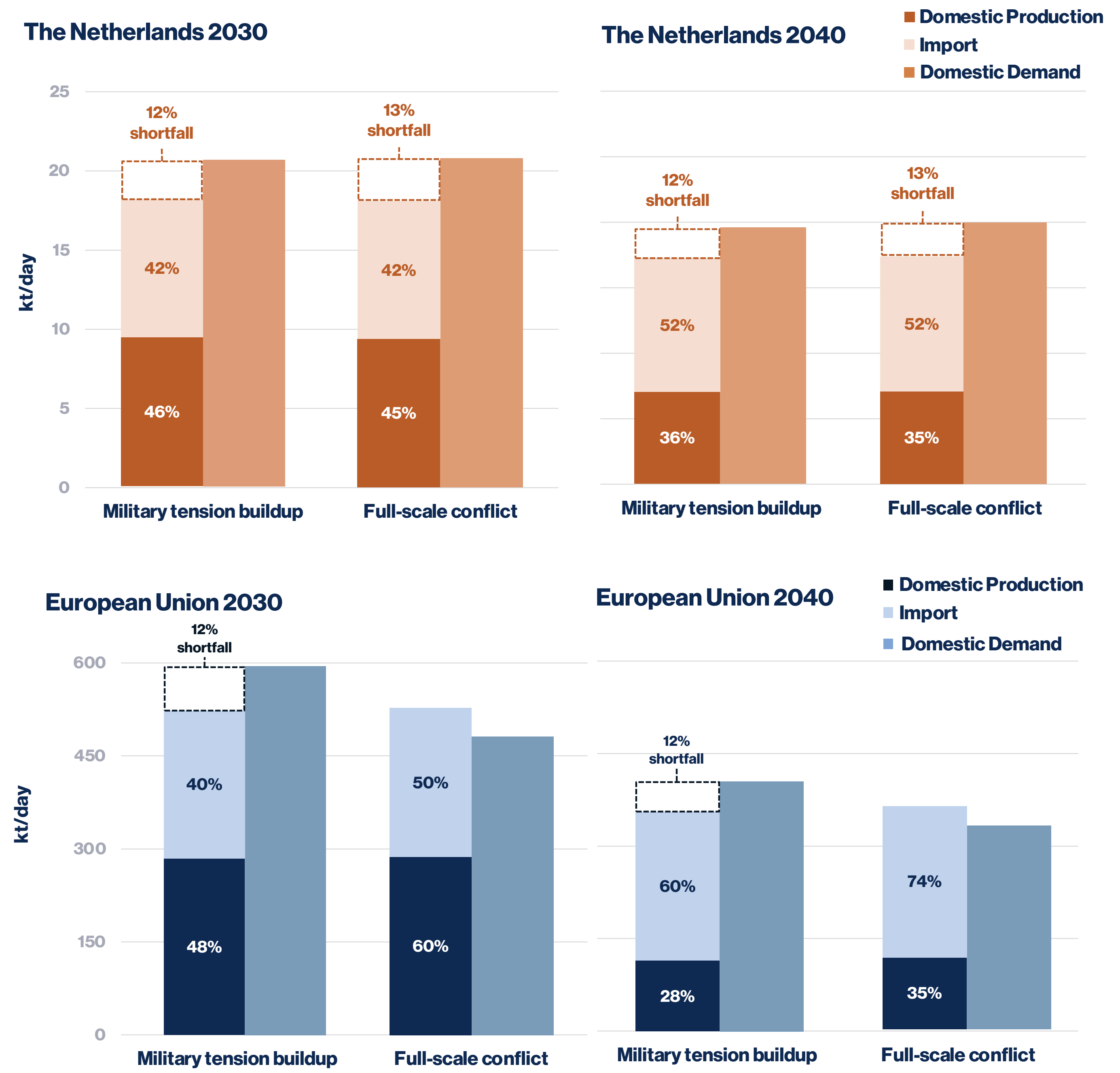


Note: In 2030, aviation fuel in the Netherlands is assumed to be 86% jet fuel and 14% SAF & e-SAF; and in the EU 94% jet fuel, 4.8% SAF and 1.2% e-SAF. In 2040, aviation fuel in the Netherlands and the EU is assumed to be 66% jet fuel, 24% SAF, 10% e-SAF. The left bar (domestic production+import+shortfall) shows the numbers after excluding exports.

Source: HCSS analysis based on interviews and data from Eurostat, Energex, Concawe, International Energy Agency, the Dutch SAF Roadmap, the Dutch Emissions Authority, Kennisinstituut voor Mobiliteitsbeleid, European Union Aviation Safety Agency (EASA), Transport & Environment (T&E).

Figure 10. Daily aviation fuel supply-demand balances in a conflict scenario

Shortfalls of road fuel in the Netherlands could inhibit the country's ability to fulfil NATO Host Nation obligations during military conflict



Note: In 2030, road fuel in the Netherlands is assumed to be 71.6% road diesel and 28.4% HVO; and in the EU 97% road diesel and 3% HVO. In 2040, road fuel in the Netherlands is assumed to be 55% road diesel and 45% HVO; and in the EU 87.5% road diesel and 12.5% HVO. The left bar (domestic production+import+shortfall) shows the numbers after excluding exports.
Source: HCSS analysis based on interviews and data from Eurostat, Energex, Concawe, International Energy Agency, the Dutch SAF Roadmap, the Dutch Emissions Authority, Kennisinstituut voor Mobiliteitsbeleid, European Union Aviation Safety Agency (EASA), Transport & Environment (T&E).

Figure 11. Daily road fuel supply-demand balances in a conflict scenario

3. Import dependency increases further by 2040

By 2040, fuel resilience becomes more difficult to sustain because Dutch and European refining capacity is expected to decline significantly, while fossil fuels are still expected to account for more than half of total aviation and road fuel consumption. Crude oil is relatively easy to source on the global market given its liquidity, but oil products like jet fuel and diesel are sources from a narrower group of suppliers.

This creates a structural mismatch. Even as climate policy gradually changes the fuel mix, liquid hydrocarbons remain indispensable for both military operations and large parts of the civilian economy. The result is higher import dependency on oil products at exactly the moment when Europe may be operating in a more contested global trading environment.

The import dependency for aviation fuel will increase towards 2040, reaching 46% dependency for the Netherlands and more than 70% for the EU (see Figure 12). The Netherlands seems to be somewhat better positioned than other European countries, mainly because of the refining capacity may decline slightly slower than the EU average, as well as many announced SAF and e-SAF projects. This would point to a heightened dependency of European members on Dutch industry, as a large part of European production capacity would be in the Netherlands.

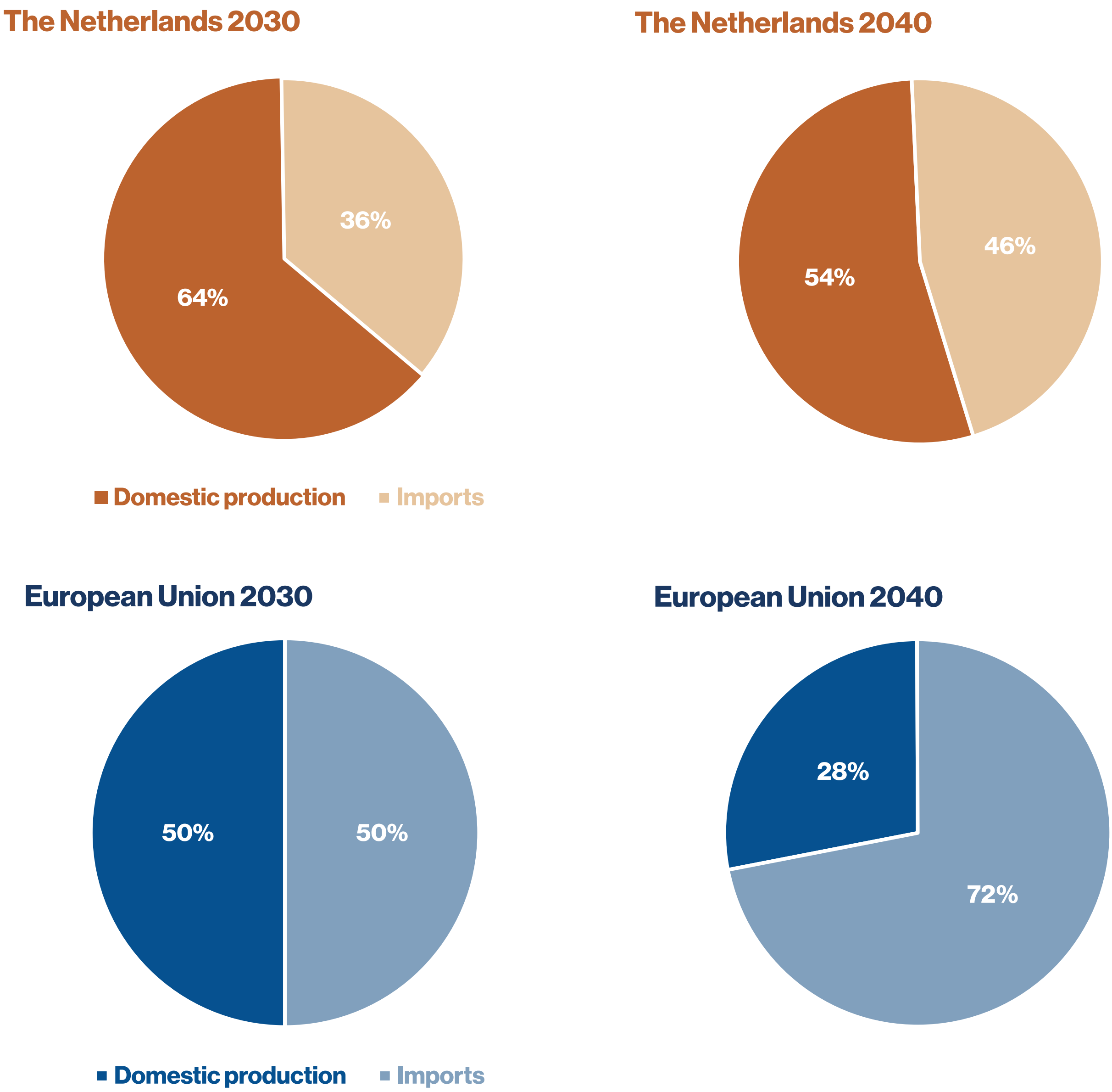
Yet it is still a question whether the Netherlands manages to keep domestic production capacity. The EUMR and growing CO_2 prices could lead to premature closures in refining capacity and leave less than expected in this report's storylines.

Moreover, even if more alternative fuels are produced in the Netherlands, they could still depend heavily on imported feedstocks and intermediates. This is the case for methanol used in e-SAF production, as well as for used cooking oil and other waste-based feedstocks used for SAF and HVO.

This means that the transition to a more diverse fuel mix may reduce some risks, but it does not automatically reduce strategic vulnerability. Europe may replace one form of dependency with another unless supply chains for feedstocks, intermediates, and finished fuels are secured more systematically.

High import dependency for aviation fuel in peacetime could weaken Dutch and European military readiness

Low domestic production capacity for aviation fuel combined with a high import dependency make it difficult to overcome fuel shortfalls in conflict. Aviation fuel consists of jet fuel and blends of SAF and e-SAF according to policy targets.



Note: The import dependency refers to the fuel and not to feedstocks.
Source: HCSS analysis based on interviews and data from Eurostat, Energex, Concawe, IEA, T&E, EASA, the Dutch SAF Roadmap, Akkoord Duurzame Luchtvaart, ReFuelEU Aviation targets.

Figure 12. Aviation fuel import dependency in 2030 and 2040

4. By 2040, fuel shortfalls become harder to close as supply flexibility declines and the fuel mix becomes more complex

The largest shortfalls are expected for jet fuel in the Netherlands during conflict, reflecting the country's Host Nation role, its position as a major European fuel hub, and the aim of preserving civilian economic activity for as long as possible.

In principle, these shortfalls can be addressed through commercial inventories, higher domestic production, and increased imports. In practice, all three options are constrained. Commercial stocks depend on market conditions and may not be readily available to governments in a crisis. Domestic refining can only be adjusted within narrow limits, and this flexibility will decline further as refining capacity falls by 2040. Imports can help fill gaps, but they also increase dependence on vulnerable global supply chains, ports, terminals, and inland transport networks.

By 2040, these challenges are compounded by a more complex fuel mix. In aviation, supply is expected to consist increasingly of conventional jet fuel, SAF, and e-SAF. While this diversification can improve resilience by broadening the supply base, it also makes crisis response more difficult. Filling shortfalls will require access not only to larger fuel volumes, but also to multiple fuel types, feedstocks, blending capacity, and dedicated logistics chains.

For diesel, the picture is somewhat different at the EU level. During the buildup of tensions, shortages emerge because both civilian and military demand must still be met. During conflict, however, reduced civilian demand may create a modest aggregate surplus. Even so, this does not remove the challenge of ensuring that fuel reaches the right users in the right place and at the right time.

Overall, by 2040, fuel shortfalls become harder to manage not only because supply flexibility declines, but also because the fuel system itself becomes more complex and more dependent on vulnerable external inputs.

5. Even when fuel is available, getting it to the right place at the right time remains a major vulnerability

Securing sufficient fuel supply is only part of the challenge. Europe's fuel system also faces significant weaknesses in storage and distribution capacity, and these may become decisive in a crisis. During the buildup phase, large volumes of fuel must be pre-positioned at or near ports, airports, depots, military bases, and transport corridors. Across much of Europe, storage capacity for this purpose is limited, fragmented, or not configured for rapid military use. In conflict, the challenge becomes even greater: fuel must then be moved continuously from refineries, import terminals, and storage locations to military users under conditions of disruption, congestion, and possible attack.

The Central Europe Pipeline System (CEPS) remains the backbone of military fuel distribution in much of Europe, but it terminates in Germany, as discussed in Section 3. Beyond that point, road and rail become increasingly important. This creates a major vulnerability, because military mobility in Europe remains constrained by infrastructure limitations, regulatory obstacles, capacity shortages, and competing civilian demand. If CEPS were used primarily or exclusively for military purposes during conflict, civilian users would need to rely more heavily on rail, road, and inland waterways, making the overall supply chain more congested, less efficient, and more vulnerable to disruption.

These logistical challenges become even more significant as the fuel mix becomes more complex. Different fuel types may be produced in different places, require different blending or handling arrangements, and need to be delivered to different users under different technical standards. Linking production sites, import terminals, blending hubs, and final consumers therefore becomes a much more demanding task. In a conflict setting, this added complexity could itself become a source of delay and vulnerability.

The key implication is that fuel security cannot be understood as a supply issue alone. Even if sufficient aggregate volumes are available at the national or European level, military operations can still be constrained if storage is inadequate, inland transport is disrupted, or distribution networks cannot surge fast enough.

During conflict, disruptions and unexpected developments can escalate, hampering supply and creating larger shortages.

4.3. **Compounding risks for supply security**

The supply and demand storylines sketched out above assume that supply chains will be relatively stable. However, in times of conflict, this is rarely the case. During conflict, disruptions and unexpected developments can escalate, hampering supply and creating larger shortages. These supply disruptions can take place in the import, refining, distribution or storage stages. In the first month, some of these disruptions will be cushioned by the strategic fuel stocks the Netherlands holds. However, if these stocks are depleted, supply shortages start to appear.

Disruption scenarios like shutting off or limiting several of supply and transport nodes could lead to additional supply reductions (see Table 5). These numbers should be taken as indicative, as the real impact would depend largely on the length, severity and precise impact of the disruption.

Table 5. Potential impact of supply chain disruptions on jet fuel supply in the Netherlands

Type of Disruption	Potential Supply Reduction of Jet Fuel in the Netherlands
Power Outage in the Port of Rotterdam	29-58%
Disruption of Strait of Hormuz and/or production asset destruction in the Gulf	5-10% (crude) 30-50% (jet)
CEPS Pipeline Disruption	9-31%
Inland Waterway Drought	4-8%

A power outage in the Port of Rotterdam lasting a few days or weeks, could severely hamper not only refining, but also fuel onshoring and distribution. Marine offloading pumps could stop working, refinery capacity could go offline, and pumps from storage to pipeline and in the pipelines could cease to work, hampering fuel flows. Depending on the scale (the area in the Port of Rotterdam affected) and the length (time to repair and restart), this could lower jet fuel supply in the Netherlands by 29-58%, assuming that a lengthy, full outage of the whole port infrastructure would be unlikely.

Another example is an upstream supply shock, such as the closure of the Strait of Hormuz or the destruction of production facilities and refineries in other parts of the world, such as in the Middle East. This could further squeeze supply and constrain availability. This disrupts global crude oil and jet fuel supply, reducing import volumes arriving at Rotterdam. Depending on the scale, this could lead to supply reductions of 5-10% in the case of crude, and 30-50% in the case of jet fuel.

Further along the supply chain, disruptions in fuel distribution could also occur. Sabotage of pipelines, for example, could significantly impact flows. The impact would mostly depend on whether one or more of the CEPS pipelines in the Netherlands would be sabotaged. If several central European CEPS pipelines were destroyed, repairs would take time, assuming sufficient spare parts and personnel are available. Depending on downtime, this could lead to a supply gap ranging from 9 (one pipeline) to 31 (all CEPS pipelines in the Netherlands) percent.

If other cascading risks occur simultaneously, European militaries and societies might be unable to overcome the shortages, with potentially disastrous effects on Europe's territorial integrity and economy.

Lastly, increasing droughts, already occurring in Europe, and other extreme weather events could disrupt inland waterways and render them unavailable for transport. This has already occurred in Germany, for example, in 2022.[120] As a result, depending on the scale of cascading effects, a significant portion of fuel supply could possibly not be distributed – and therefore will not be available – during conflict or other unforeseen events. Based on the fuel that comes through the RMR oil pipeline from the Netherlands to Germany, that needs to be transported by barge to the end point of Frankfurt, disrupted water transport would lower total supply by about 4 to 8 percent.

These uncertainties should be considered in military planning, particularly in ensuring sufficient fuel availability and redundancy in the event of conflict.

4.4. Mitigating interventions and trade-offs

The sections above show that the Netherlands and the EU would have to overcome significant supply shortages in case of military conflict. Before 2030 there is higher flexibility in the system considering the larger domestic refining capacity, meaning that there are several options to bridge the gap. By 2040 the European fuel system gains complexity, and the opportunities to mitigate shortfalls weaken. If other cascading risks occur simultaneously, European militaries and societies might be unable to overcome the shortages, with potentially disastrous effects on Europe's territorial integrity and economy.

Depending on the conflict phase and the severity of the shortage, different governmental interventions can help mitigate the impact. Some of these interventions have already been discussed throughout section 4. Table 6 below provides an overview of the key interventions that could help mitigate the risks.

[120] 'Drought in Europe: Shipping Threatened in Germany as Rhine Water Levels Continue to Drop | Euronews', accessed 3 April 2026, https://www.euronews.com/2022/08/10/germany-drought-river-rhine-water-levels-could-fall-to-critical-low.

Table 6. Interventions to strengthen military supply security and trade-offs

Intervention	Type	Conflict phase	Pros	Cons
Maintain a minimum level of domestic refining production	Structural	Buildup & Conflict	• Increases strategic autonomy Secures baseline supply • Preserves industrial capacity in related industries (e.g. chemicals)	• Higher peacetime costs Potential tension with climate goals Domestic infrastructure remains vulnerable • Regulatory barriers (e.g. state aid regulation)
Increase domestic production of alternative fuels (HEFA SAF, HVO, e-fuels)	Structural	Buildup & Conflict	• Diversifies the fuel mix Contributes to civilian climate goals	• Depends on imported feedstocks and potentially imported fuels • Slow to scale up, with notable results visible in 10+ years • Can be legally blended only to a percentage into fossil fuels • Domestic infrastructure remains vulnerable
Increase security arrangements for (civilian) energy infrastructure	Structural	Buildup & Conflict	• Reduces disruption risks Protects critical infrastructure Supports economic continuity	• Requires significant investments Cannot remove all risks
Increase imports of jet and diesel	Crisis response	Buildup & Conflict	• Fast to mobilise Covers short-term supply gaps	• Greater dependence on global suppliers Vulnerable to global shortages and/or price volatility • Requires significant investments in import, storage and distribution infrastructure from main import hubs
Reduce civilian consumption	Crisis response	Conflict	• Frees fuel for priority use Can be implemented quickly Extends available stocks	• High social and economic costs Politically difficult to sustain Can weaken societal resilience
Reduce extra-EU exports	Crisis response	Conflict	• Frees fuel for priority use Can be implemented quickly • Extends available stocks	• Limited effect in severe shortages given that the EU is already import dependent on jet & diesel, SAF & HVO (both feedstock and potentially final product) • Harms trade relations May trigger retaliation

The interventions involve clear trade-offs between speed, cost, resilience, and political feasibility. Measures such as increasing imports, reducing civilian consumption, and limiting extra-EU exports can help address shortages relatively quickly, but they also increase exposure to volatile markets, create political and economic costs, and may shift risks onto partners and civilians. By contrast, maintaining domestic production, expanding alternative fuel production, and strengthening infrastructure security can improve structural resilience and strategic autonomy. These measures require more time, investment, and policy coordination, and must be tailored in such a way that they do not undermine decarbonisation objectives.

At the same time, intervening in the market to reduce civilian consumption and to reduce extra-EU exports can be politically difficult and is therefore unlikely unless there is ongoing conflict. These, together with a sudden increase in imports, are crisis response measures rather than structural mechanisms. They can also have relatively low impact if structural conditions are not fulfilled – for instance, if the EU is already highly import dependent in peacetime, the flexibility to further increase imports is reduced, compared to a situation where domestic production already provides a portion of the supply. The more structural resilience is built into the system, the more opportunities for mitigation will be available in times of crisis.

5. Conclusion and policy recommendations

The risk of conflict in Europe is at the highest level since the end of the Cold War, but fuel security lags behind and we can expect an increased risk for NATO operations in case of a crisis or conflict. For a long time, fuels were a plentiful commodity for European militaries: easy to source in a short time and at affordable prices. Yet supply security is no longer a given and governments must act to secure fuel supplies. The analysis leads to seven conclusions.

1. Dutch and European energy security depend on Dutch industry.

In peacetime, the Netherlands is one of the largest European hubs for the import, production, and distribution of oil products and alternative fuels across Northwest Europe. In crisis and conflict, this role becomes even more critical, as the Netherlands is also expected to function as a NATO Host Nation, supporting the reception, staging, and onward movement of allied forces. This means that Dutch infrastructure would not only have to meet domestic civilian and military demand but also facilitate the reception, processing and distribution of fuel for European defence operations.

2. The European fuel system is not prepared to simultaneously meet military and civilian fuel demand.

A substantial increase in military activity would raise demand for jet fuel, diesel, and alternative fuels at a time when the energy system is already under pressure from a weak business case and the energy transition. The storylines for 2030 and 2040 show the dire consequences of a full-scale conflict on the Eastern Flank for fuel security, including large-scale shortages and a limited capability to mitigate these without putting a halt on the economy.

3. If military conflict coincides with additional crises like sabotage and import disruptions, the Netherlands and the EU will face severe fuel shortages.

Sabotage, cyberattacks, port disruption, pipeline damage, or interruptions to international shipping could all reduce the availability or movement of fuels precisely when demand is rising. These risks can reinforce one another, creating cascading effects across refining, storage, and distribution systems. As a result, shortages that might otherwise have been manageable through rerouting or market adjustments could become much more severe and difficult to resolve, especially if multiple failures occur simultaneously.

4. The reduction in domestic refining capacity without sufficient alternatives hurts defence readiness.

If refineries close earlier than anticipated, the available domestic production of fossil fuel will fall faster than the system can compensate through alternative fuels. The Netherlands is one of Europe's most important fuel hubs, and its refining capacity is expected to shrink by half by 2040 if all announced policies materialize according to plan. Yet this pathway is inherently uncertain, and high carbon costs paired with an uneven playing field compared to international competitors could accelerate the decline of Dutch refineries even further. Given that refineries produce multiple products simultaneously, increasing or reducing output of one fuel affects the production balance of others, such as diesel, gasoline, and feedstocks. This interdependence limits the ability to address fuel shortages in isolation.

5. Alternative fuels can help fuel security by 2040 if their supply chains are resilient.

Alternative aviation fuels could play a meaningful role in reducing reliance on conventional jet fuel by 2040. Yet the slow pace of market scale-up brings substantial risks that the goals will not materialize. Moreover, if these investments are to strengthen resilience in a defence context, they must not only focus on sustainability but also on strategic autonomy when it comes to feedstock availability and production capacity.

6. Import dependency is growing and this creates a major strategic vulnerability.

The fuel import dependency in the Netherlands and the EU is expected to grow significantly by 2040. This is primarily due to the decline in refining capacity, but also because of insufficient production capacity for alternative fuels. Reliance on imports creates a strategic vulnerability because it depends on external suppliers, functioning ports, secure shipping routes, and stable international markets. All of these may be disrupted during conflict. Structural interventions are essential, because without them the Netherlands and the EU risk entering a future crisis with a disproportionately high dependence on fragile external supply chains.

7. Civil-military coordination on fuels remains too weak to deliver real resilience.

Despite the strategic importance of fuel supply in crisis and conflict, coordination between civilian energy actors and defence stakeholders remains limited, fragmented, and often reactive. Energy planning is still largely driven by market, climate policies, and efficiency considerations, while military needs and broader resilience requirements are insufficiently integrated into long-term investment and infrastructure decisions.

To address the challenges highlighted in the conclusions, five policy recommendations are developed for the Dutch government.

Recommendation 1: Appoint a national fuel security representative to build a civil-military fuel strategy that treats energy resilience as a core security task. The absence of updated oil policy in the Netherlands has left liquid fuel security without clear political ownership. A representative should be tasked by the Ministry of Economic Affairs and Climate (EZK) to develop an integrated liquid fuel strategy. This should bring together ministries of Defence, Economic Affairs and Climate, Infrastructure and Water Management, and industry stakeholders around a shared assessment of risks, demand scenarios, and crisis roles. This strategy should move beyond ad hoc coordination and explicitly incorporate military requirements into energy planning, including refining capacity, storage, import dependency, and infrastructure protection. Doing so would provide political ownership and help ensure that fuel security is treated as a strategic concern. It would also provide the enabling framework to implement the other four recommendations below.

Recommendation 2: Preserve critical refining capacity. If domestic refining capacity is strategically important but commercially unviable under normal market conditions, the Dutch government and the EU should identify the minimum needed capacity and consider targeted mechanisms to keep this capacity operational. This could include capacity payments, long-term contracts, or other instruments that maintain minimum output or surge capability for key products such as diesel and jet fuel. Such measures would not eliminate dependence on imports, but they could reduce exposure to external shocks and prevent the loss of capabilities that would be difficult to rebuild in a crisis. Intervening early can avoid a situation where measures are only considered once key capacity has already been lost.

Recommendation 3: Build resilience into alternative fuel supply chains. Support for alternative fuels should not focus only on emissions reduction, but also on supply security and defence relevance. This means prioritising production pathways, infrastructure investments, demand creation and feedstock choices that reduce dependence on imports and are compatible with military requirements where possible. Policymakers should also assess how alternative fuel supply chains would perform under crisis conditions, including disruptions to electricity, green hydrogen, or imported intermediates.

Recommendation 4: Enhance security measures for critical energy infrastructure. The likelihood of attacks on fuel import, production and distribution capacity has substantially grown over the last years, and it is almost guaranteed in times of conflict. To reduce the impact of potential cyber and physical attacks, a security assessment should be performed to determine whether and when higher security measures are needed around physical energy infrastructure. Clear protocols including roles and responsibilities between the government and industry, standardized incident response protocols, and mechanisms for real-time information sharing and joint investigations.

Recommendation 5: Strengthen EU and NATO coordination on fuel security. Fuel resilience cannot be achieved by member states acting alone. The Netherlands should actively advocate within the EU and NATO for deeper coordination on fuel demand planning, emergency prioritisation, infrastructure protection, and burden-sharing. This should also include clearer mechanisms for joint scenario planning and alignment between civilian and military fuel requirements. In parallel, strategic reserve policies should be reviewed and updated to reflect higher military demand, the risk of long-duration conflict, and product-specific vulnerabilities such as jet fuel and diesel. Finally, this would involve cooperation on effective transport and logistics throughout the EU, especially from the West towards the Eastern Flank. Together, these steps would reduce fragmentation, strengthen Europe's collective response capacity, and give Dutch ministries and industry greater certainty about their role in a crisis.

Annex 1. Fuel conversion tables

1.1 Diesel conversion table

Density of diesel = 0.84 kg/L

Unit	Equivalent
1 litre (L)	0.84 kg = 0.00084 t
1 cubic metre (m^3)	1,000 L = 0.84 t
1 barrel (bbl)	158.987 L = 133.5 kg = 0.1335 t
1 metric tonne (t)	1,190.5 L = 1.190 m^3 = 7.49 bbl
1 US gallon	3.785 L = 3.18 kg = 0.00318 t
1 t/day	7.49 bbl/day
1,000 bbl/day	133.5 t/day
1,000 bbl/day	48,700 t/year ≈ 0.0487 Mtpa

1.2 Jet fuel conversion table

Density of jet fuel = 0.80 kg/L

Unit	Equivalent
1 litre (L)	0.80 kg = 0.00080 t
1 cubic metre (m^3)	1,000 L = 0.80 t
1 barrel (bbl)	158.987 L = 127.2 kg = 0.1272 t
1 metric tonne (t)	1,250 L = 1.25 m^3 = 7.86 bbl
1 US gallon	3.785 L = 3.03 kg = 0.00303 t
1 t/day	7.86 bbl/day
1,000 bbl/day	127.2 t/day
1,000 bbl/day	46,400 t/year ≈ 0.0464 Mtpa

The Hague Centre
for Strategic Studies

HCSS
Lange Voorhout 1
2514 EA The Hague

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