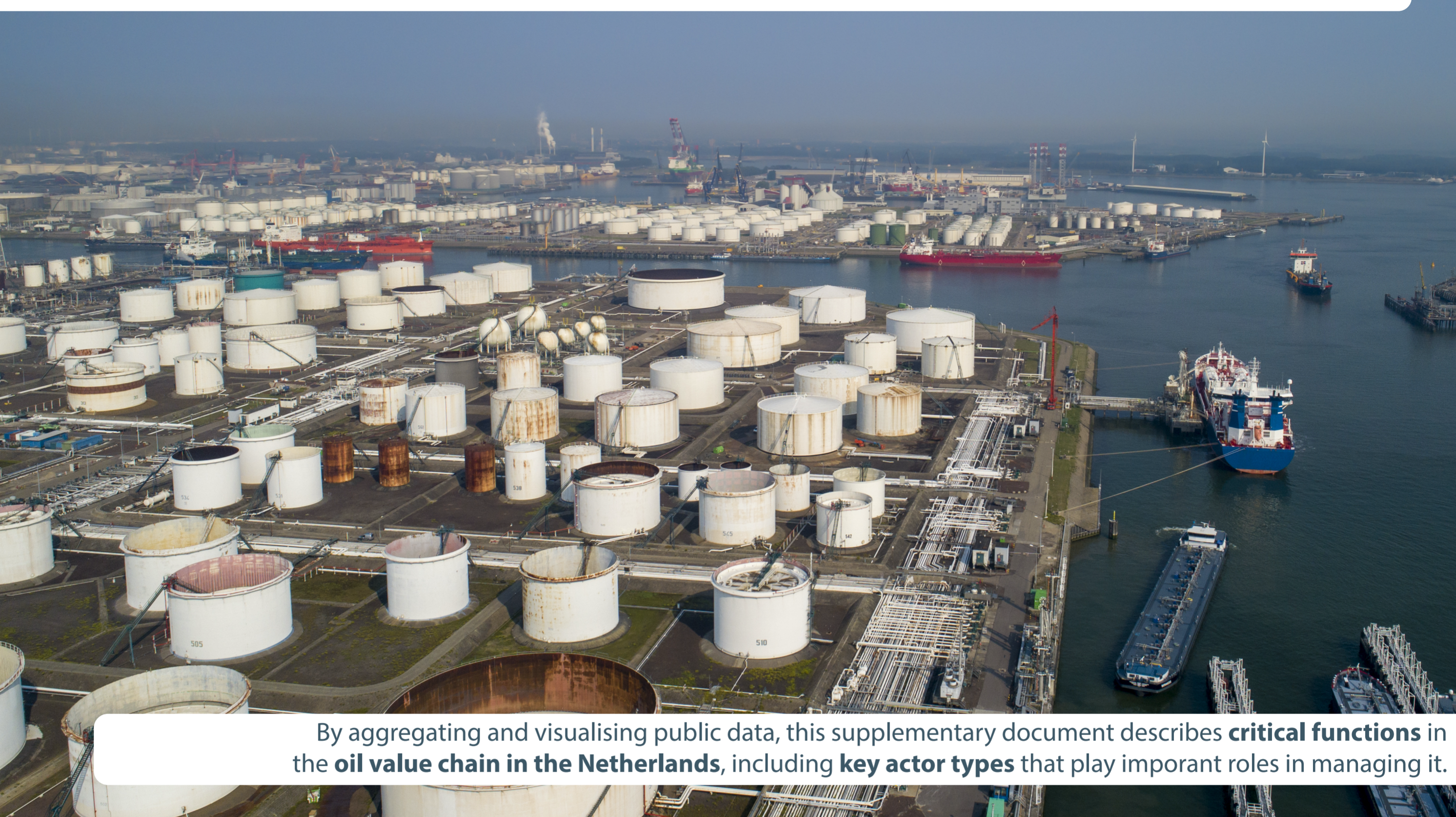
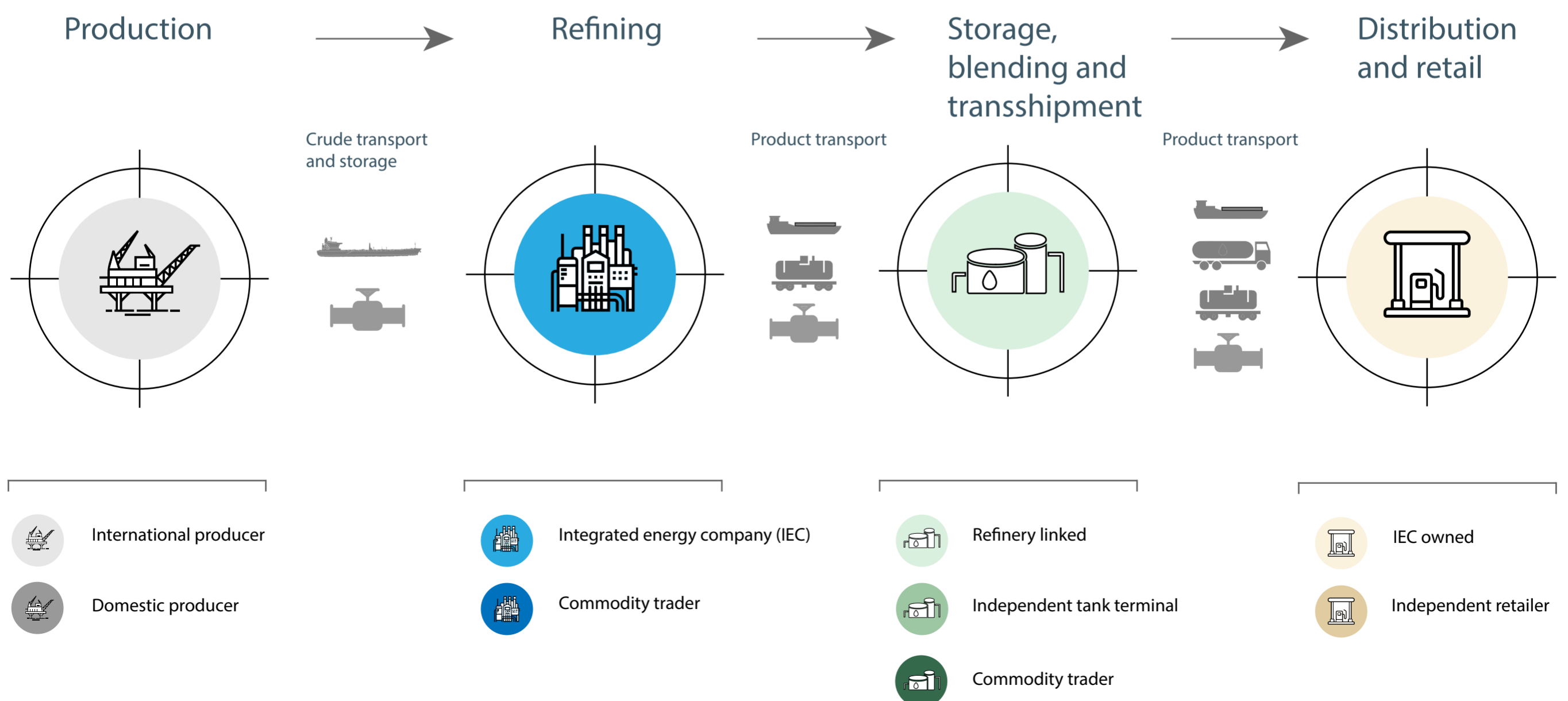


CRITICAL FUNCTIONS IN THE OIL VALUE CHAIN IN THE NETHERLANDS



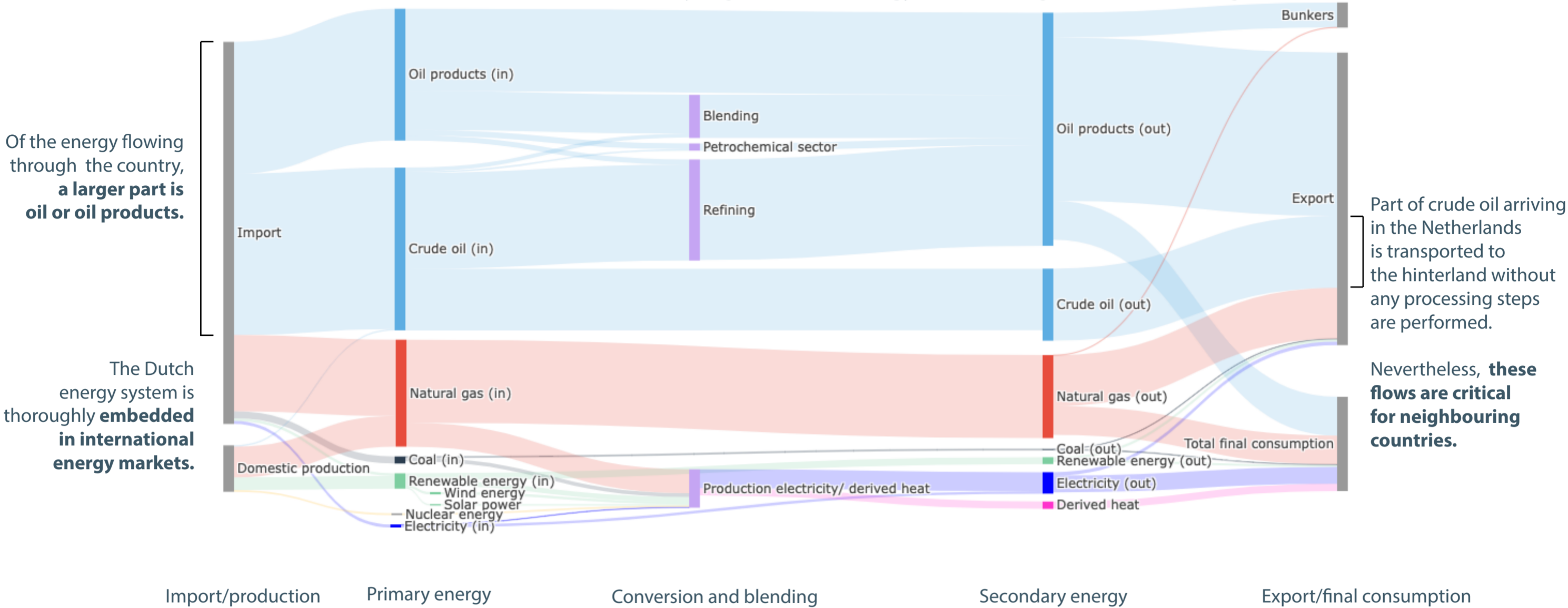
By aggregating and visualising public data, this supplementary document describes **critical functions** in the **oil value chain in the Netherlands**, including **key actor types** that play important roles in managing it.

Throughout the oil value chain, **a diverse group of players fulfils a major part of our energy needs**



Energy flows through the country, oil and oil products provide a major part of our energy needs

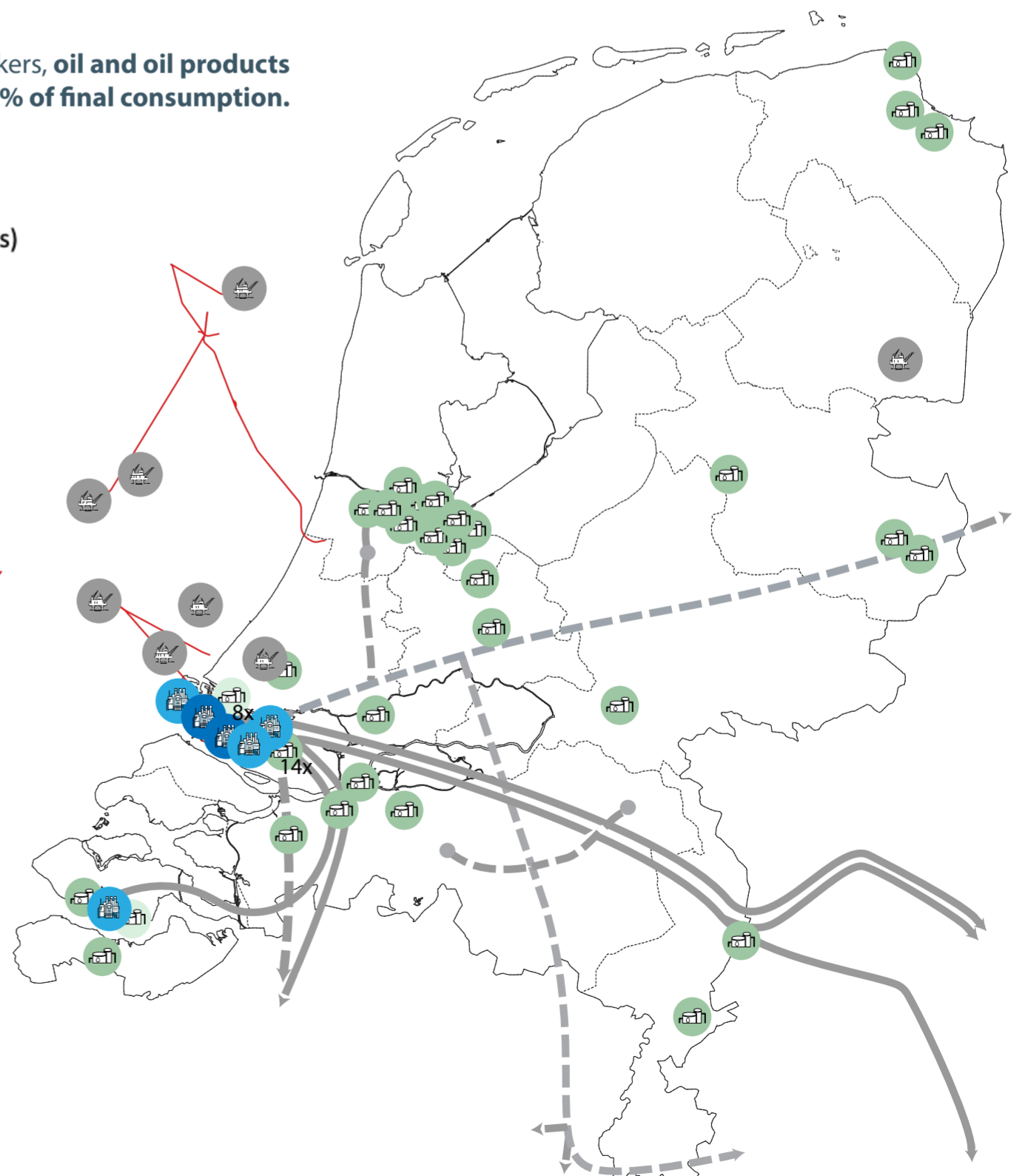
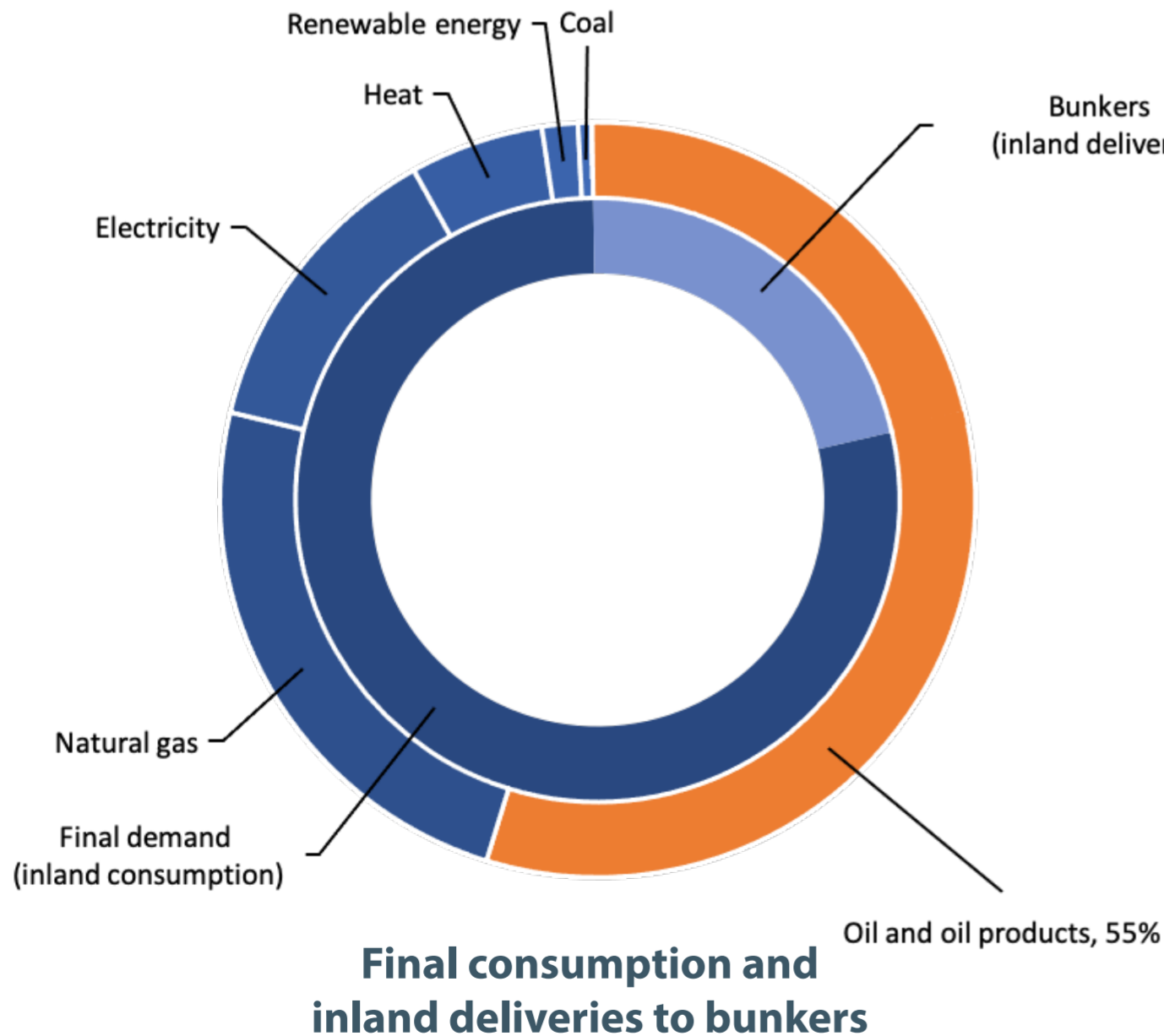
This Sankey diagram visualises **energy flows**, including their **relative size**, origin and use.



By managing oil and oil products streams, **the Netherlands plays a critical role** in the Northwest European energy system.

Oil and oil products still provide a major part of our energy and feedstock needs

When accounting for inland deliveries to bunkers, **oil and oil products** are responsible for **55% of final consumption.**



In energy statistics, bunker deliveries are often reported separately. These **inland deliveries** do, however, represent an **important physical stream** going to consumers in the **maritime** and **aviation** sectors.

Production takes place globally and complements modest levels of domestic production

Available for energy conversion NL, 63.75

Transport to **entrepôt** represent commodity streams that enter Dutch soil without customs clearance. **Physically** these stream are **in the country**, but as no import duties are paid they are **not part of domestic transshipments**.

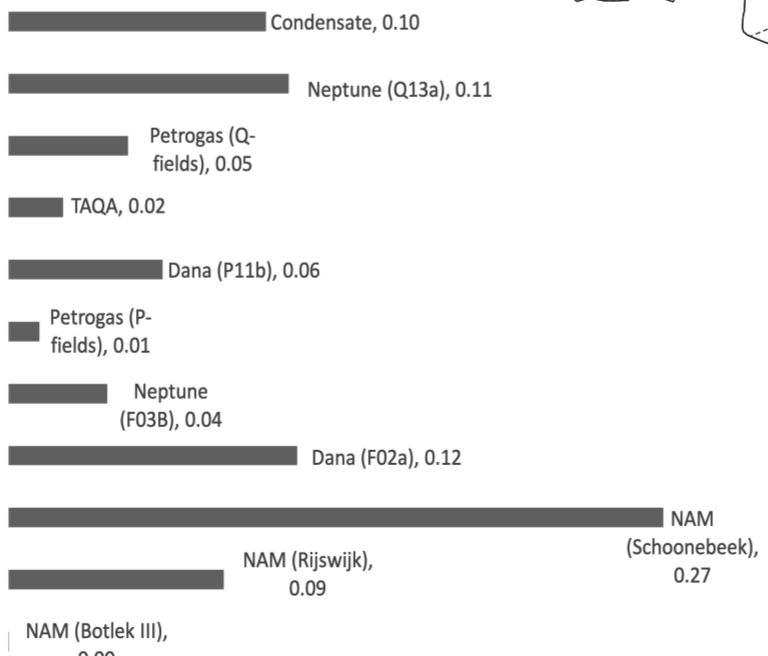
Import partner country → refining NL, 57.08

Transport partner country → entrepot, 50.01

Transport entrepot → partner country, 44.18



Production (bio)additives, 1.22
Domestic production, 0.88



Export NL → partner country from domestic production, 0.88
Stock mutations, 0.38

Oil entering NL in 2019 (Mln tons)

Domestic production in 2019 (Mln tons)

The Netherlands is **not a major oil producing nation**. Though, domestic production plays a role in increasing diversity of supply.

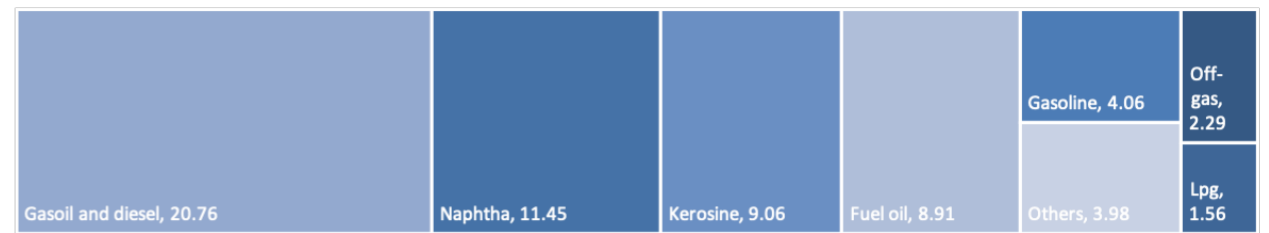
Oil leaving NL in 2019 (Mln tons)

Refining assets are owned by integrated energy companies and commodity traders

Refinery capacity is typically measured in **1000 barrels of crude oil a day** or kb/day. Total refinery capacity in the Netherlands is **1318 kb/day**, this equals about **65 mln tons/year**, enough to fill more than **2.4 million tank trucks**.

In the pre-covid year of 2019, the six refineries produced over **62 million ton of oil products**. This is considerably **more than** is requested by **the local product market** of 40.8 million ton.

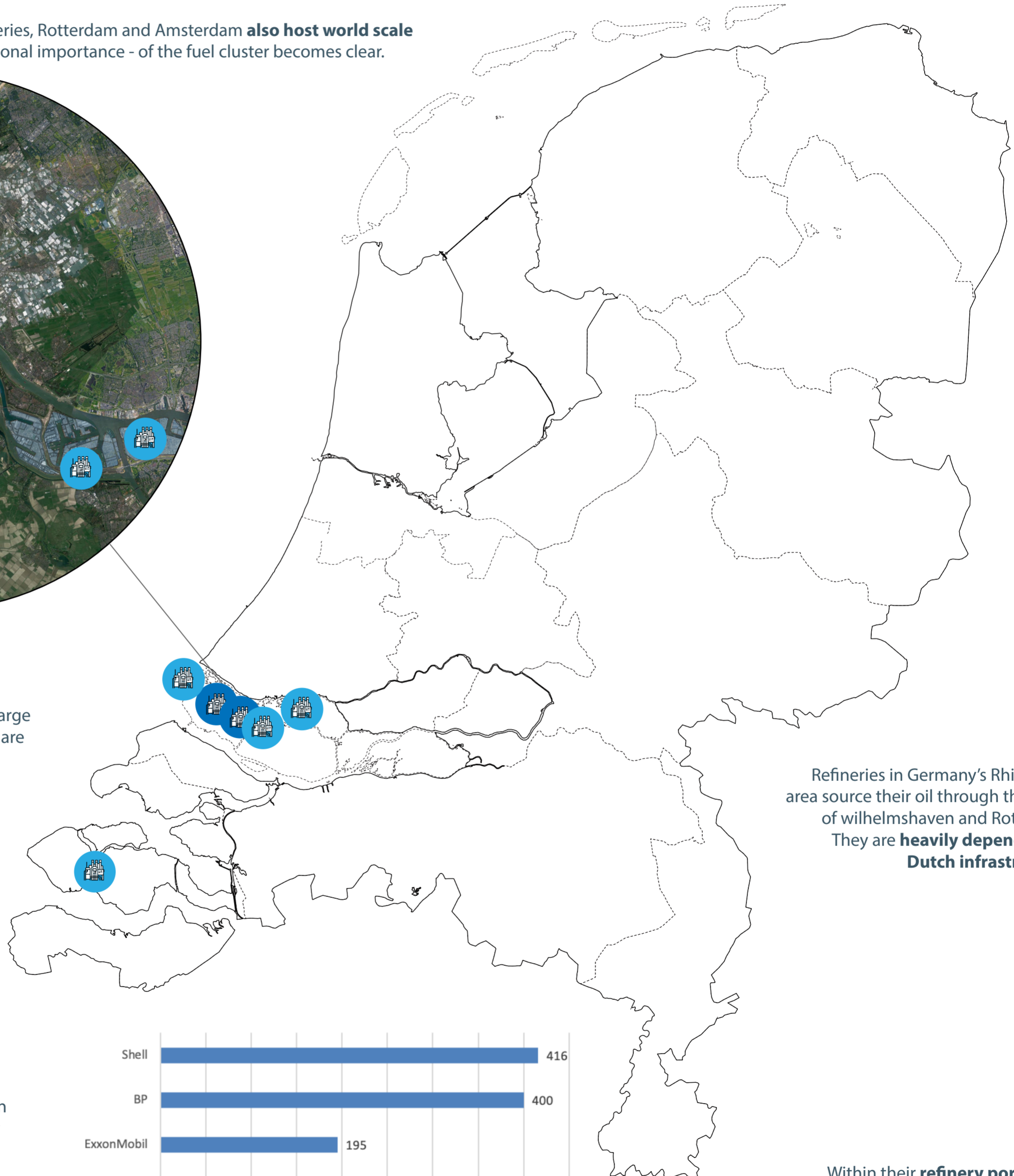
Considering that, in addition to these refineries, Rotterdam and Amsterdam **also host world scale fuel blending hubs**, the size - and the regional importance - of the fuel cluster becomes clear.



Refining output in 2019 [Mln tons]



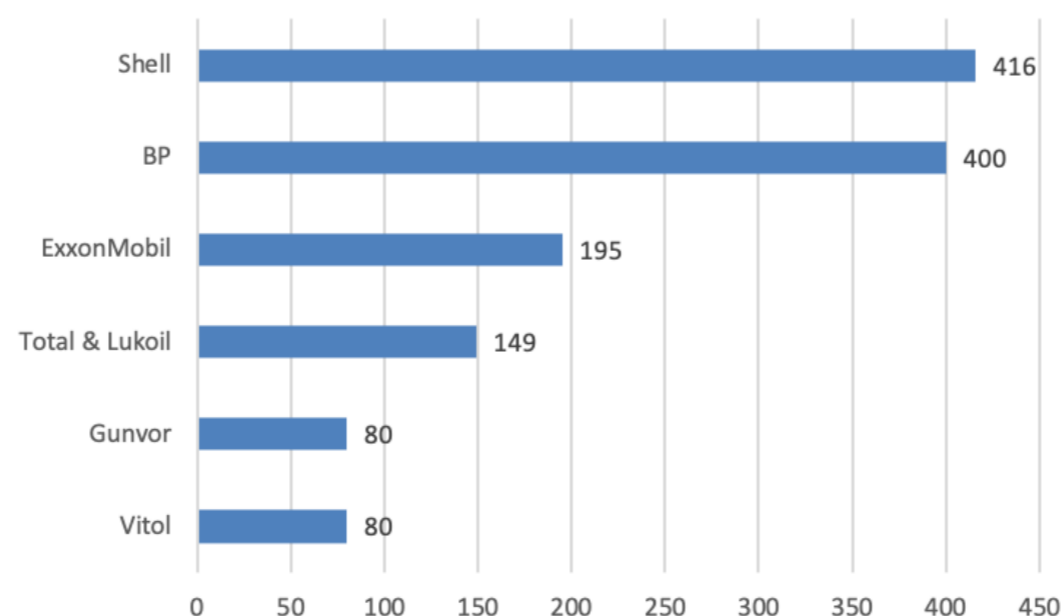
Oil is supplied to The Netherlands by very large crude carriers (VLCCs) and ultra large crude carriers (ULCCs). These supertankers are among the **largest ships ever built**.



Refineries in Germany's Rhine-Ruhr area source their oil through the ports of Wilhelmshaven and Rotterdam. They are **heavily dependent on Dutch infrastructure**.

Integrated energy companies typically own assets, across the entirety of multiple energy value chains, located all over the world.

Refineries owned by **commodity traders**, also referred to as merchant refineries, are companies that combine refining activities with outsized oil trading portfolios.

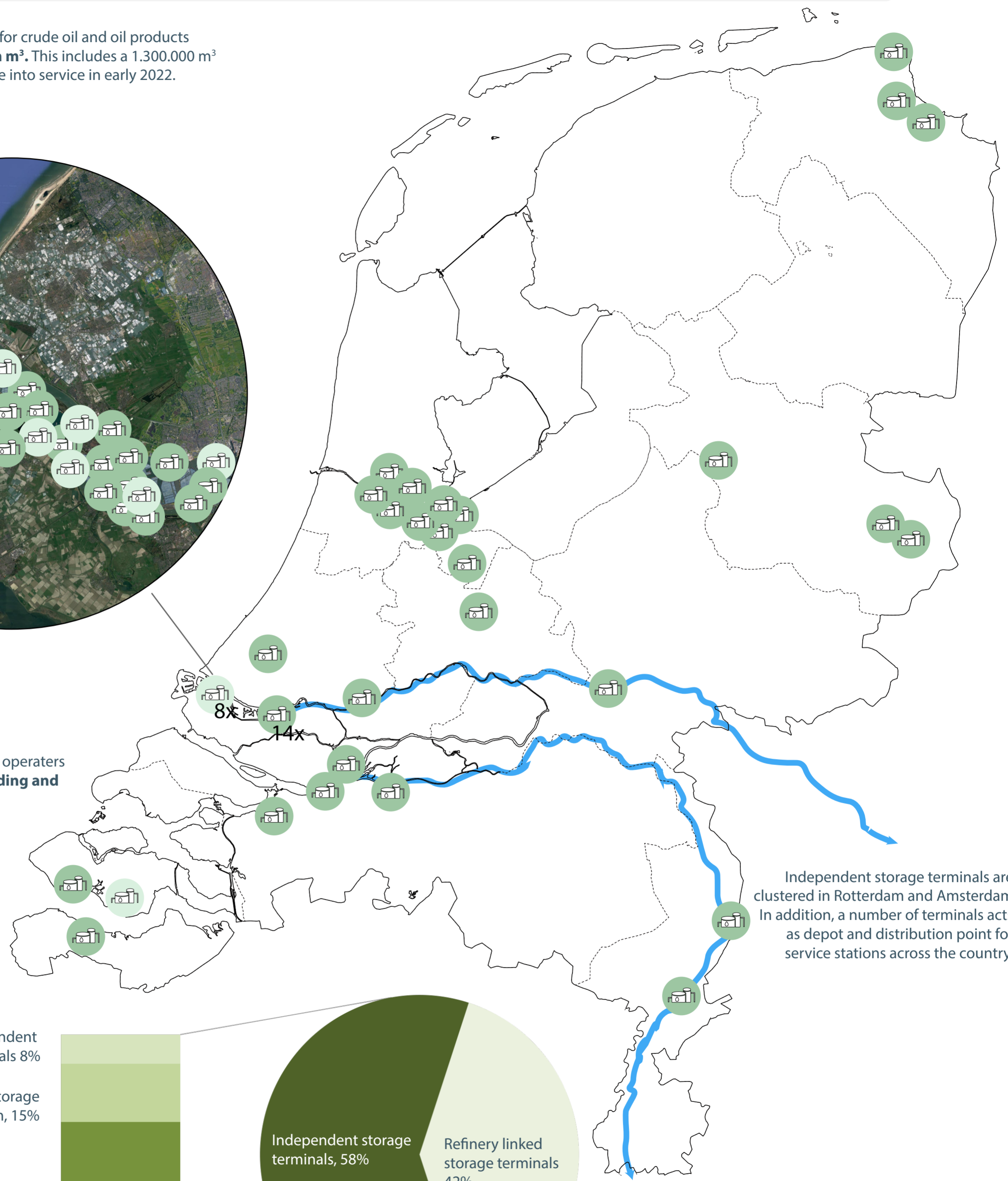


Refining capacity [kb/d]

Within their **refinery portfolios**, owners constantly look for an optimal allocation of assets and resources.

Storage operated by independent tank terminals and terminals linked to refineries

Estimated total storage capacity for crude oil and oil products in the Netherlands is **39.2 million m³**. This includes a 1.300.000 m³ terminal that is expected to come into service in early 2022.



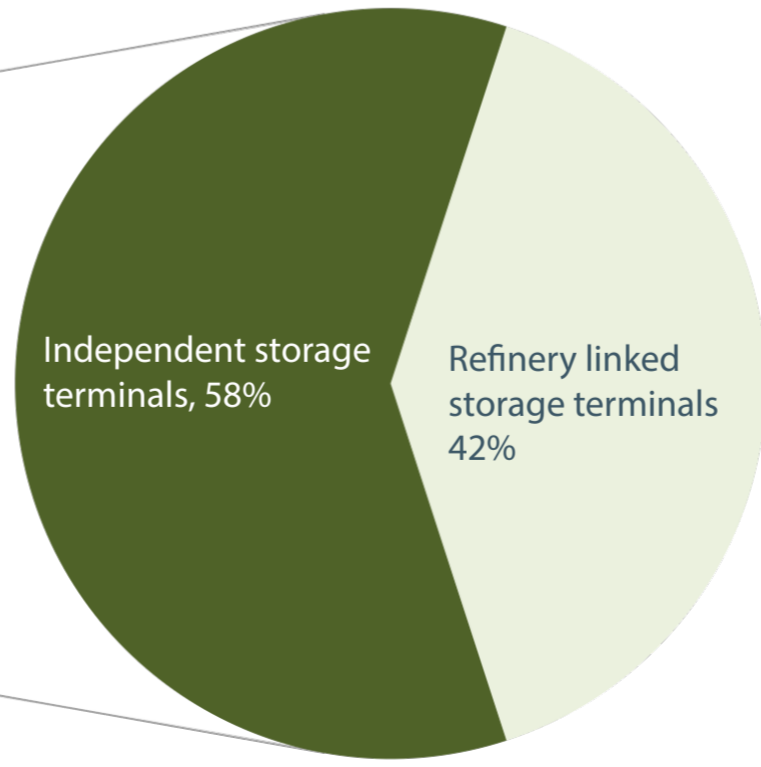
In addition to storage, terminal operators may be active in **trading, blending and transshipment** activities.

Independent storage terminals are clustered in Rotterdam and Amsterdam. In addition, a number of terminals acts as depot and distribution point for service stations across the country.

Other independent storage terminals 8%

Independent storage terminals in Amsterdam, 15%

Independent storage terminals in Rotterdam, 35%



Military and aviation related storage terminals are not included in this overview.

Estimated storage capacity per category [%]

Blending of oil products, using imported and refinery-sourced blending components

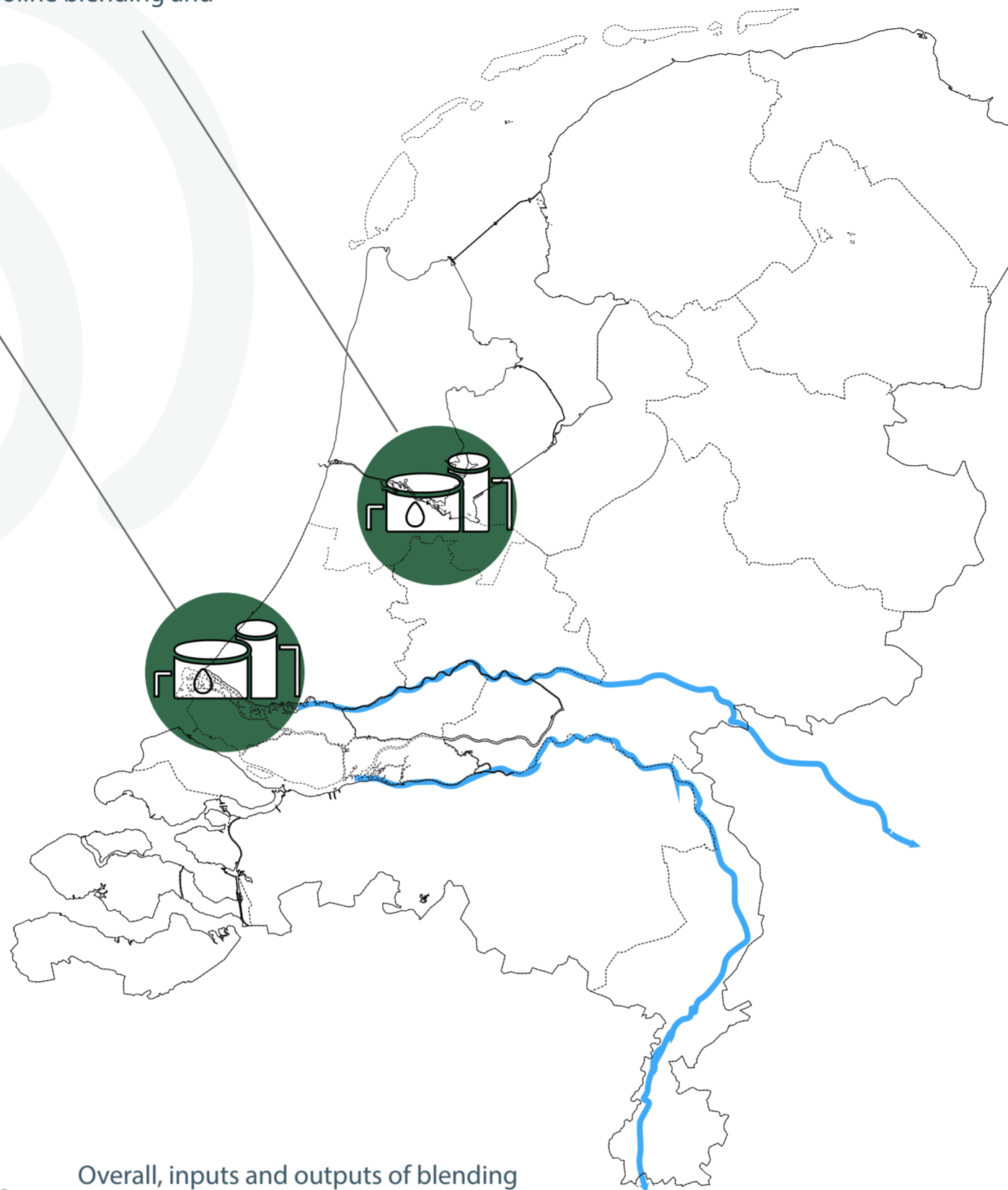
Amsterdam is the world's largest gasoline port, facilitating many gasoline blending and trading activities.

The Port of Rotterdam is a major international blending and trading hub for fuel oil.

Fuel oil blended in Rotterdam is not only used for ships bunkering in this port, it is also exported to other parts of the world.

Gasoline is a complex blend of many different refinery intermediates, non-refinery-sourced blending components and additives.

The blending and trading activities performed in the Amsterdam and Rotterdam hubs, are partly performed by commodity traders that also own refinery and storage assets.



Domestic production of oil products, 62.08

Import of oil products, 83.81

Export of oil products, 105.30

Oil products available for domestic consumption and deliveries, 40.59

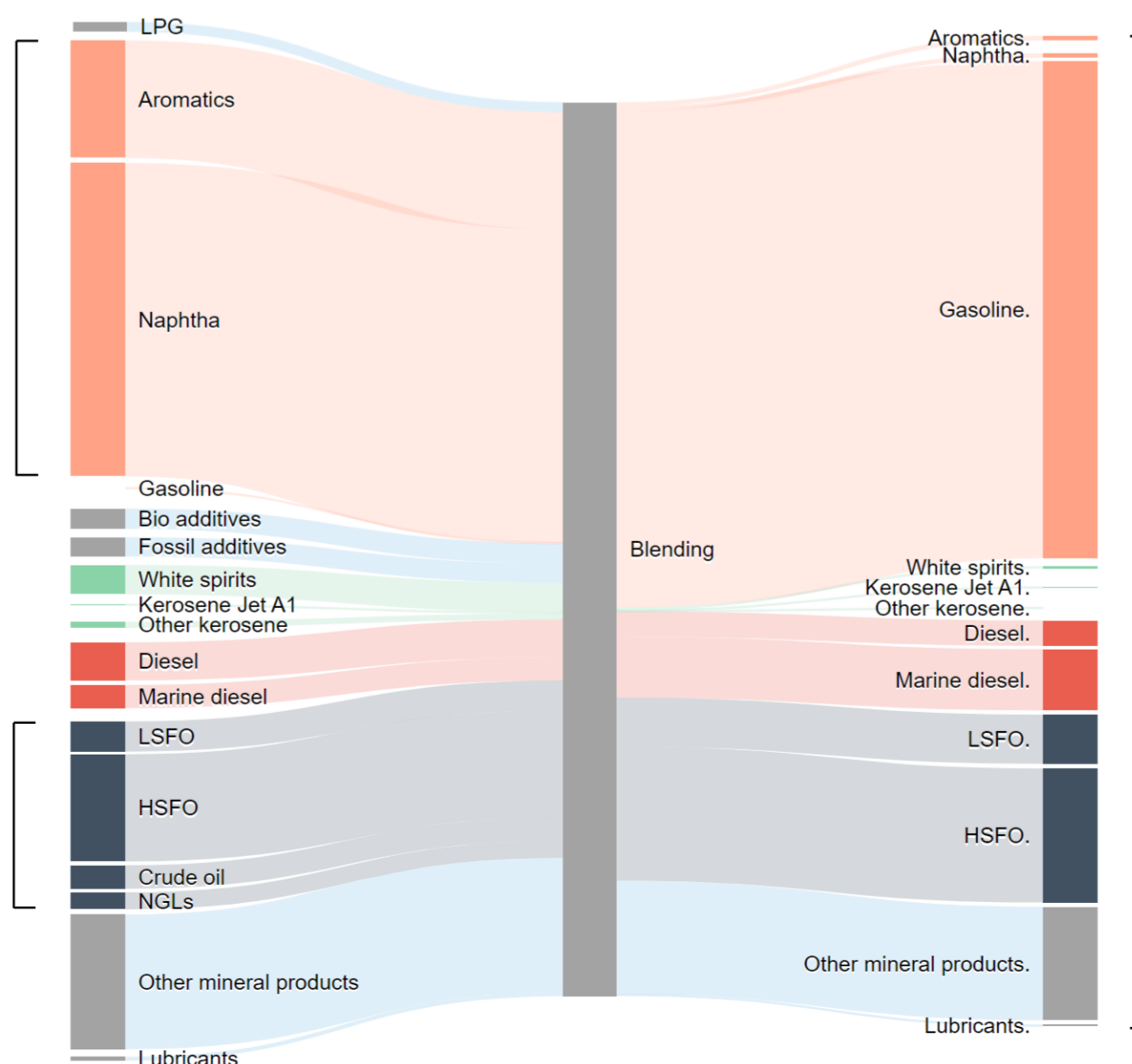
Oil products entering NL in 2019 (Mln tons)

Overall, inputs and outputs of blending activities are equal, as the sector neither produces nor consumes fuel. Instead, it blends components to change the specifications of the products.

Oil products leaving NL in 2019 (Mln tons)

This Sankey shows blending inputs and products:

Large volumes of aromatics and naphtha are blended into the gasoline pool.



Total blending activities in the Netherlands accumulated to 33.75 mln tons in 2019.

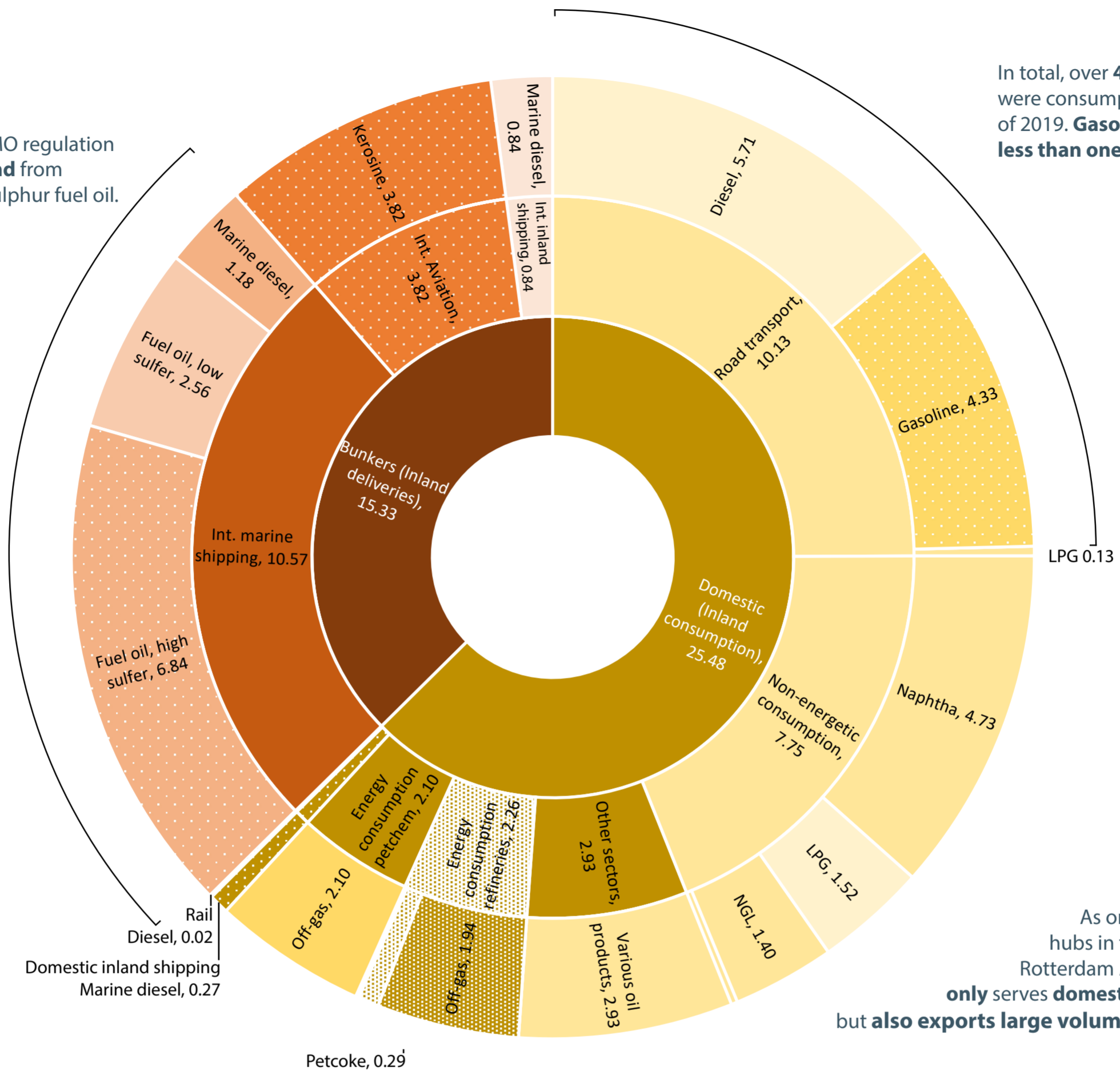
For comparison, domestic refining production in 2019 accumulated to 62 mln tons and the total inland fuel demand (incl. bunkers) sums up to 40,8 mln tons.

There is a net production of (high and low sulfur) fuel oil in the blending subsector.

These fuels are mainly blended with crude oil and natural gas liquids (NGLs).

Distribution of petroleum products to meet a wide range of customer needs

In 2020, implementation of IMO regulation led to a **major shift in demand** from high-sulphur fuel oil to low-sulphur fuel oil.

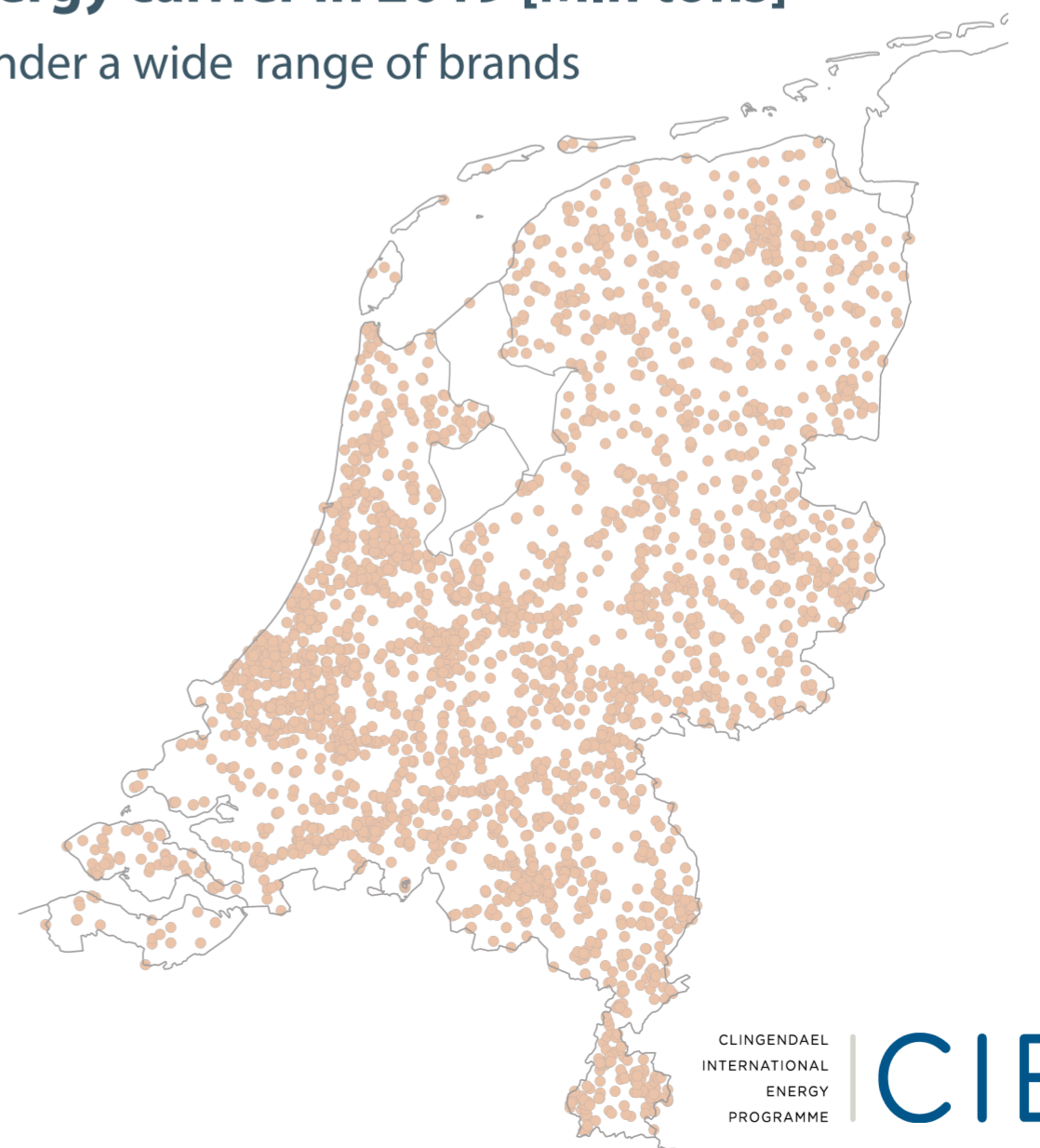
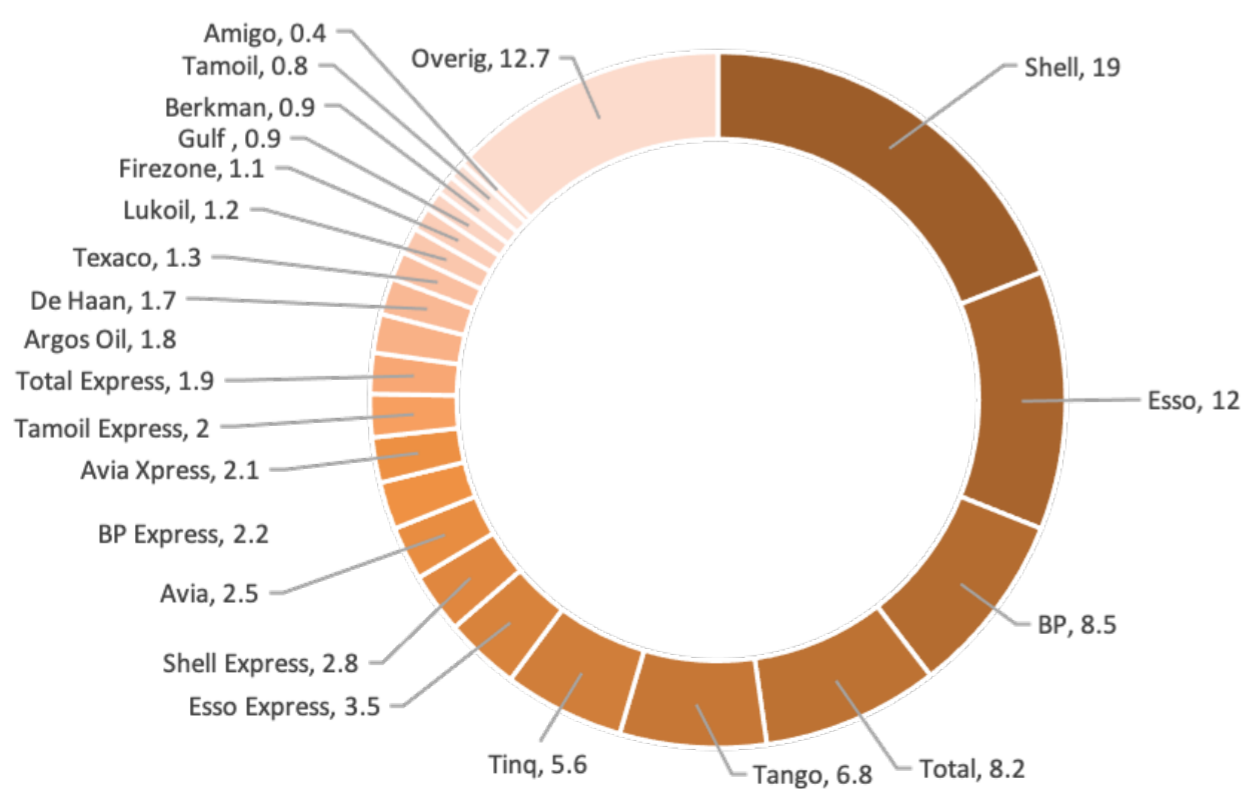


In total, over **40.8 mln tons of oil products** were consumed in the pre-covid year of 2019. **Gasoline and diesel** make up **less than one-fourth**.

As one of the three largest fuel hubs in the world, the Amsterdam Rotterdam Antwerp (ARA) cluster **not only** serves **domestic demand and bunkers**, but **also exports large volumes** of fuel internationally.

Domestic consumption and bunkers per energy carrier in 2019 [Mln tons]

Fuels are sold at more than 4000 locations, under a wide range of brands



Transportation by pipeline systems and waterways, as well as by road and rail, in smaller volumes

In the Netherlands most energy is transported through pipeline systems. Pipelines transported **6647 PJ of crude oil** in 2018. This is **almost twice as much** as the **3380PJ** that is transported through the entire **natural gas system**.

The amount of energy that is transported through pipeline systems for **crude oil** outstrips the amount of energy going through the **Dutch electricity system** (428 PJ) with a **factor 15**.

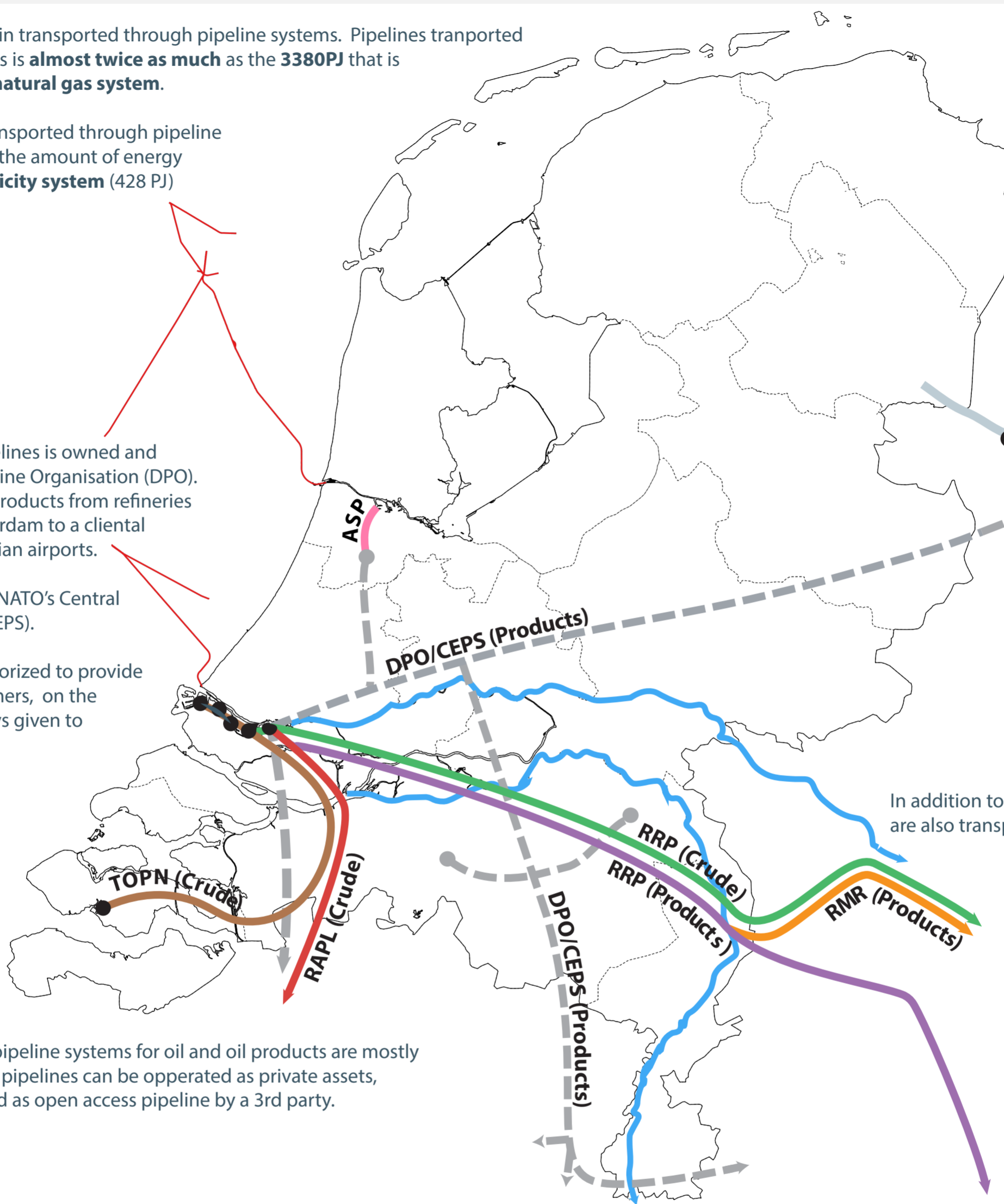
About 550 KM of product pipelines is owned and operated by the Defense Pipeline Organisation (DPO). These pipelines transport oil products from refineries and storage terminals in Rotterdam to a cliental that includes military and civilian airports.

The DPO pipelines are part of NATO's Central European Pipeline Systems (CEPS).

In peacetime, the CEPS is authorized to provide services to commercial customers, on the condition that priority is always given to military requirements.

Not only crude oil is transported through pipelines, pipelines are also used to transport oil products such as gasoline, naphtha, diesel, heating fuel and jet fuel.

The Schoonebeek oil field is directly connected to the Linge refinery, just across the border in Germany.



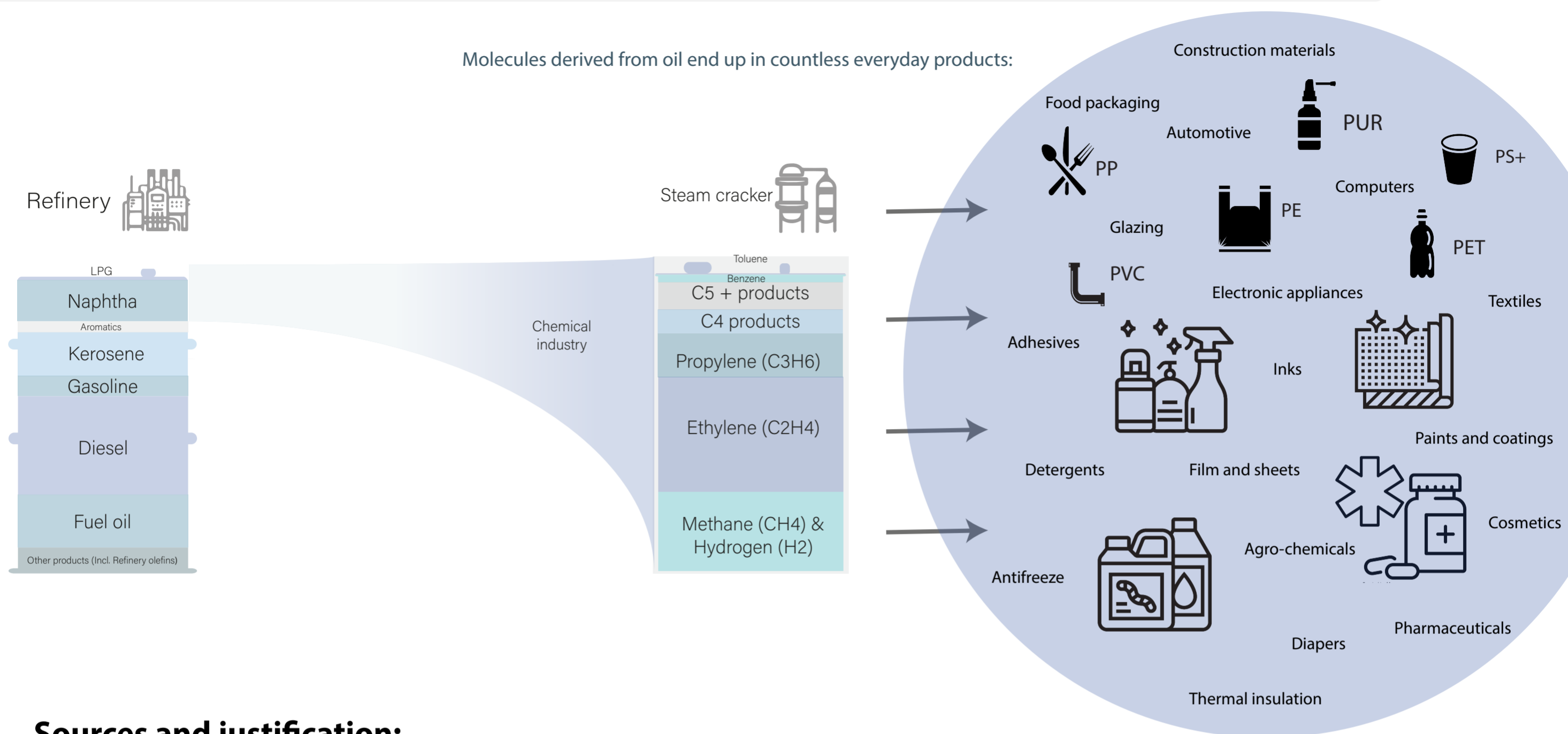
In addition to pipeline systems, oil and oil products are also transported by river barge and trains.

Apart from the DPO pipelines, pipeline systems for oil and oil products are mostly owned by private parties. These pipelines can be operated as private assets, held in joint venture or managed as open access pipeline by a 3rd party.

Pipeline systems:

Abbr. - Name (Product)	Capacity (mln tons/year)	Length (Km)	
RAPL - Rotterdam Antwerp Pipeline (Crude)	30	68.2	● Refinery
TOPN - Zeeland Refinery (Crude)	Undisclosed	138	● Refinery
RRP - Rotterdam Rhine Pipeline (Crude)	22	177	● Refinery
SL - Schoonebeek Lingen (Crude)	Undisclosed	38 Approx.	● Refinery
RRP - Rotterdam Rhine Pipeline (Products)	12	155	● Airport
RMR - Rhein Main Rohrleitung (Products)	34,7	50	● Airport
ASP - Amsterdam Schiphol Pijpleiding (Jet)	Undisclosed	16	● Airport
DPO - Defensie Pijpleiding Organisatie part of	Undisclosed	550	— Offshore pipeline systems
CEPS - Central European Pipeline System (Products)	Undisclosed	5120 Cross border	~ Navigable river

Oil and petroleum product use in many non-energy sectors and in countless product groups



Sources and justification:

Energy flows

Sankey Energy in the Netherlands: COVA based on CBS Statline - 'Energy balance sheet; supply, transformation and consumption'

Final consumption, including bunker deliveries: CIEP analysis based on CBS Statline - 'Crude and petroleum products balance sheet (2019)'

Production

Crude oil entering NL: CIEP analysis based CBS Statline - 'Crude and petroleum products balance sheet (2019)'

Domestic production: CIEP analysis based on Ministry of Economic affairs and climate policy (2020) - Natural resources and geothermal energy in the Netherlands, NLOG Annual review 2019 Table 3.8 'Oil production in 2019' and Table 3.9 '9 Condensate production in 2019'.

Conversion to mln ton based a crude oil density of 853 kg/m³ and condensate density of 611 kg/m³.

Crude oil leaving NL: CIEP analysis based CBS Statline - 'Crude and petroleum products balance sheet (2019)'

Offshore pipelines: CIEP analysis based on Rijkswaterstaat Kabels en leidingen - pijpleidingen op de Noordzee.

Refining

Refining output in 2019: CIEP analysis based CBS Statline - 'Crude and petroleum products balance sheet (2019)'

Refinery capacity: CIEP analysis based on company reports and industry press.

Storage

Storage locations: CIEP analysis based on company reports and industry press.

Estimated storage capacity per category: CIEP data based on company reports and industry press.

Blending

Oil products entering/leaving NL: 'Crude and petroleum products balance sheet (2019)'

Note that numbers are not adjusted for stock mutations and excluding oil product conversion in petrochemical and blending sectors.

Sankey blending: CBS Statline - 'Crude and petroleum products balance sheet (2019)'

Distribution

Domestic consumption and bunkers per energy carrier: CIEP analysis based on CBS Statline - 'Crude and petroleum products balance sheet (2019)'

Market share service station brands: BOVAG (2021)

Note that brands can be used in various ownership structures.

Indication of gas station locations: OpenStreetMap - Tankstations (bèta), Esri Nederland content.

Note that for about 750 gas stations location data is not included.

Infrastructure

Pipeline systems capacity, length and locations: CIEP analysis based on company reports, industry press and expert consultation.

Note that pipeline routes are approximations.

Use

From oil to products: Figure based on CIEP (2021) The Dynamic development of organic chemistry in North-West Europe.

If not explicitly mentioned, the sources cited in this document were consulted on 1 December 2021.

Where appropriate, the year 2019 is used as year of reference as later years are less representative due to the effects of the COVID-19 pandemic.

