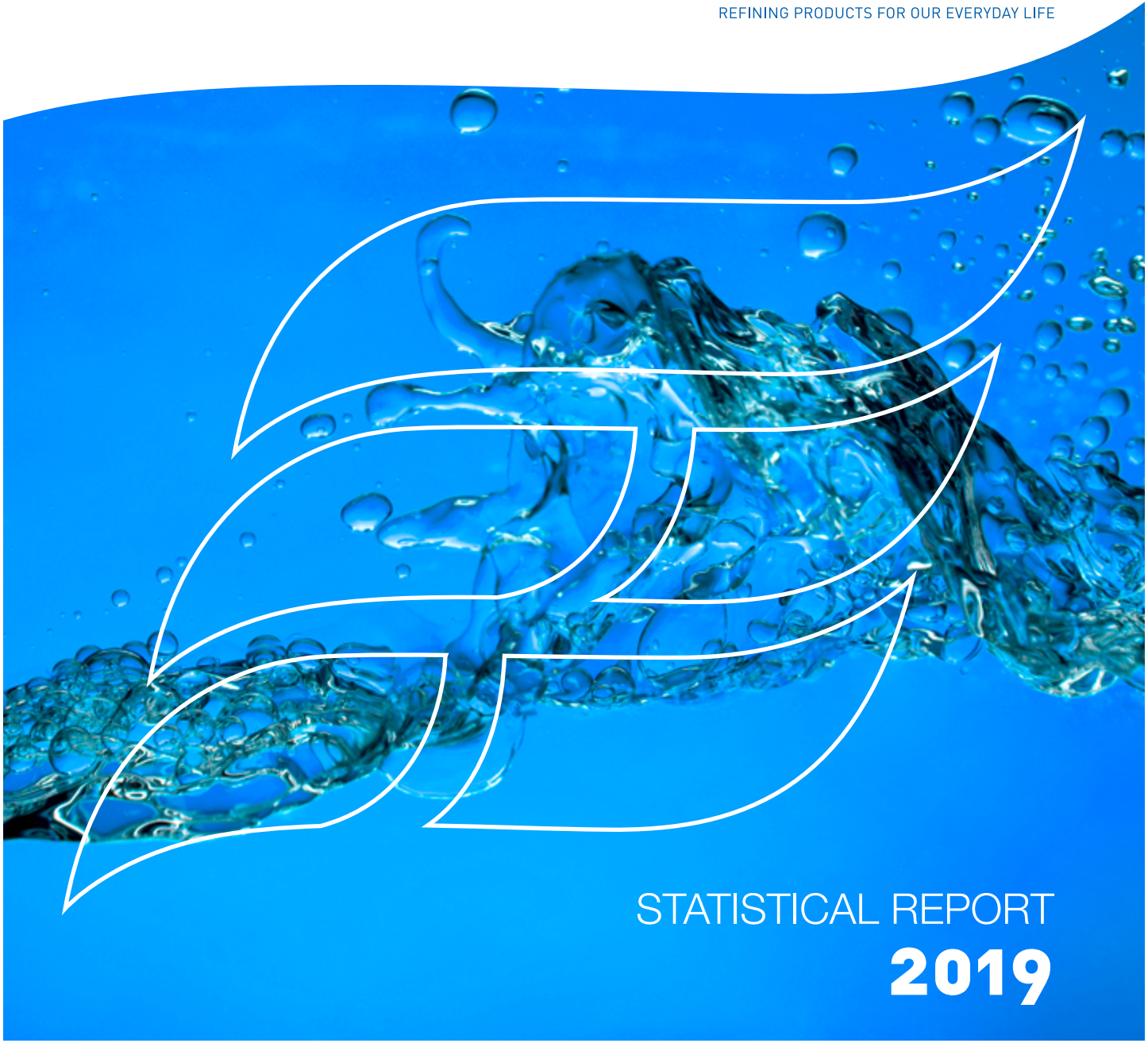
FuelsEurope

REFINING PRODUCTS FOR OUR EVERYDAY LIFE



STATISTICAL REPORT 2019

Editor: John Cooper

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STATISTICAL REPORT
2019

Foreword

High quality, verified and reliable facts and figures are essential to support economic and political analysis. For this purpose, FuelsEurope Statistical Report 2019 aims at providing a comprehensive set of statistics about the refining industry that can be used by all stakeholders.

This 2019 edition contains the most up-to-date information based on currently available data for the sector. One should however note that some of the data is updated every 2 or 4 years.

This includes global energy markets, oil products demand and international trade flows, fuel specifications, prices and margins, the integration with the petrochemical sector as well as the environmental performance of the EU refining industry.

Colour coding aims to help our readers browse effectively through the document. Each colour corresponds to a specific theme making browsing between subsections user-friendly. We hope that you will find this Report useful.

- **Oil & Energy**
- **Refined Oil Products**
- **Prices & Margins**
- **Refining**
- **Emissions**
- **Retail & Marketing Infrastructures**

John Cooper
Director General

FuelsEurope

REFINING PRODUCTS FOR OUR EVERYDAY LIFE

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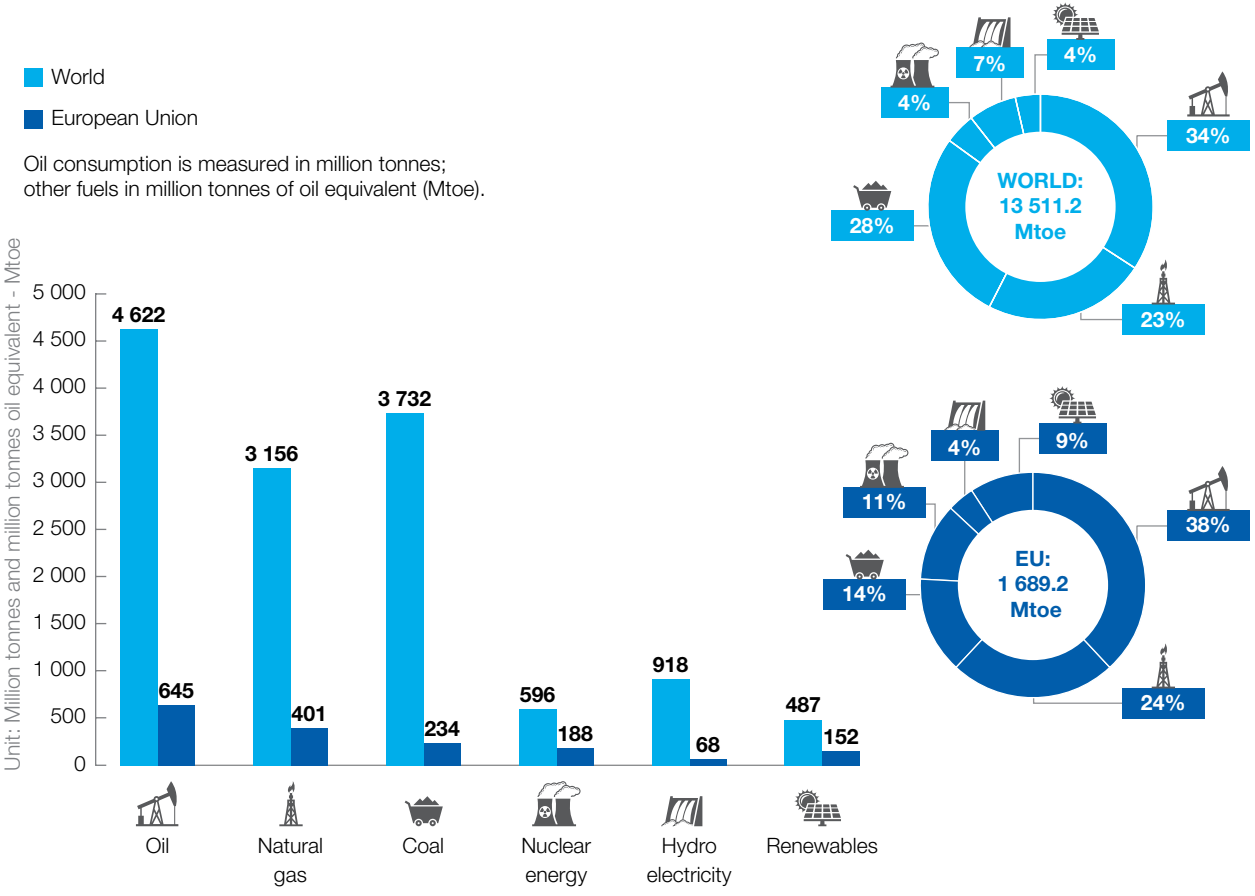
FIG.1 WORLDWIDE ENERGY CONSUMPTION BY FUEL TYPE IN 2017

Source: BP Statistical Review of World Energy 2018



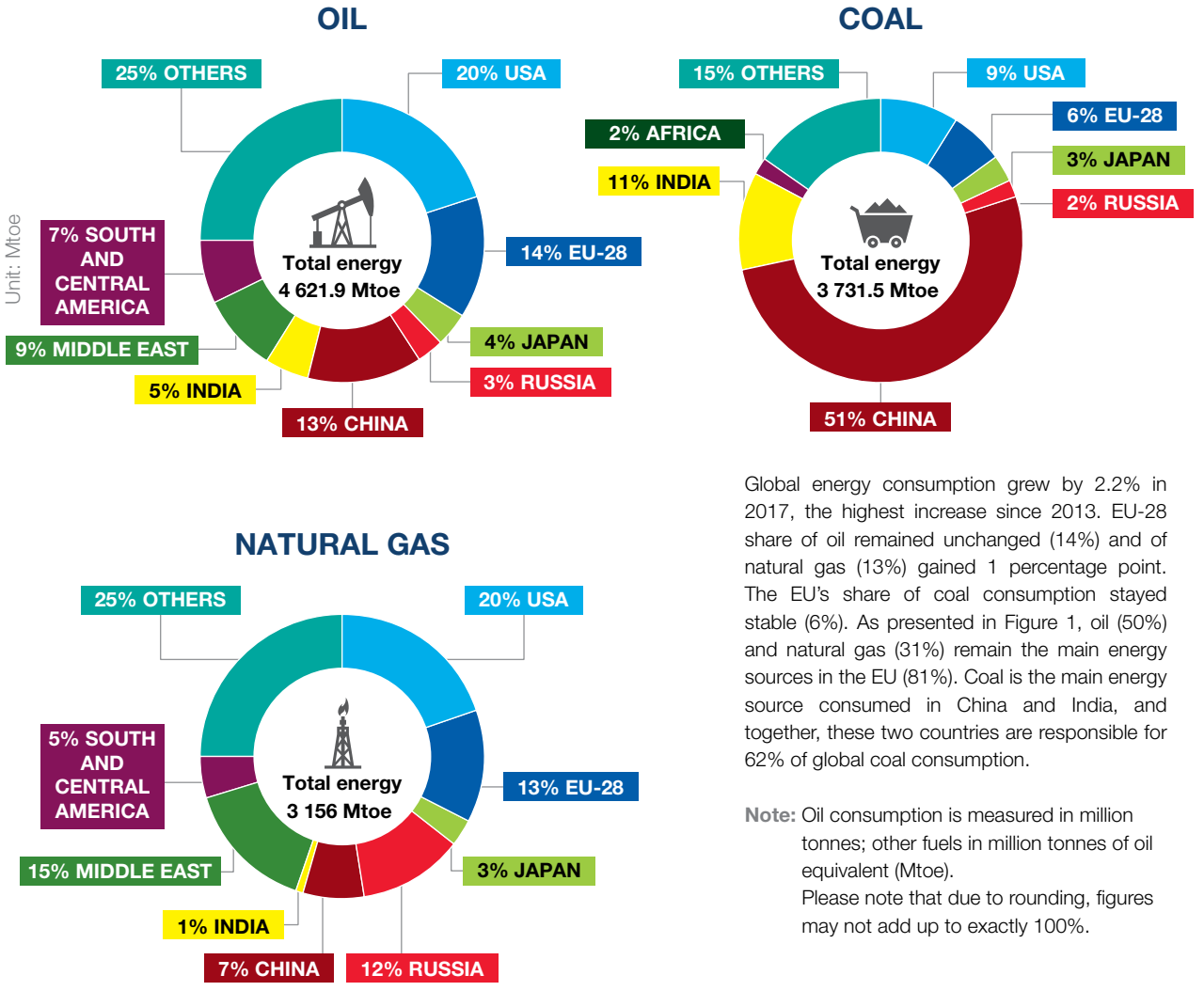
Oil remains the world's dominant fuel, making up just over a third of all energy consumed. In 2017 oil's market share declined slightly, following two years of growth. Coal's market share fell to 28%, the lowest level since 2004.

Natural gas accounted for a record 23% of global primary energy consumption, while renewable power hit a new high of 4%.

Note: Please note that due to rounding, figures may not add up exactly to 100%.

FIG.2 WORLDWIDE ENERGY CONSUMPTION BY REGION IN 2017

Source: BP Statistical Review of World Energy 2018

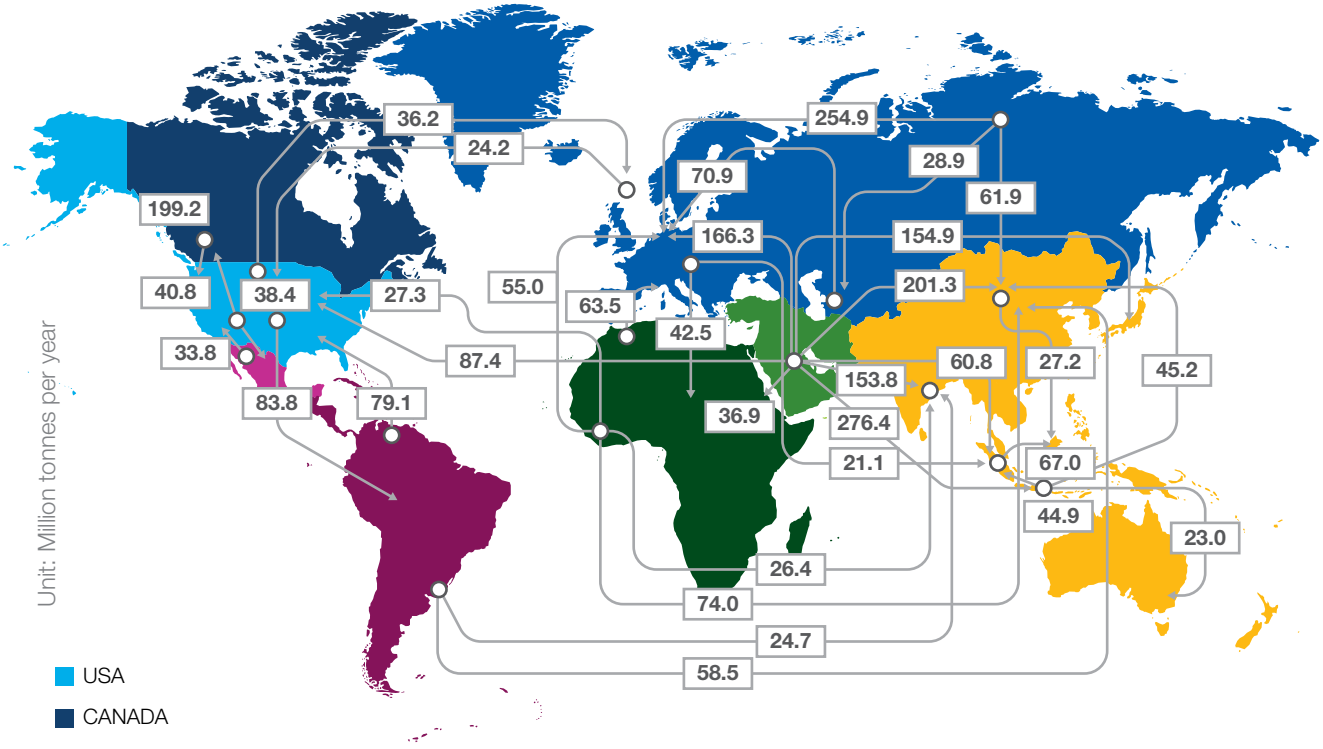


Global energy consumption grew by 2.2% in 2017, the highest increase since 2013. EU-28 share of oil remained unchanged (14%) and of natural gas (13%) gained 1 percentage point. The EU's share of coal consumption stayed stable (6%). As presented in Figure 1, oil (50%) and natural gas (31%) remain the main energy sources in the EU (81%). Coal is the main energy source consumed in China and India, and together, these two countries are responsible for 62% of global coal consumption.

Note: Oil consumption is measured in million tonnes; other fuels in million tonnes of oil equivalent (Mtoe).
Please note that due to rounding, figures may not add up to exactly 100%.

FIG.3 WORLDWIDE CRUDE OIL MOVEMENT IN 2017

Source: BP Statistical Review of World Energy 2018

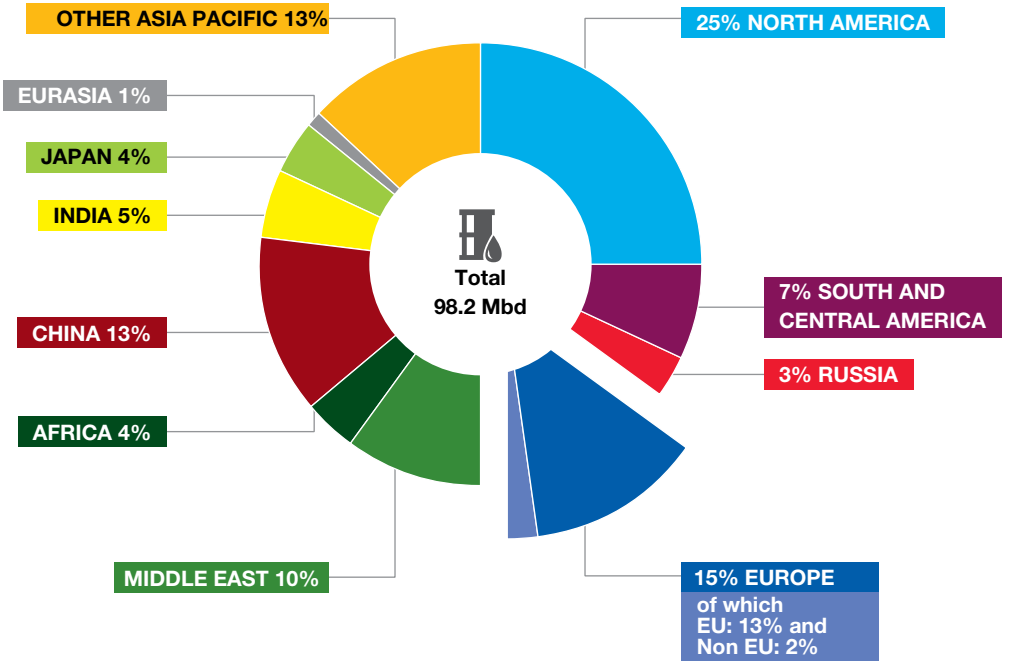


Crude oil is an internationally traded commodity with trade flows taking place all over the world.

There are two open and transparent markets - crude oil and refined products - within which the European refining industry operates.

FIG.4 WORLDWIDE REFINED PRODUCT DEMAND* AVERAGED 98.2 MILLION BARRELS PER DAY IN 2017, WITH EU ACCOUNTING FOR 13%

Source: BP Statistical Review of World Energy 2018

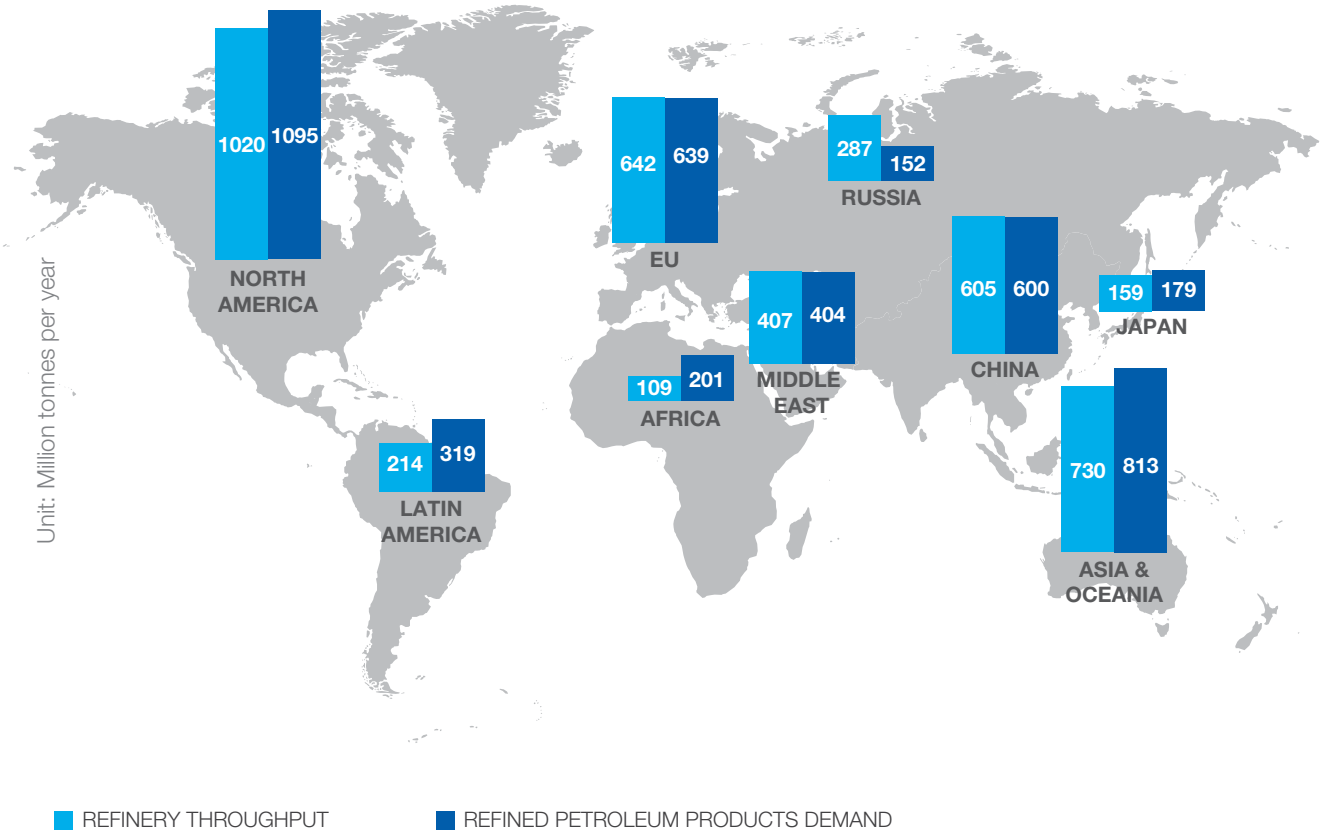


Global demand for oil demand products increased from 96.4 million barrels per day in 2016 to 98.2 in 2017. Although the European market is declining, it still remains the second largest in the world (15%) behind North America. China, Middle East and Africa noted a continued growth in demand for refined products.

*Inland demand plus international aviation and marine bunkers and refinery fuel and loss. Consumption of biogasoline (such as ethanol), biodiesel and derivatives of coal and natural gas are also included.

FIG.5 WORLDWIDE REFINING SUPPLY/MARKET DEMAND BALANCES IN 2018

Source: Wood Mackenzie



The refining supply/market demand balance shows that most of the regions are dependent on imports to meet market demand.

Relatively balanced product demand and refinery throughput in the EU hides a large surplus of EU gasoline production and a significant shortage of diesel and jet production.

Russia has a positive trade balance, which provides it with a key role in supplying the demand from other regions.

FIG.6 EU TOTAL OIL DEMAND AMOUNTED TO 638.5 MILLION TONNES IN 2018

Source: Wood Mackenzie

COUNTRY	Mt/y	COUNTRY	Mt/y
Austria	12.9	Italy	62.0
Belgium	32.3	Latvia	2.0
Bulgaria	4.2	Lithuania	3.0
Croatia	3.3	Luxembourg	2.9
Cyprus	2.5	Malta	2.5
Czechia	9.8	Netherlands	45.3
Denmark	7.5	Poland	32.3
Estonia	1.4	Portugal	11.7
Finland	10.2	Romania	9.9
France	79.2	Slovakia	4.2
Germany	113.5	Slovenia	2.6
Greece	15.3	Spain	64.6
Hungary	8.1	Sweden	14.4
Ireland	7.5	United Kingdom	73.2
EU TOTAL	**638.5**		
Norway	9.3		
Switzerland	10.3		
Turkey	50.3		
TOTAL NO + CH + TR	**69.9**		
TOTAL	**708.4**		

EU NON EU

Unit: Million tonnes per year

EU-28 total oil demand amounted to 638.5 Mt in 2018, representing a slight increase of approximatively 1.3% compared to 2017.

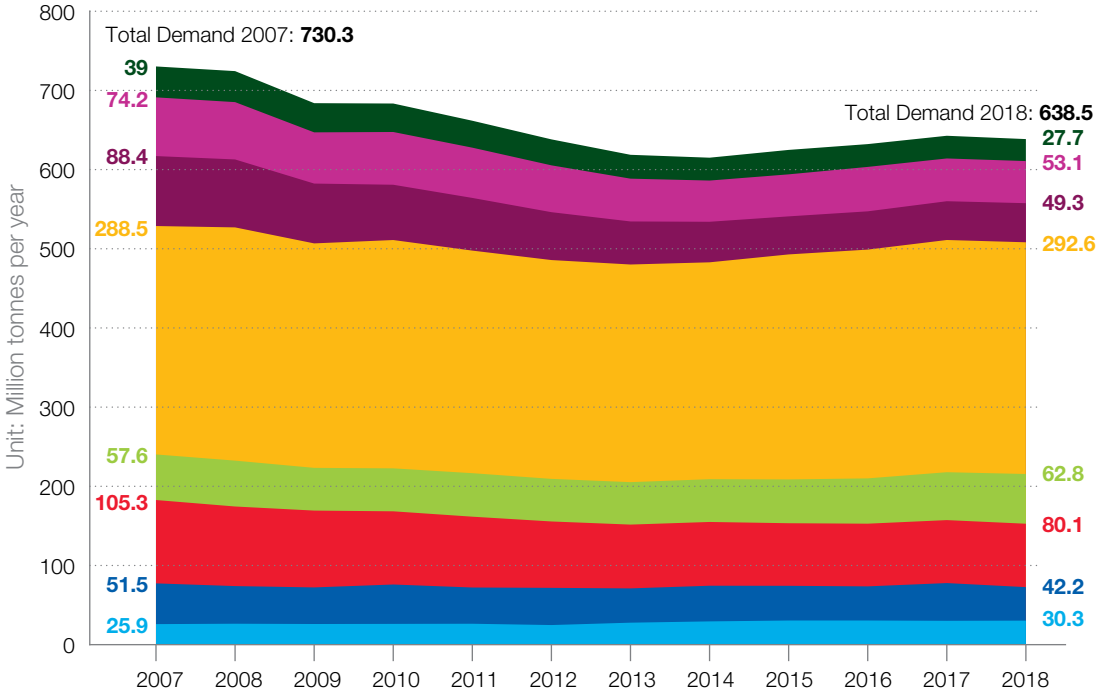
Most EU Member States recorded an increase in oil demand. Poland, Lithuania and Latvia with respectively 16.8%, 14.2% and 11.5%, show the biggest increase.

Among EU Member States that recorded the biggest fall in the oil demand were the Netherlands (-5.17%), Czechia (-3.9%) and Germany (-3.5%).

Note: Please note that due to rounding, figures may not add up.

FIG.7 HISTORICAL DEMAND FOR OIL PRODUCTS IN THE EU IN 2018

Source: Wood Mackenzie

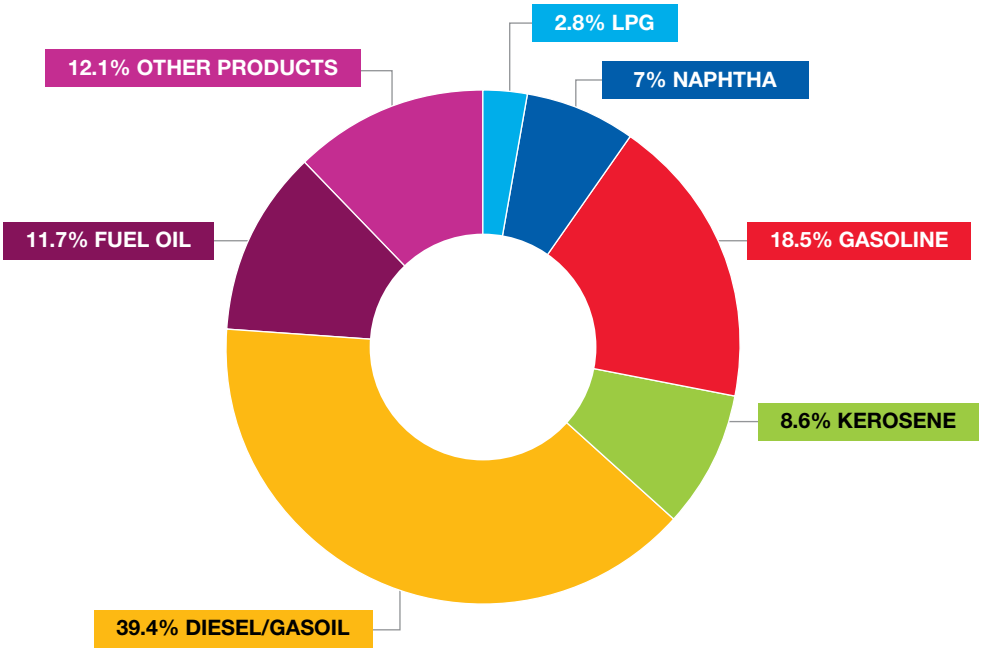


Since 2008, we can observe a downward trend for oil products demand in the EU. Over the past 8 years, overall demand declined by around 12.5%. The downward trend is mainly driven by the decrease in fuel oil and gasoline demand, whilst diesel/gasoil and kerosene demand decreased only marginally.

- LPG
- NAPHTA
- GASOLINE
- JET/KEROSENE
- DIESEL/GASOIL
- FUEL OIL
- OTHER PRODUCTS
- REFINERY FUEL & LOSS

FIG.8 AVERAGE REFINERY OUTPUT BY PRODUCT TYPE IN OECD EUROPE IN 2018

Source: OECD and IEA

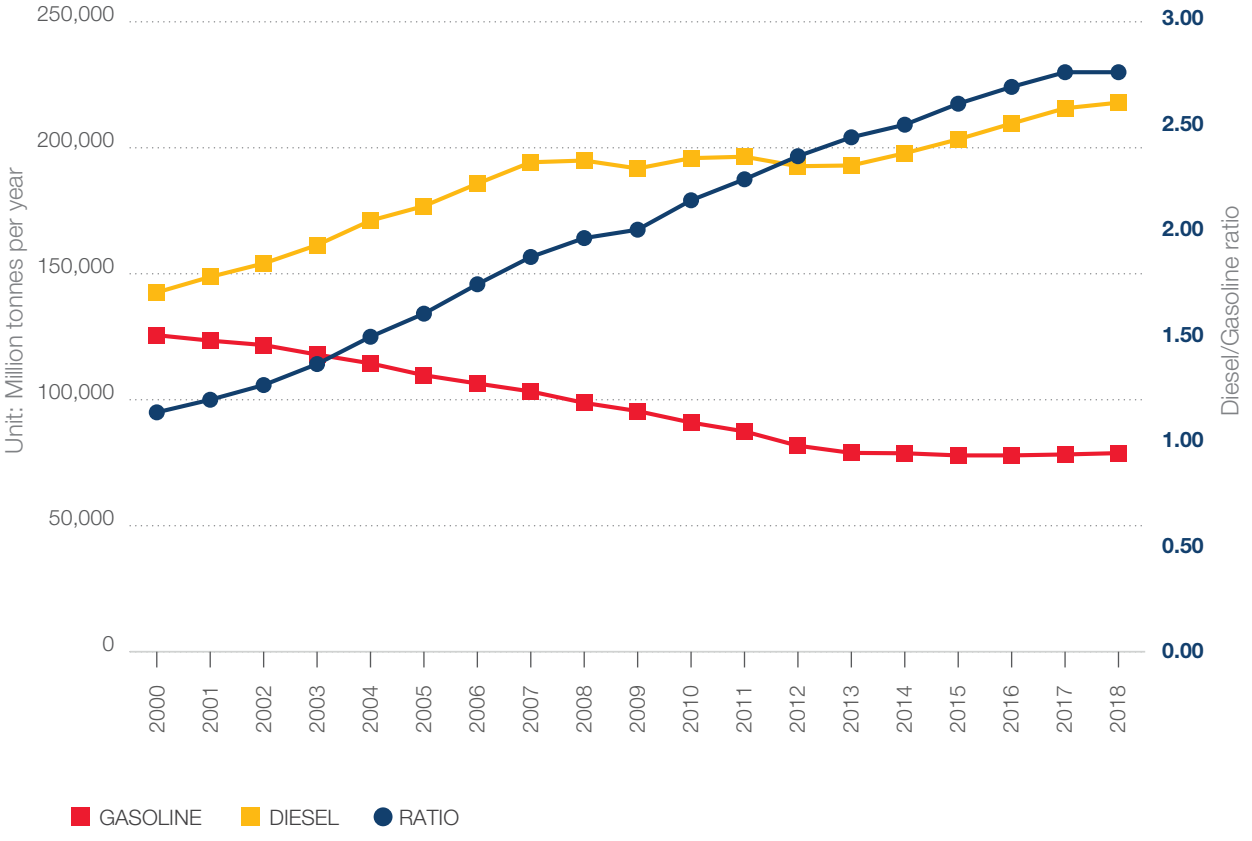


A wide range of products, from transportation and industrial fuels to chemical feedstock, are produced from crude oil. EU refineries also produce many specialty products, such as bitumen for road construction and roofing, lubricants for transport and industry, petroleum coke for the metal industry as well as waxes, solvents and other specialised products. Fuels for transport represent the biggest share of the production.

Note: Please note that due to rounding, figures may not add up.

FIG.9 ROAD FUEL DEMAND IN THE EU IN 2018

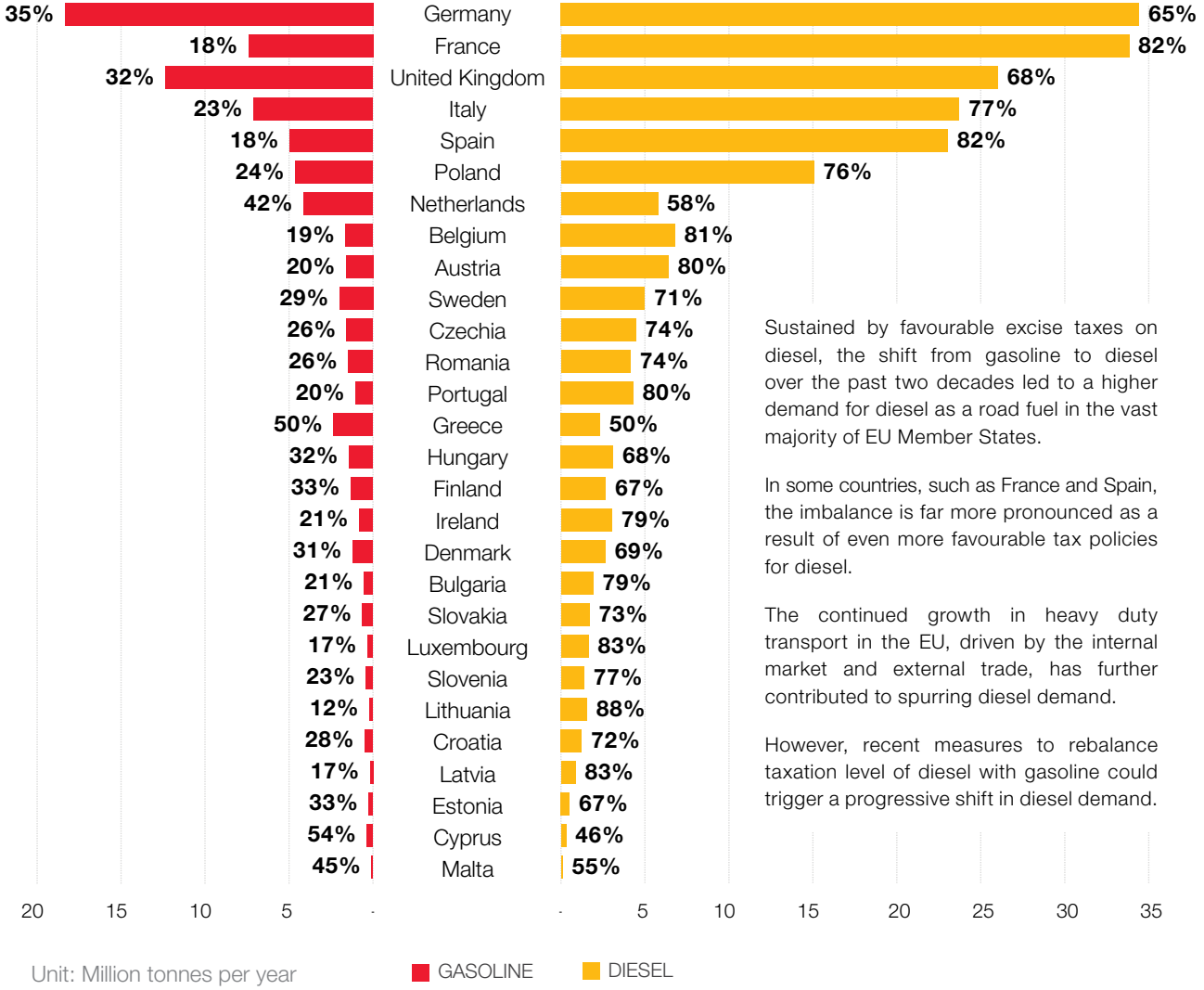
Source: Wood Mackenzie



The tax-incentivised dieselisation trend has significantly contributed to a fundamental change in the EU's road fuel demand structure. The shift from gasoline to diesel began some 25 years ago and led to a major demand decline for gasoline as well as a shortage of diesel production in the EU. However, since 2017 this trend is slowly reversing. Demand for diesel in the EU has deteriorated while gasoline continues to improve.

FIG.10 ROAD FUEL DEMAND IN THE EU BY COUNTRY IN 2018

Source: Wood Mackenzie



Sustained by favourable excise taxes on diesel, the shift from gasoline to diesel over the past two decades led to a higher demand for diesel as a road fuel in the vast majority of EU Member States.

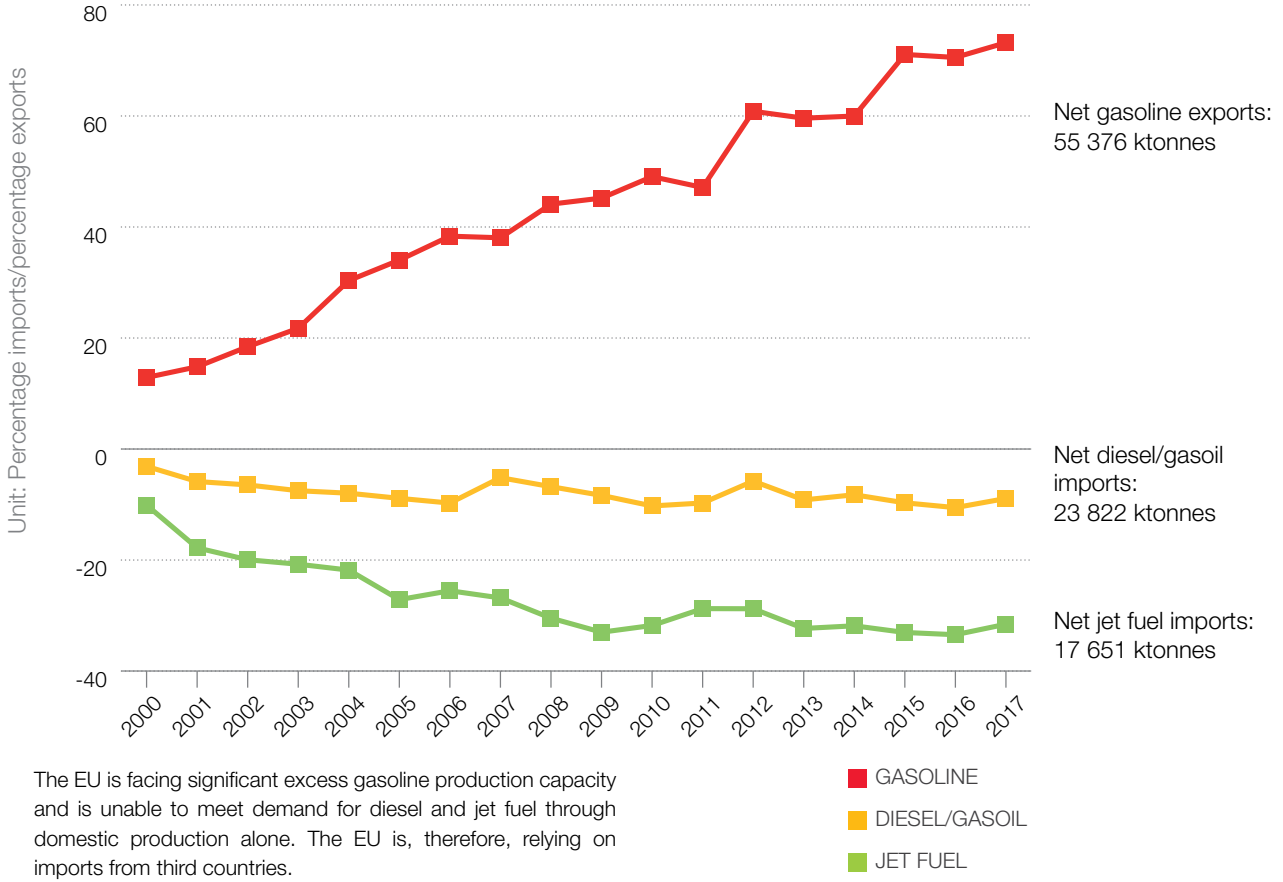
In some countries, such as France and Spain, the imbalance is far more pronounced as a result of even more favourable tax policies for diesel.

The continued growth in heavy duty transport in the EU, driven by the internal market and external trade, has further contributed to spurring diesel demand.

However, recent measures to rebalance taxation level of diesel with gasoline could trigger a progressive shift in diesel demand.

FIG.11 NET TRADE FLOWS FOR REFINED PRODUCTS DEMONSTRATE THE TREND OF GROWING GASOLINE SURPLUS AND DIESEL / GASOIL / JET FUEL DEFICITS

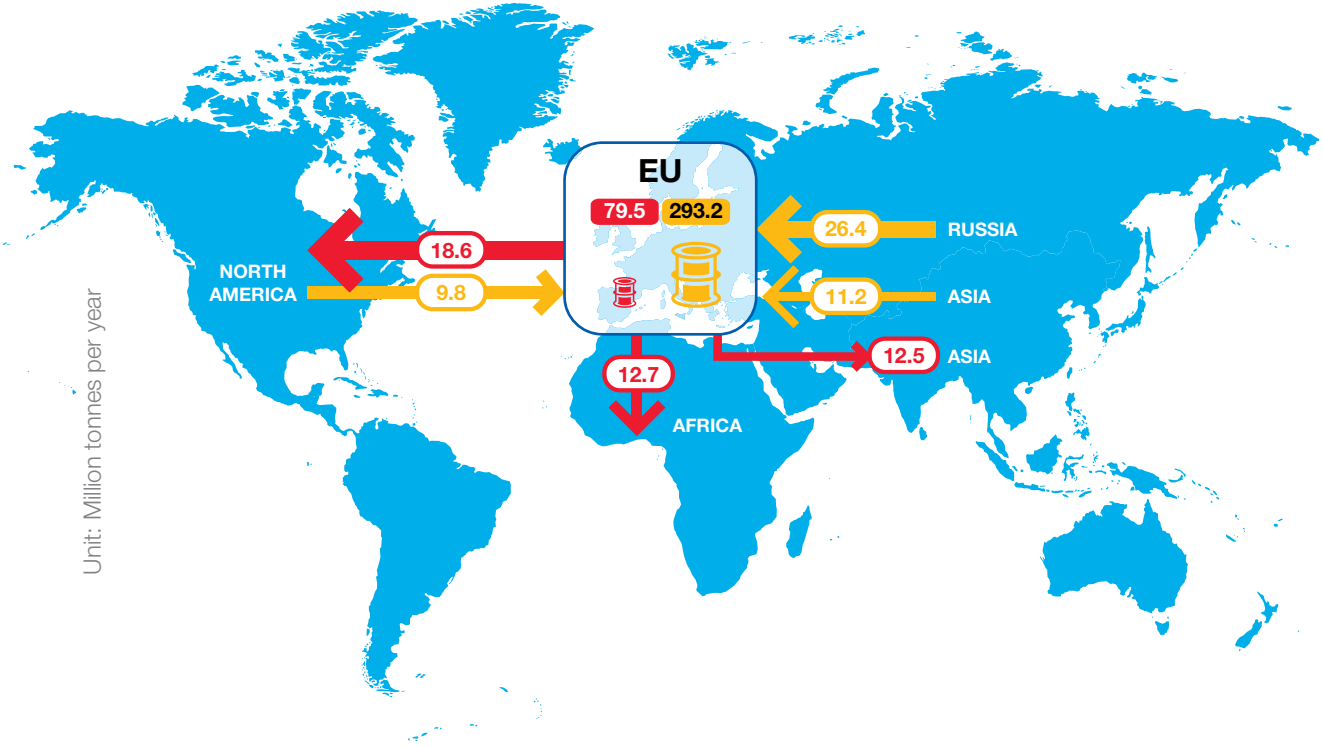
Source: Eurostat



The EU is facing significant excess gasoline production capacity and is unable to meet demand for diesel and jet fuel through domestic production alone. The EU is, therefore, relying on imports from third countries.

FIG.12 MAJOR GASOLINE AND DIESEL/GASOIL TRADE FLOWS TO AND FROM THE EU IN 2017

Source: Eurostat



The major trade flows to and from the EU reflect the imbalance in gasoline/diesel demand in Europe. As a consequence, significant excess gasoline production capacity needs to be exported, whilst Europe became heavily reliant on imports from third countries/regions - especially Russia, the Middle East and the USA to meet regional demand for diesel and jet fuel.

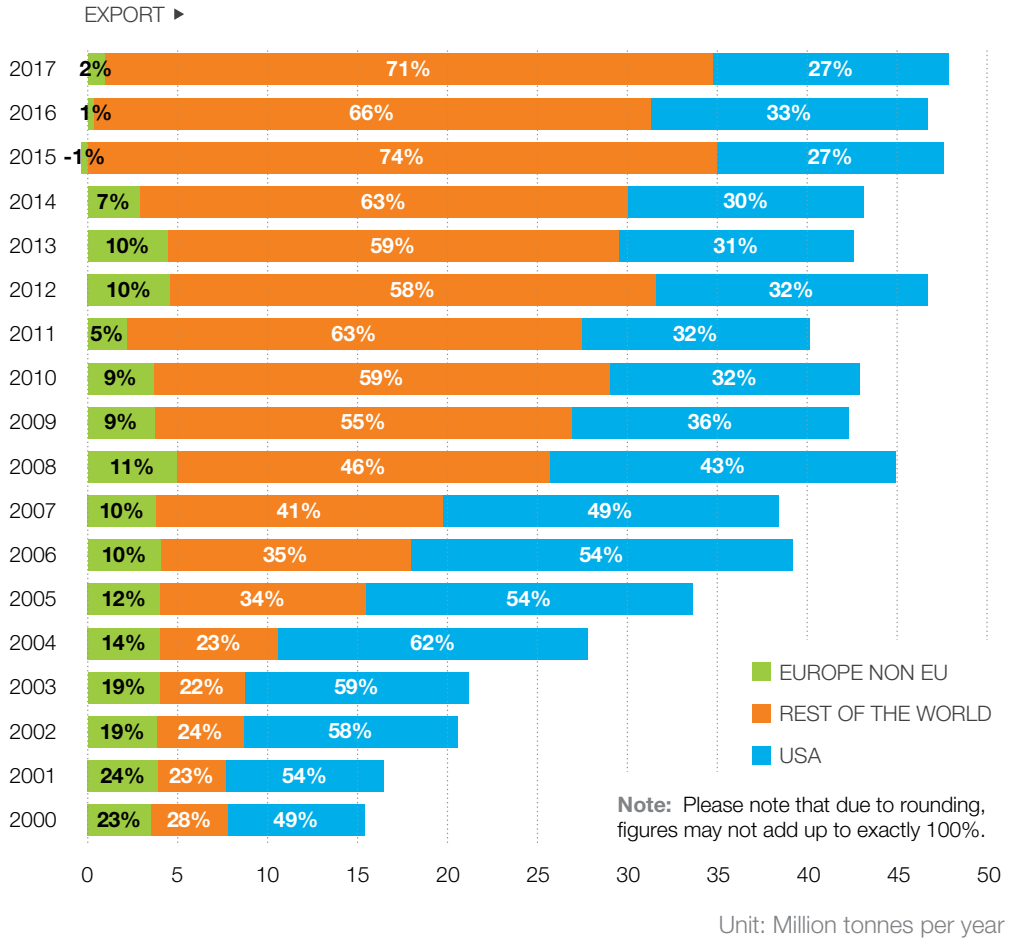
North America was the traditional export market for gasoline surpluses in Europe, but the recent shale oil revolution and cheap energy enabled US refiners to increase their supplies for their internal market and compete on other export markets with EU refiners.

- GASOLINE DEMAND IN 2017
- DIESEL/GASOIL DEMAND IN 2017
- MAIN GASOLINE TRADE FLOWS IN 2017
- MAIN DIESEL/GASOIL TRADE FLOWS IN 2017

FIG.13 EU GASOLINE TRADING BALANCE

USA REMAINS AN IMPORTANT EXPORT MARKET FOR THE EU

Source: Eurostat

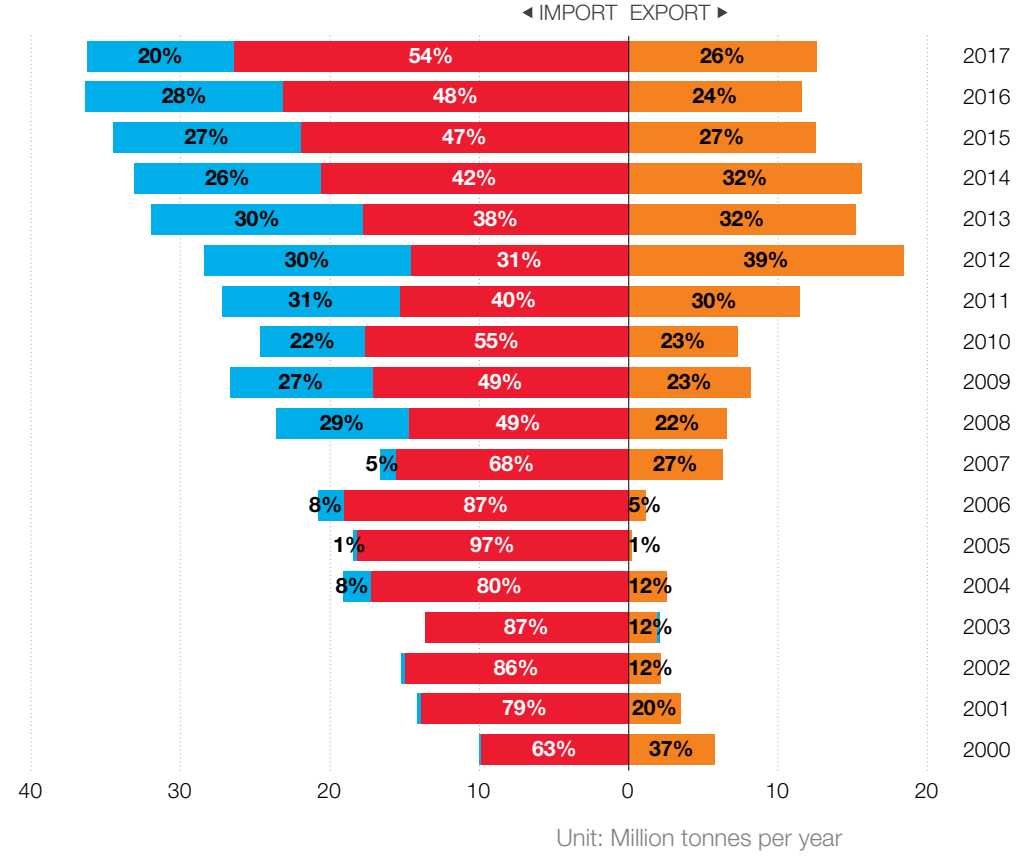


The US was the traditional export market for the structural EU gasoline surplus. The shale oil boom has decreased export opportunities to the US and forced EU refiners to find other markets, primarily in Africa and Asia. The EU gasoline surplus in 2017 remained high. North America and Asia were the two key export markets for the EU.

FIG.14 EU DIESEL/GASOIL TRADING BALANCE

RUSSIA IS A LEADING EXPORTER OF GASOIL TO THE EU

Source: Eurostat



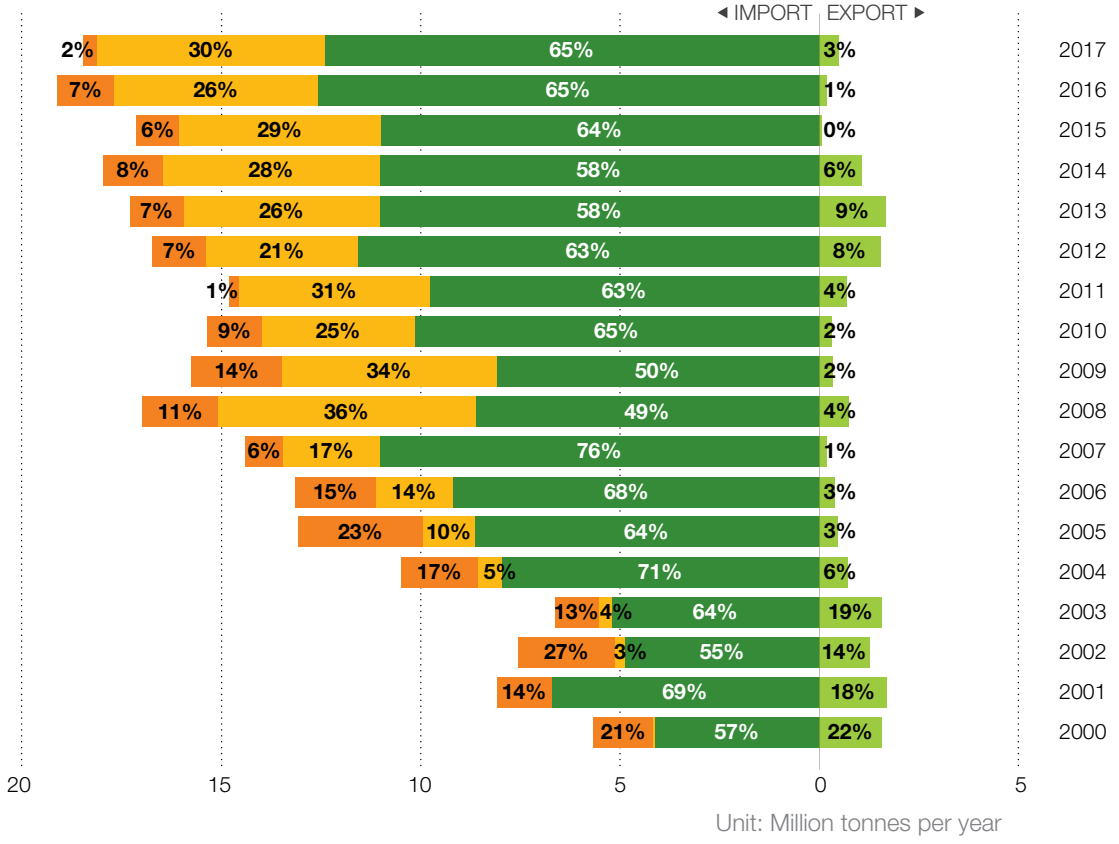
After a significant increase of gasoil imports from the US between 2008 and 2013, Russia recovered some of the lost shares in 2014-2017 to remain the leading gasoil exporter to the EU. This continued dependence of the EU on imports of gasoil is the result of the diesel/gasoline imbalance it has been facing for many years.

Note: Please note that due to rounding, figures may not add up exactly to 100%.

FIG.15 EU JET FUEL TRADING BALANCE

MIDDLE EAST REMAINS MAIN JET FUEL SUPPLIER FOR THE EU

Source: Eurostat



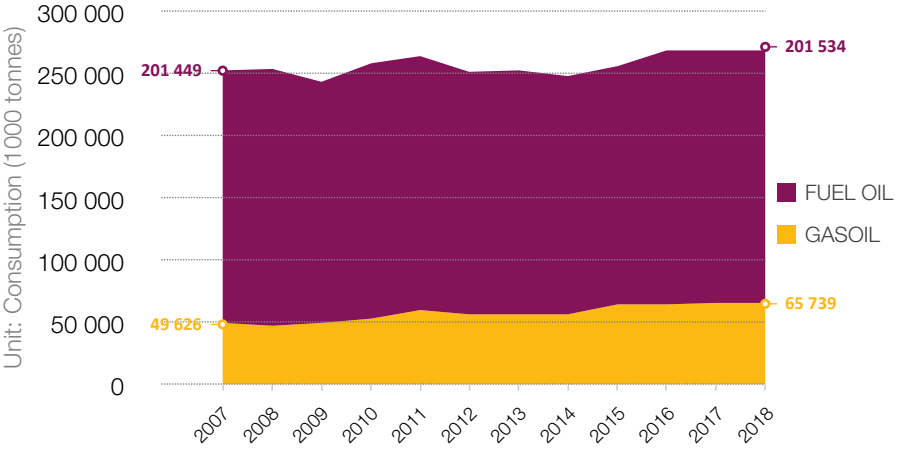
REST OF THE WORLD
ASIA PACIFIC
MIDDLE EAST
EUROPE NON EU

There is a substantial EU dependence on jet fuel imports originating mainly from the Middle East and to a lesser extent from Asia Pacific.

Note: Please note that due to rounding, figures may not add up exactly to 100%.

FIG.16a GLOBAL MARINE FUEL CONSUMPTION

Source: Wood Mackenzie

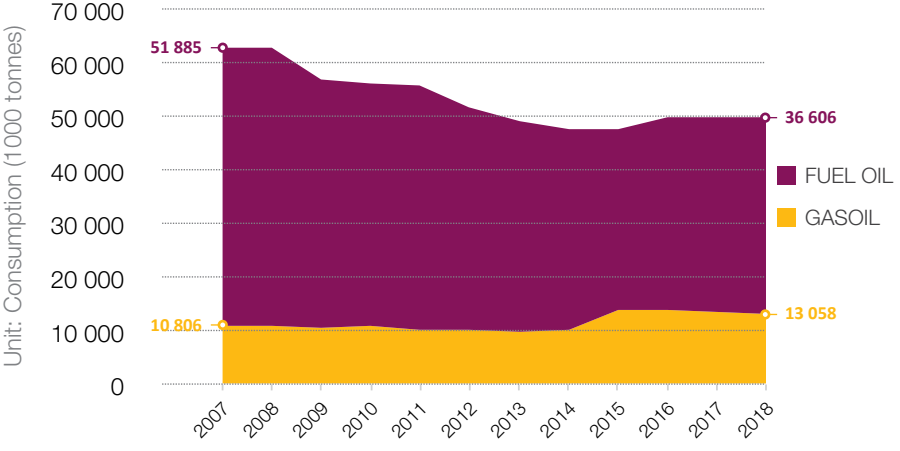


The global demand for marine fuel is mainly met by fuel oil (75.5%). Gasoil only represents 24.5% of the market.

The new limits for sulphur content of marine fuels drastically change the market with a massive demand for low sulphur distillates, which required major refinery investments.

FIG.16b MARINE FUEL CONSUMPTION IN THE EU

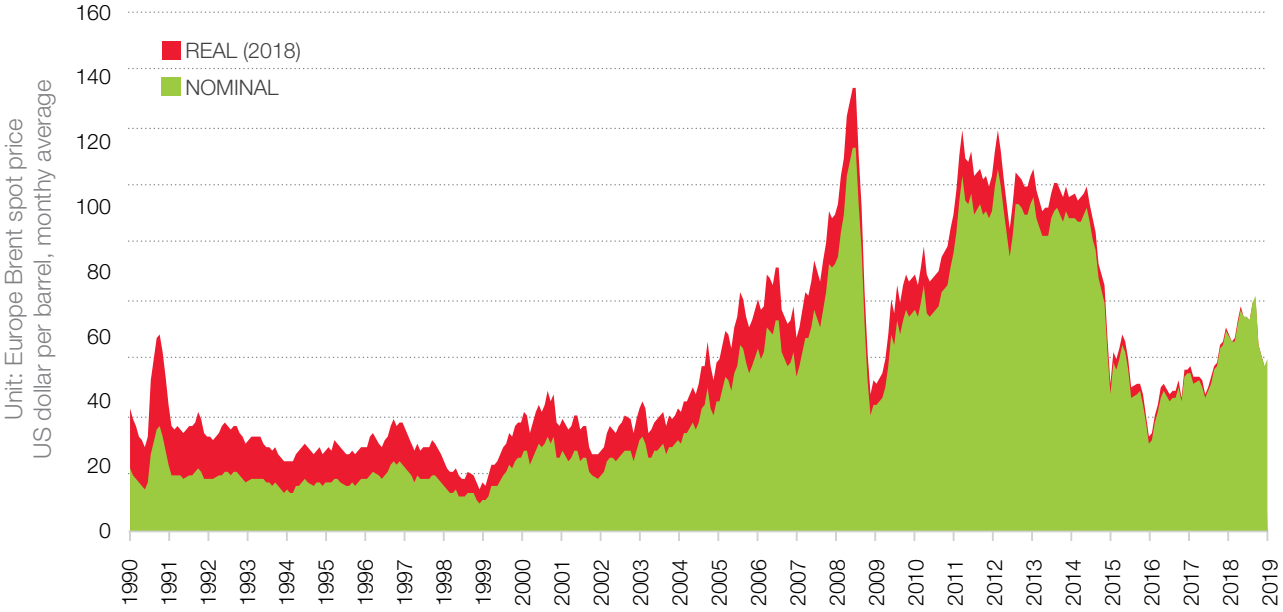
Source: Wood Mackenzie



During the past years, the EU recorded a rise in marine gasoil consumption at the expense of fuel oil. The alternatives to meeting the new International Maritime Organisation (IMO) emissions limits are a switch to LNG or using scrubbers.

FIG.17 CRUDE OIL PRICE EVOLUTION

Source: Energy Information Administration

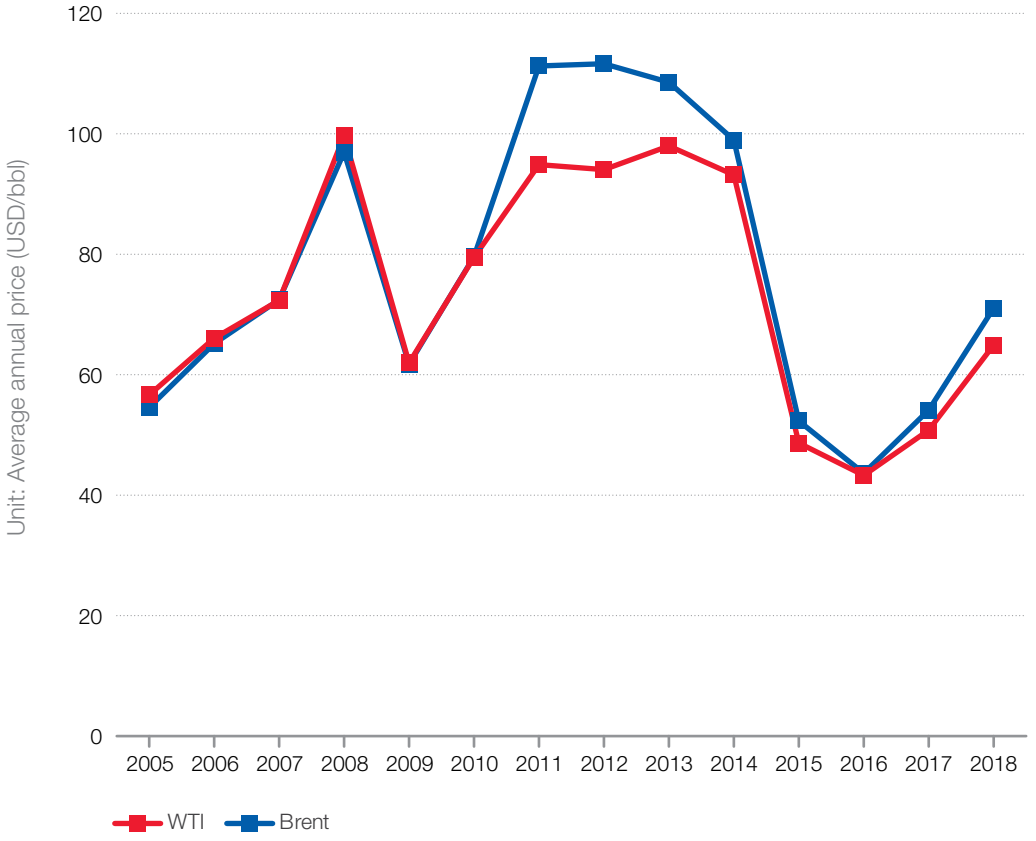


The EU Refining industry operates between two global, open and transparent markets: the market for crude oil and the market for refined products. The main benchmarks are priced in dollars. The price of crude oil is set on international spot markets and reported by designated agencies. It is an important marker for the global economy and is closely watched by businesses and policy-makers.

After a decade of relatively low prices, oil started rising, leading to peaks just before the financial crisis in 2008. In March 2016, oil prices fell sharply reaching closing prices below 40$. Prices started to rise again in 2017 to reach 80$ in October 2018.

FIG.18 BRENT VS WTI

Source: Energy Information Administration

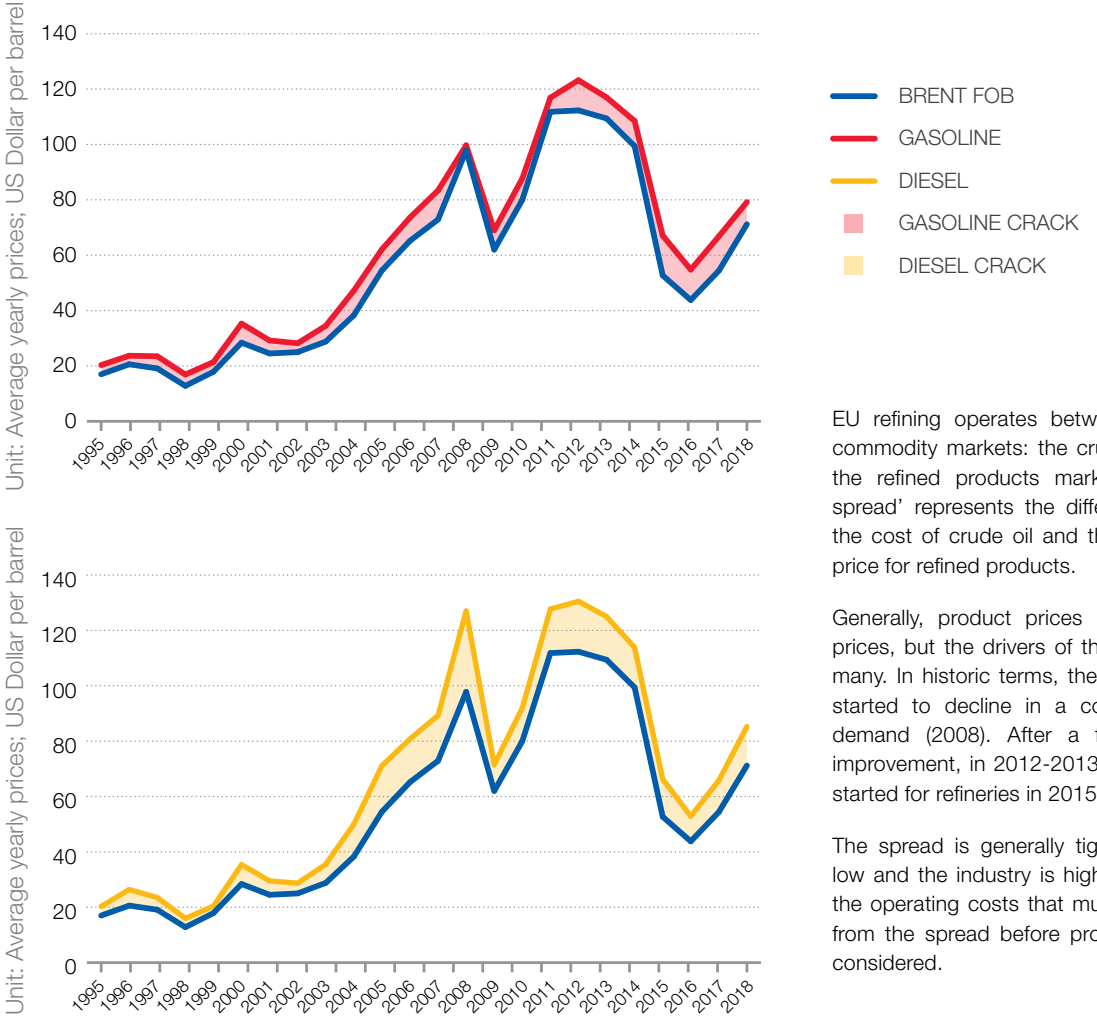


Brent and West Texas Intermediate (WTI) are two of the main crude oil benchmarks. Historically, these crudes, of similar quality, have traded at similar prices. Recent years saw Brent trade at a premium to WTI, meaning EU refiners generally faced higher costs, though this differential decreased last year.

The lifting of the US crude oil export ban is one of the reasons that led to the narrowing of the spread between North Sea Brent and U.S. West Texas Intermediate.

FIG.19 **REFINERS OPERATE BETWEEN TWO GLOBAL COMMODITY MARKETS:** CRUDE MARKET AND REFINED PRODUCTS MARKET

Source: Wood Mackenzie and Argus Media



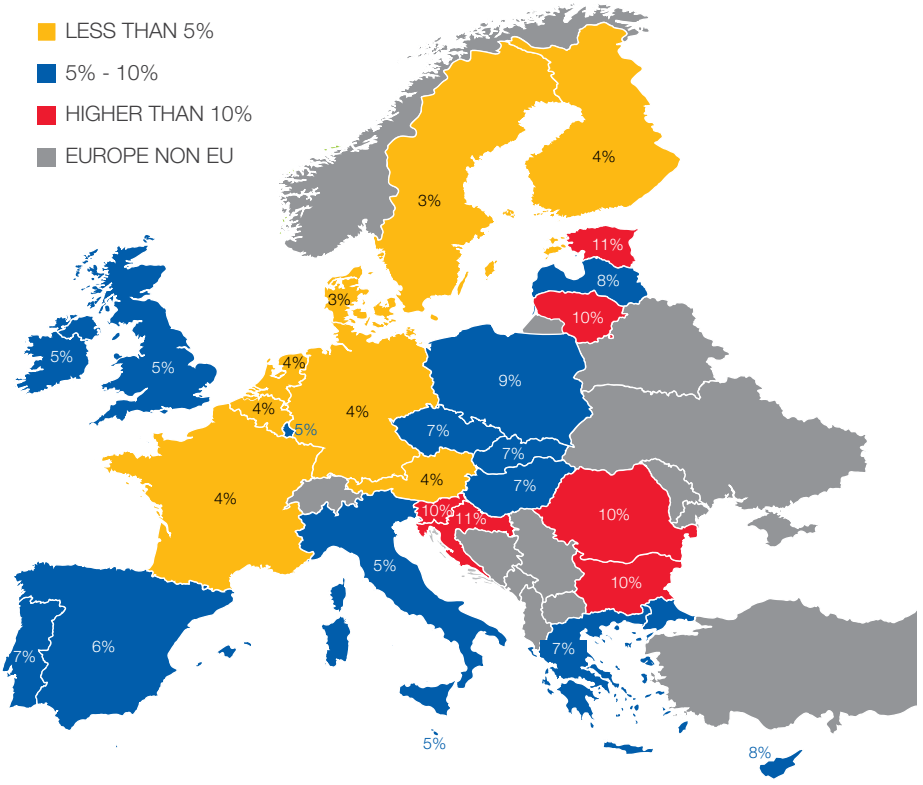
EU refining operates between two global commodity markets: the crude market and the refined products market. The 'crack spread' represents the difference between the cost of crude oil and the market sales price for refined products.

Generally, product prices rise with crude prices, but the drivers of the difference are many. In historic terms, the profitability has started to decline in a context of falling demand (2008). After a first, yet small, improvement, in 2012-2013 a better period started for refineries in 2015-2018.

The spread is generally tight, margins are low and the industry is highly vulnerable to the operating costs that must be deducted from the spread before profitability can be considered.

FIG.20 FUEL TAXES MAKE A SIGNIFICANT CONTRIBUTION TO MEMBER STATE NATIONAL INCOME

Source: Eurostat, Wood Mackenzie and European Commission



COUNTRY		SHARE
EE	Estonia	11%
HR	Croatia	11%
BG	Bulgaria	10%
LT	Lithuania	10%
RO	Romania	10%
SI	Slovenia	10%
PL	Poland	9%
CY	Cyprus	8%
LV	Latvia	8%
CZ	Czechia	7%
EL	Greece	7%
HU	Hungary	7%
PT	Portugal	7%
SK	Slovakia	7%
ES	Spain	6%
IE	Ireland	5%
IT	Italy	5%
LU	Luxembourg	5%
MT	Malta	5%
UK	UK	5%
AT	Austria	4%
BE	Belgium	4%
DE	Germany	4%
FI	Finland	4%
FR	France	4%
NL	Netherlands	4%
DK	Denmark	3%
SE	Sweden	3%

Taxes on fuels contribute on average to some 7% of Member State tax revenue. This significant contribution has to be put in perspective with the subsidies given to many competing alternatives to oil. This shows that replacing petroleum products by these alternatives would have significant consequences for Member States' income.

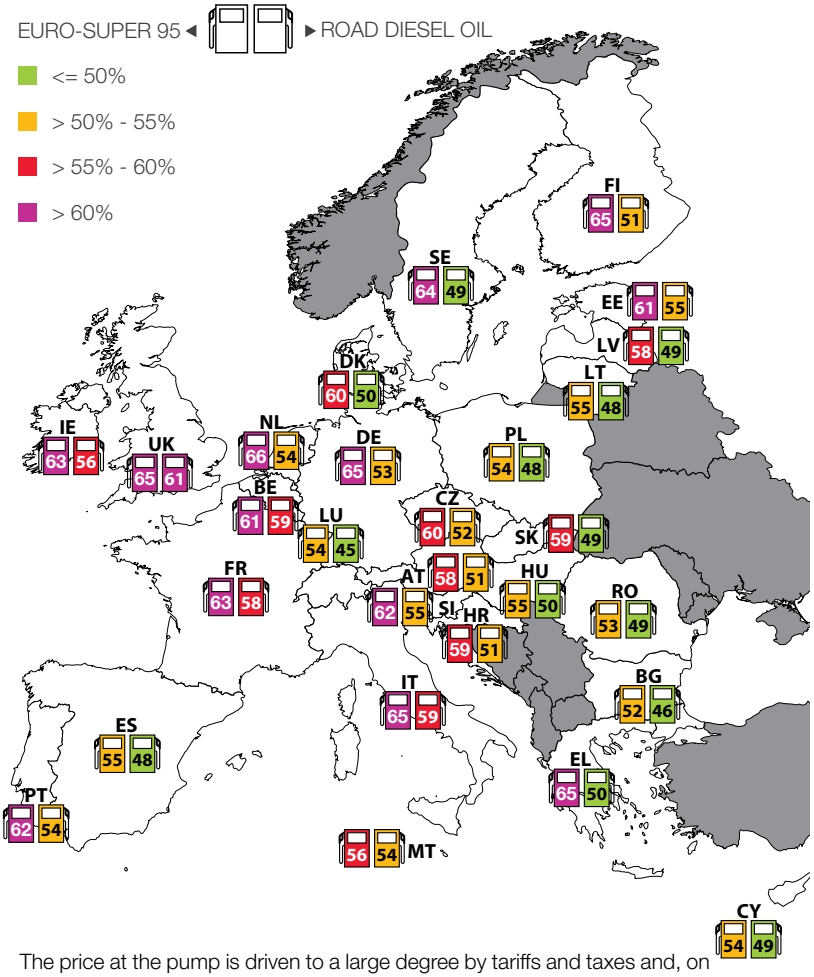
*Figures are based on 2018 tax revenues

FIG.21 TOTAL TAXATION SHARE IN THE END CONSUMER PRICE

Source: European Commission

EURO-SUPER 95

COUNTRY	%
Netherlands	66
Finland	65
Germany	65
Greece	65
Italy	65
United Kingdom	65
Sweden	64
France	63
Ireland	63
Portugal	62
Slovenia	62
Belgium	61
Estonia	61
Czechia	60
Denmark	60
Croatia	59
Slovakia	59
Austria	58
Latvia	58
Malta	56
Spain	55
Hungary	55
Lithuania	55
Cyprus	54
Luxembourg	54
Poland	54
Romania	53
Bulgaria	52



ROAD DIESEL OIL

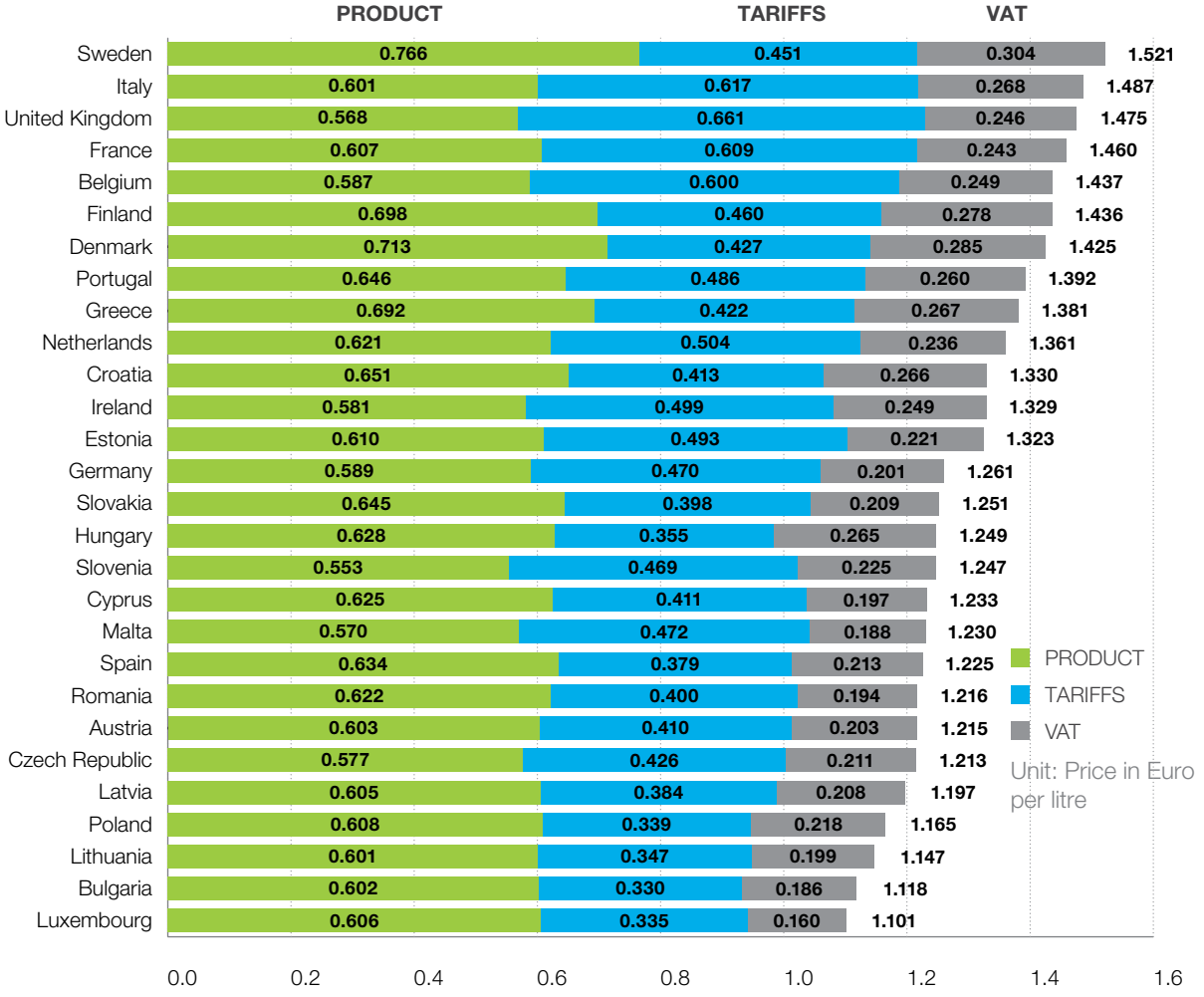
COUNTRY	%
United Kingdom	61
Belgium	59
Italy	59
France	58
Ireland	56
Estonia	55
Slovenia	55
Malta	54
Netherlands	54
Portugal	54
Germany	53
Czechia	52
Austria	51
Croatia	51
Finland	51
Denmark	50
Greece	50
Hungary	50
Cyprus	49
Latvia	49
Romania	49
Slovakia	49
Sweden	49
Lithuania	48
Poland	48
Spain	48
Bulgaria	46
Luxembourg	45

The price at the pump is driven to a large degree by tariffs and taxes and, on average, over half the cost of fuel at the pump represents taxes. The taxes on gasoline are generally higher than for diesel. This differential tax treatment has driven a demand shift over the past 20 years. Fuels taxes contribute substantially to Member States' revenues.

Reference date: 18 March 2019

FIG.22 BREAKDOWN OF AUTOMOTIVE DIESEL PRICES ACROSS EU (MARCH 2019)

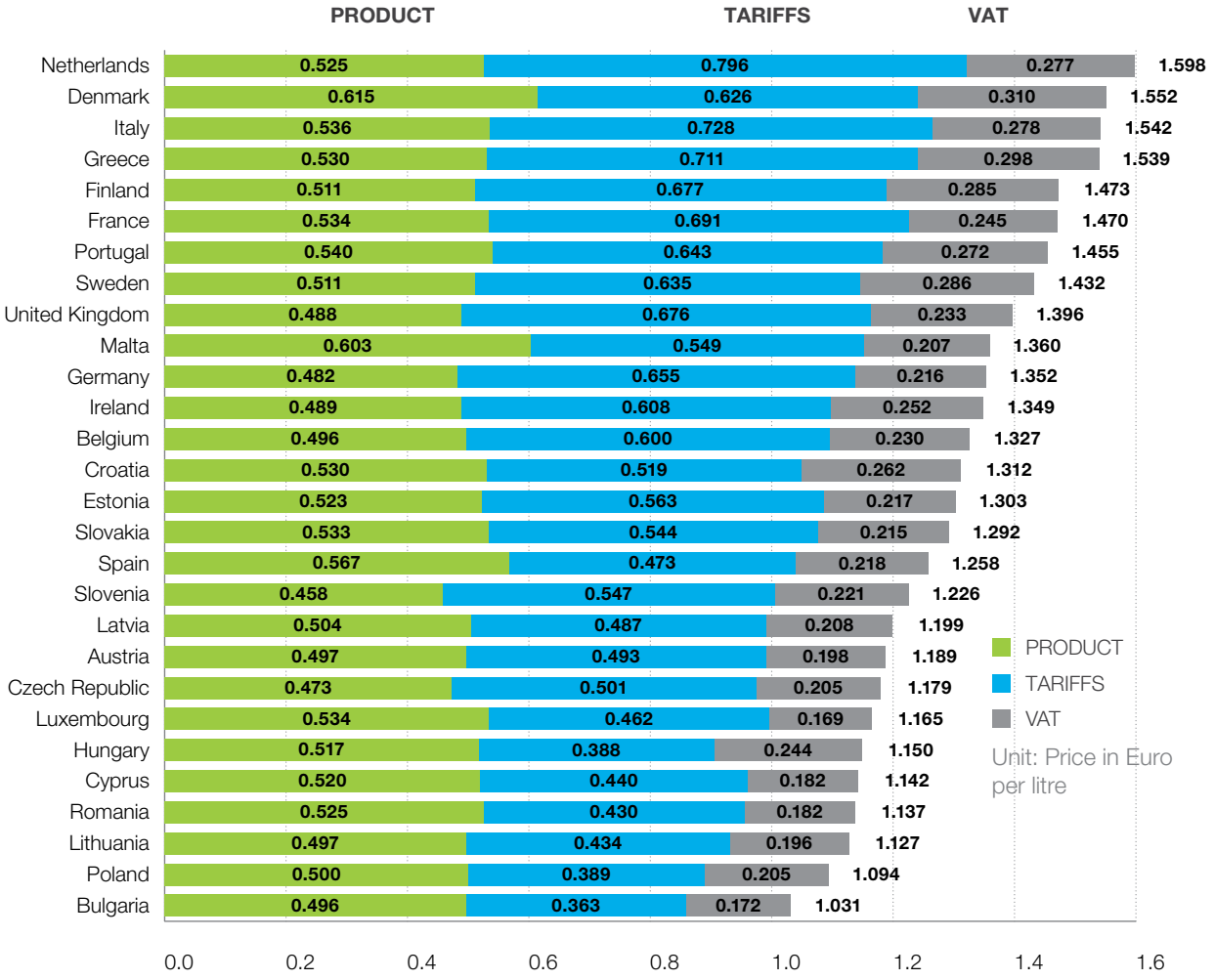
Source: Oil Bulletin, European Commission



In most EU Member States, gasoline prices are generally higher than diesel prices due to the higher tax element. Taxes represent the highest share of the price at the pump. The remainder are the purchase of the crude, distribution and marketing costs, and only a fraction contributes to the refiners' income.

FIG.23 BREAKDOWN OF AUTOMOTIVE GASOLINE PRICES ACROSS EU (MARCH 2019)

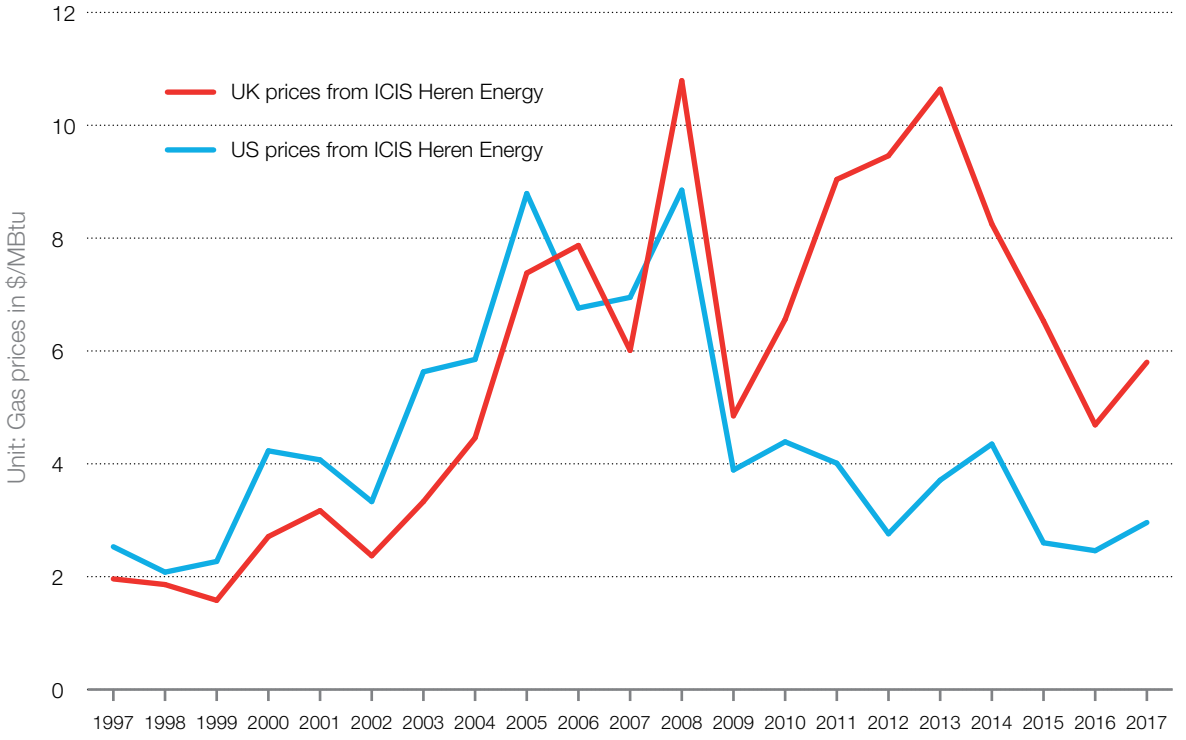
Source: Oil Bulletin, European Commission



In most EU Member States, gasoline prices are generally higher than diesel prices due to the higher tax element. Taxes represent the highest share of the price at the pump. The remainder are the purchase of the crude, distribution and marketing costs, and only a fraction contributes to the refiners' income.

FIG.24 EVOLUTION OF GAS PRICES

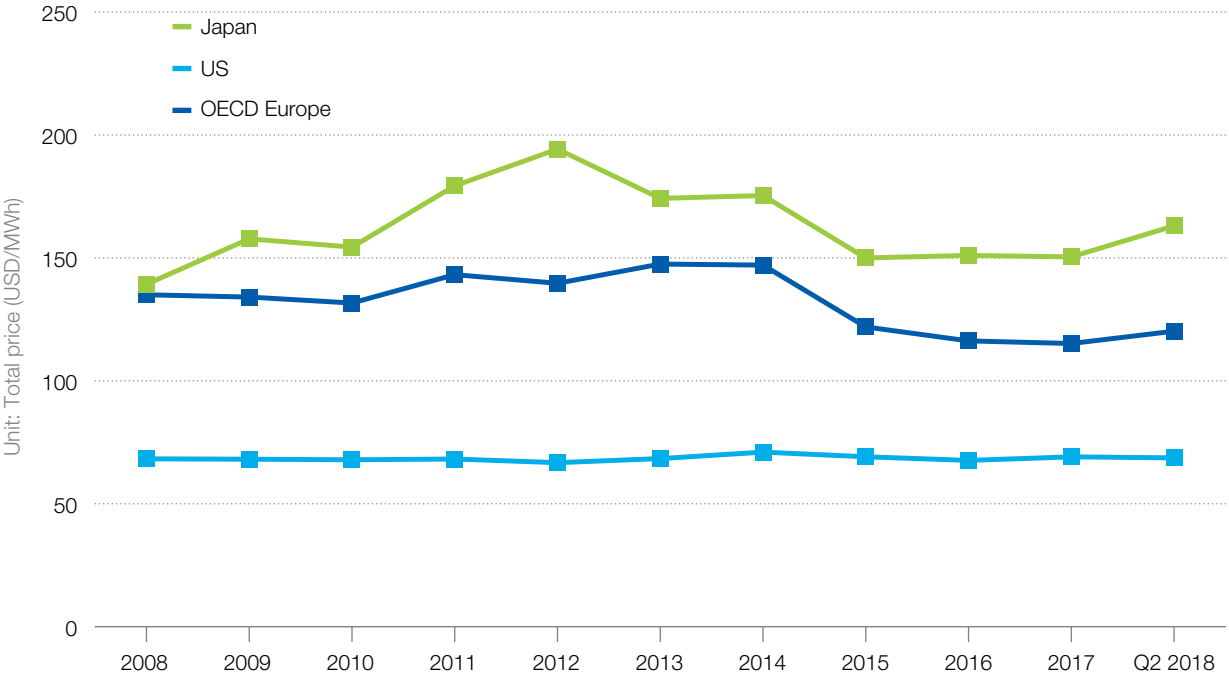
Source: BP Statistical Review of World Energy 2018



Since 2009, the US industry gained a significant competitive advantage over the EU industry as a result of the shale gas revolution. The 2017 prices in the UK were double the average of US gas prices.

FIG.25 EVOLUTION OF END-USER ELECTRICITY PRICES FOR INDUSTRY

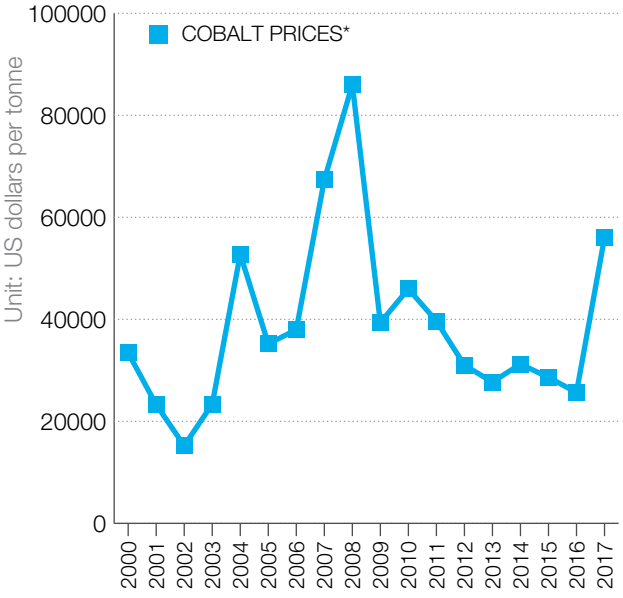
Source: International Energy Agency

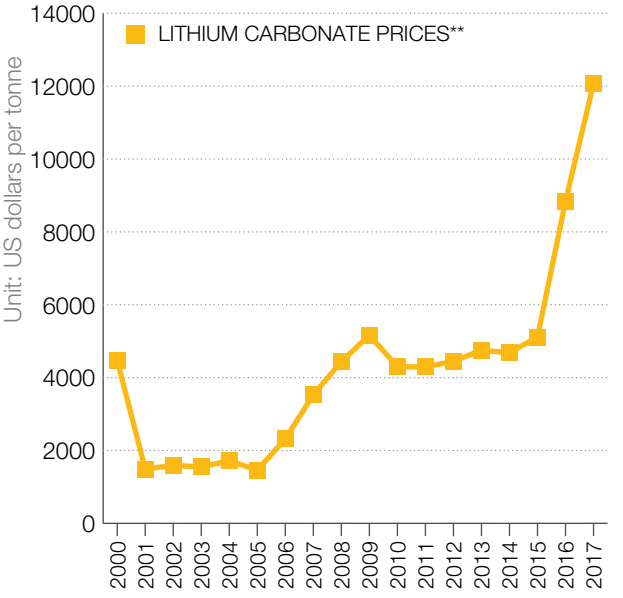


Over the past few years the US industry gained a significant competitive advantage as a result of low electricity prices. While European industry faced an 80% energy price increase between 2005 and 2014, the price of electricity for the US industry only increased by 20% over the same period. Nevertheless, since mid-2014, EU electricity prices dropped as a result of lower crude and gas prices and the gap with US refiners has been significantly reduced. This situation is however, according to experts, not due to remain overtime and the EU should face again higher electricity prices.

FIG.26 COBALT AND LITHIUM CARBONATE PRICES

Source: BP Statistical Review of World Energy 2018





Cobalt production has grown by only 0.9% per annum since 2010, compared to lithium production, which increased by 6.8% per annum over the same period. Cobalt prices have more than doubled in 2017, while lithium carbonate prices increased by 37%.

Note: *2000-2012 spot grade for cathodes, source US Geological Survey. 2013-2017 min purity 99.8%, source London Metal Exchange.

Lithium production is concentrated in Chile and Australia, with Chile holding the majority of proved reserves. For cobalt, the Democratic Republic of Congo accounts for the vast majority of both production (66%) and proved reserves (49%).

Note: **2000-2008 unit value, data series 140, source US Geological Survey. 2009-2017 FOB South America, source Benchmark Mineral Intelligence.

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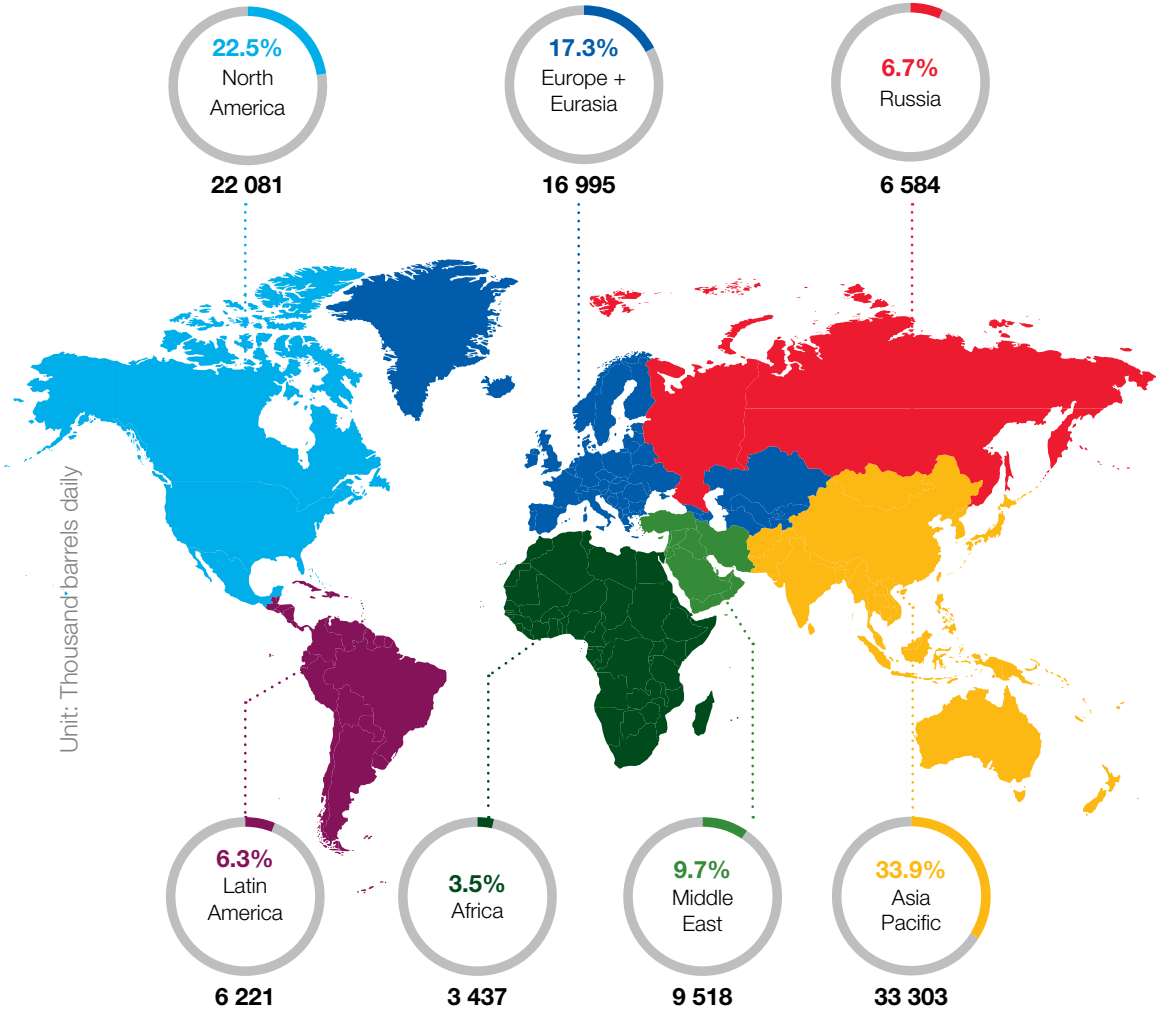
FIG.27 GLOBAL REFINING CAPACITY AS OF 2017

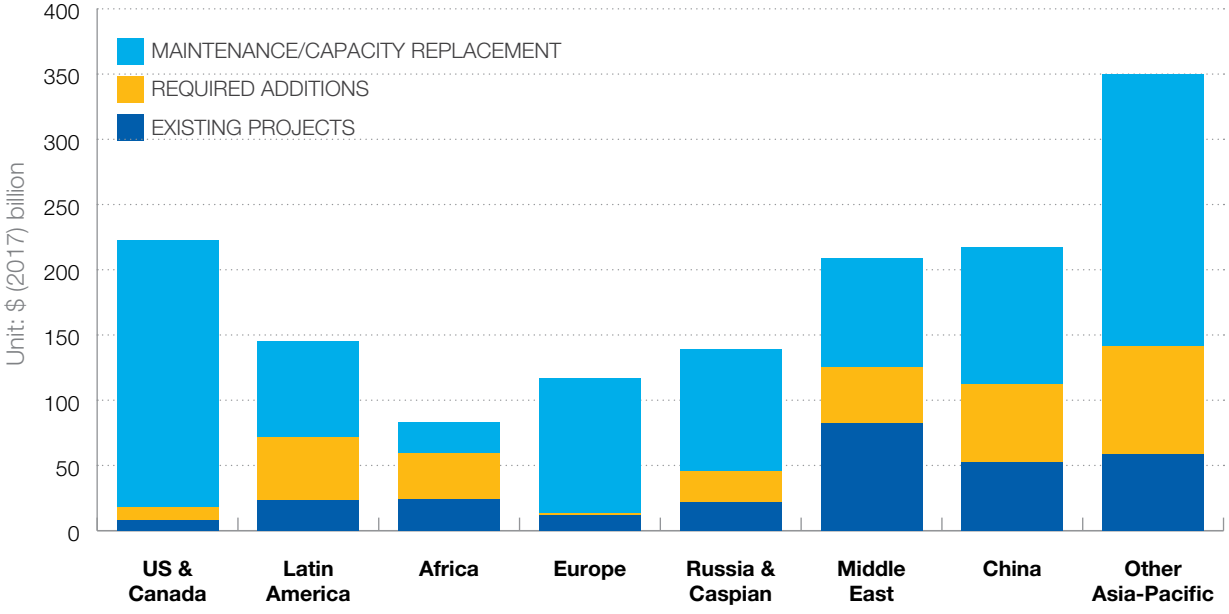
Source: BP Statistical Review of World Energy 2018



Refining is spread around the world and is a truly global business. The share of Europe and Eurasia (Russia excluded) has remained stable at 17.3% in 2017, compared to 2016, remaining the third largest refining region.

FIG.28 REFINERY INVESTMENTS IN REFERENCE CASE 2018 - 2040

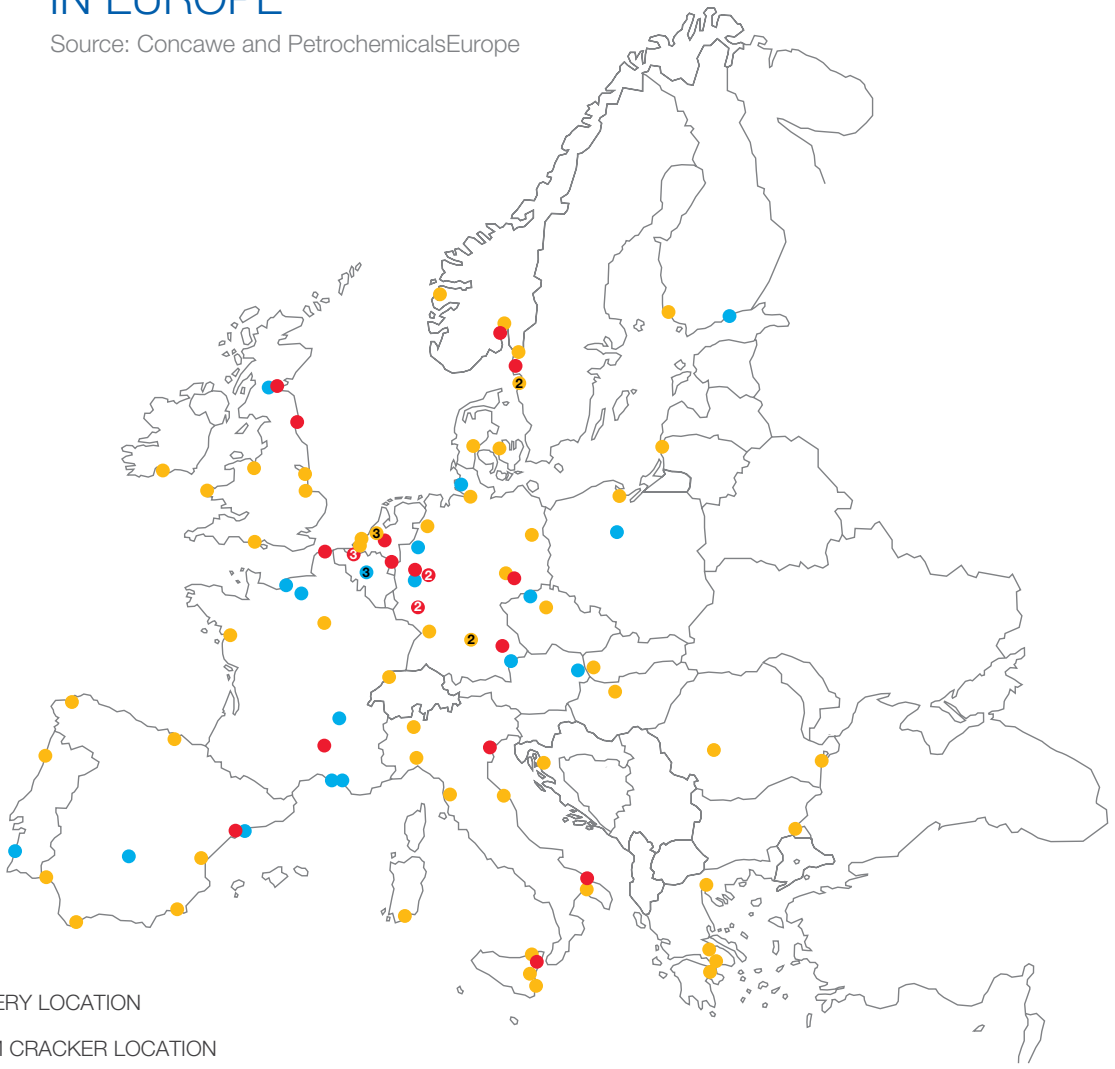
Source: OPEC World Oil Outlook 2018



All three categories of refinery investment requirements are estimated at around $1.5 trillion in the period 2018 - 2040. The majority, around $900 billion will be dedicated to maintenance, $280 billion to investments in known projects and the remaining $305 billion to additions beyond firm projects.

FIG.29 REFINERY/STEAM CRACKER SITES IN EUROPE

Source: Concawe and PetrochemicalsEurope



A large number of refineries are integrated with, or located very closely to steam crackers which produce the feedstock for the petrochemical industry.

Such interconnections show how refining is an intrinsic part of the industrial value chain and provides the basis for advanced high value products.

FIG.30 78 MAINSTREAM REFINERIES WERE OPERATING IN THE EU, NORWAY AND SWITZERLAND AT THE END OF 2018

Source: Concawe

COUNTRY	Number of refineries
Austria	1
Belgium	3
Bulgaria	1
Croatia	1
Czechia	2
Denmark	2
Finland	2
France	7
Germany	11
Greece	4
Hungary	1
Ireland	1
Italy	9
Lithuania	1
Netherlands	5
Poland	2
Portugal	2
Romania	2
Slovakia	1
Spain	8
Sweden	3
United Kingdom	6
EU TOTAL: Refineries = 75	
Norway	2
Switzerland	1
TOTAL NO + CH: Refineries = 3	
TOTAL: Refineries = 78	

EU NON EU

Threshold > 50 kbbl/d or 2.5Mt/a

In December 2018, there were 78 'mainstream' (capacity above 2.5Mt/a) refineries in the EU, Norway and Switzerland.

FIG.31 EU, NORWEGIAN AND SWISS MAINSTREAM REFINERIES HAD 662 MILLION TONNES OF PRIMARY REFINING CAPACITY IN 2018

Source: Concawe and Oil & Gas Journal

COUNTRY	*Refining capacity	COUNTRY	*Refining capacity
Austria	9.68	Ireland	3.55
Belgium	37.6	Italy	87.8
Bulgaria	9.8	Lithuania	9.5
Croatia	4.5	Netherlands	60.1
Czechia	8.7	Poland	24.6
Denmark	8.7	Portugal	15.2
Finland	13.0	Romania	8.1
France	62.8	Slovakia	5.8
Germany	93.8	Spain	68
Greece	21.2	Sweden	19.8
Hungary	8.1	United Kingdom	62.3
EU TOTAL: Refineries = 642.6 million tonnes per year			
Norway	16.0		
Switzerland	3.40		
TOTAL NO + CH: Refineries = 19.4 million tonnes per year			
TOTAL: Refineries = 662 million tonnes per year			

EU NON EU

Threshold > 50 kbbl/d or 2.5Mt/a

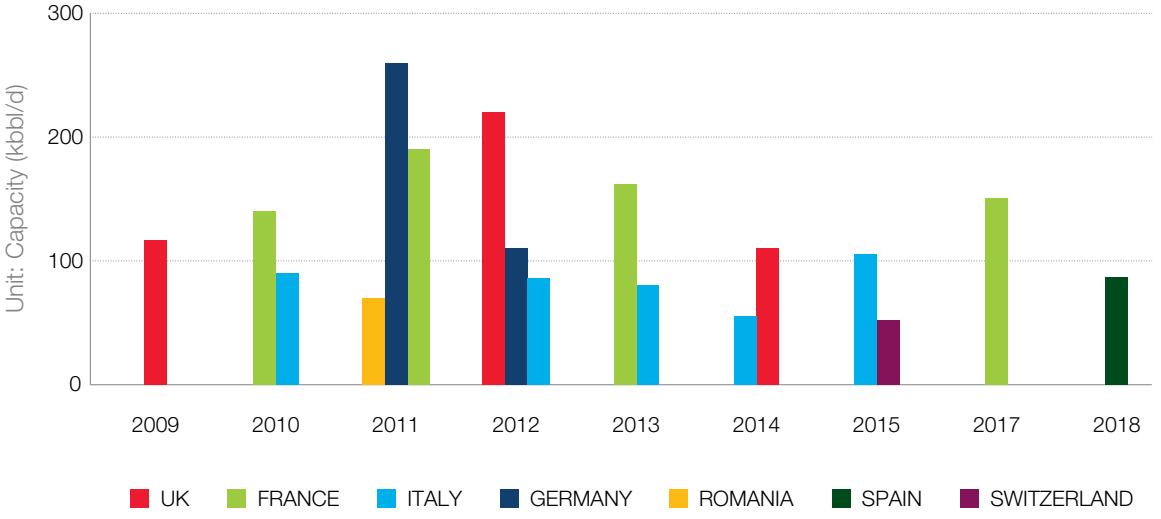
The 78 mainstream refineries operating in 2018 in the EU-28, Norway and Switzerland had a primary refining capacity of 662 million tonnes. This represents a decrease by some 95 million tonnes of primary refining capacity since 2010. Over the past 12 months the refining capacity in the EU has decreased by 2.75%, mainly due to a refinery closure in Spain.

Note: Refining capacity is expressed in million tonnes per year. Numbers may not add up due to rounding.

*Status in December 2018

FIG.32 REFINERY CLOSURES IN EUROPE

Source: Platts and Concawe

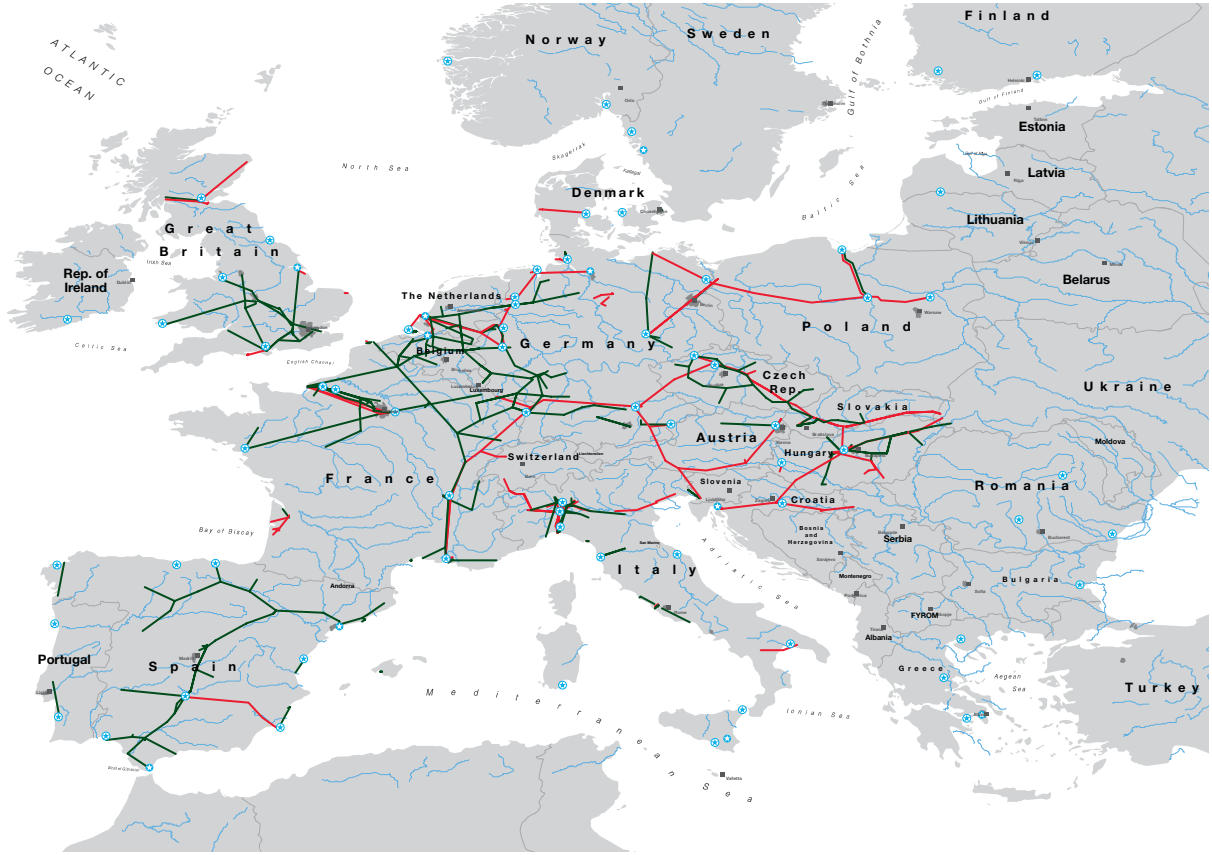


Threshold > 50 kbbl/d or 2.5Mt/a

Since 2009, out of the 100 refineries operating in Europe, 18 mainstream refineries were closed.

FIG.33 OIL PIPELINES - MAP OF EUROPE

Source: Concawe



- REFINERY IN OPERATION
- TWO OR MORE REFINERIES IN OPERATION

PIPELINES: IN OPERATION OR STAND BY

- CRUDE OIL
- OIL PRODUCTS

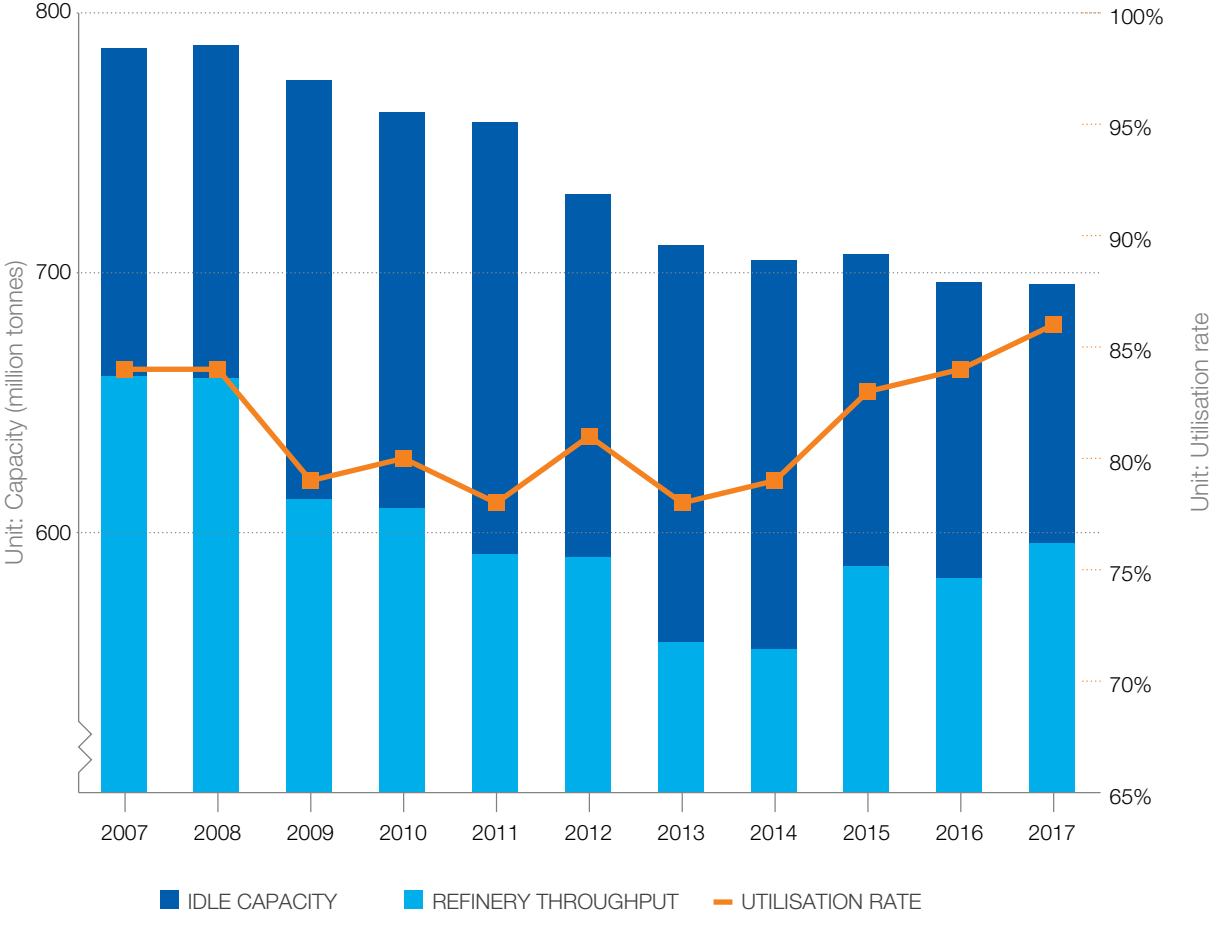
Note: The map is based on publicly available information as well as the information gathered by Concawe and as such should not be considered exhaustive.

Pipelines are a long-established, safe and efficient mode of transport for crude oil and petroleum products. They are used both for short-distance transport (e.g. within a refinery or depot, or between neighbouring installations) and long distances.

An extensive network of cross-country oil pipelines in Europe meets a large proportion of the need for transportation of petroleum products.

FIG.34 CAPACITY AND UTILISATION OF EUROPEAN REFINERIES

Source: BP Statistical Review of World Energy 2018

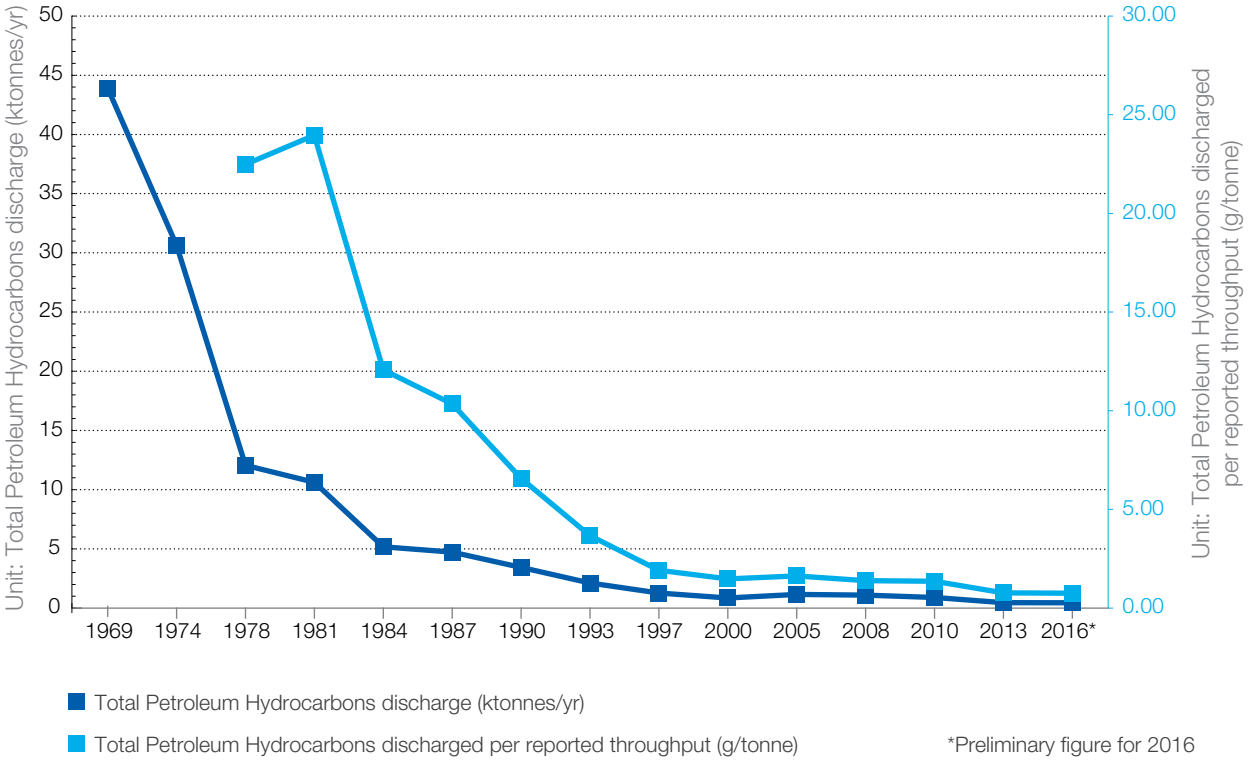


Since 2007, the utilisation rate of EU refineries has been oscillating between 84% to a lowest of 78% in 2013. In 2017, an increase of the rate has been observed with the utilisation of European refineries reaching 86%. This rate is commonly accepted as a requirement for efficient economic operations of a refinery.

FIG.35 QUALITY OF REFINERY WATER EFFLUENT

OIL DISCHARGED IN WATER

Source: Concawe

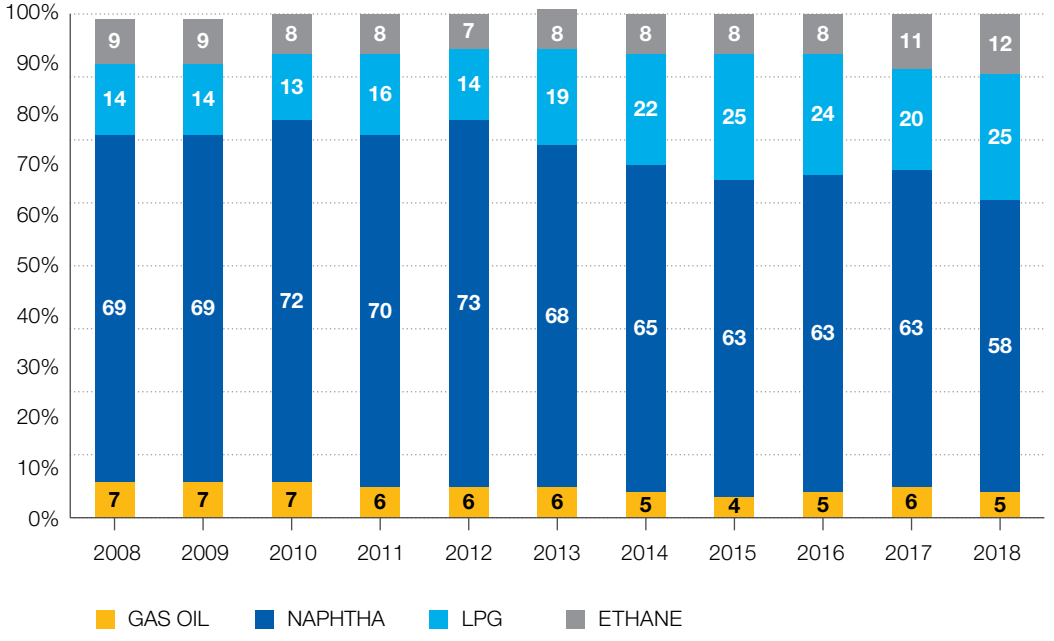


*Preliminary figure for 2016

EU refineries have significantly improved the quality of refinery water effluent in the last decades. The amount of Total Petroleum Hyrdrocarbons (TPH) discharged in effluents from reporting installations continued to decrease to extremely low levels relative to pre-1990; both in terms of the absolute amount of TPH discharged and the amount expressed relative to the volume of feedstock processed (throughput) and the refining capacity of the installations.

FIG.36 CHEMICAL INDUSTRY RAW MATERIAL USE

Source: CEFIC and ICIS



The EU refining sector is closely integrated with the petrochemical sector. A large part of the petrochemical feedstock relies on refined products, such as naphtha and petroleum gases.


Evolution is
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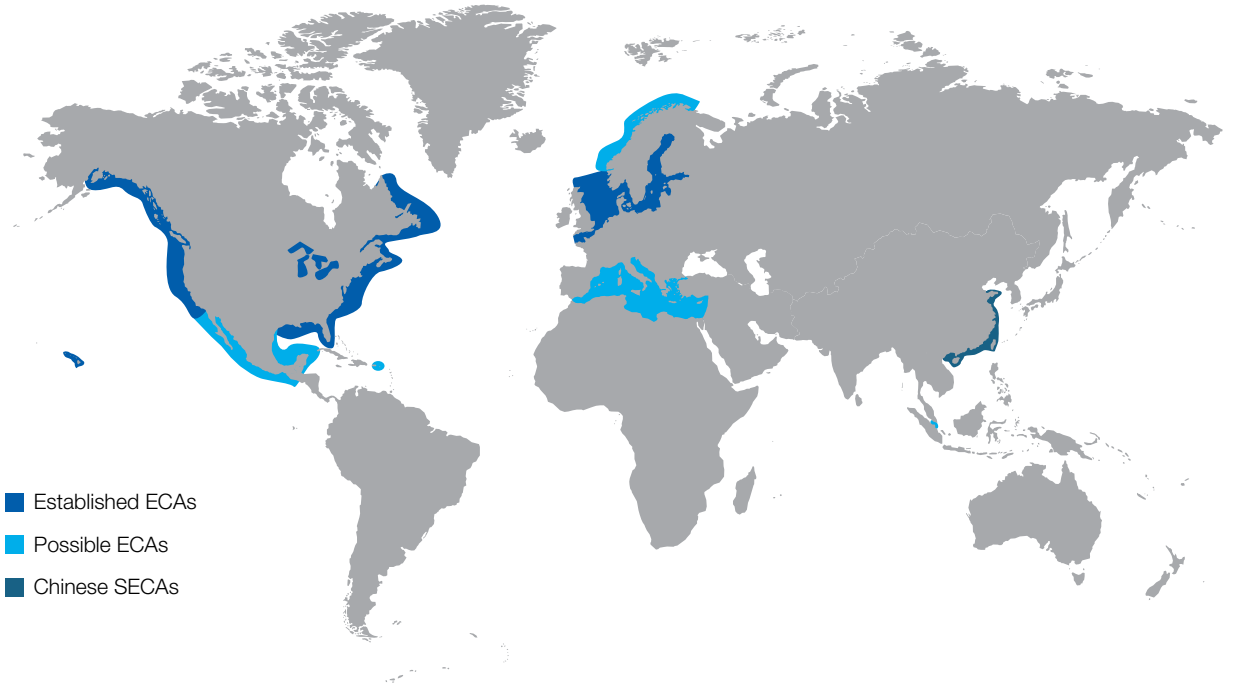
... Thinking beyond
tomorrow
Low-carbon liquid fuels
produced from algae


Evolution is
not just a theory...
... Thinking beyond
tomorrow
Low-carbon liquid fuels
produced from municipal waste

FIG.37 MARINE FUEL SULPHUR SPECIFICATIONS

SULPHUR EMISSION CONTROL AREAS (SECAs)

Source: IMO and Concawe



The limit for the sulphur content of marine fuels in SECAs is 0.1% since 1 January 2015.

The limit for the sulphur content of marine fuels outside SECAs in the EU waters is set at: 0.5% for EU waters by 2020.

Since January 2015, all vessels in the Emission Controlled Area (ECA) of the Baltic Sea, North Sea, English Channel and waters 200 nautical miles from the coast of US and Canada, have had to reduce their sulphur emissions to 0.1%.

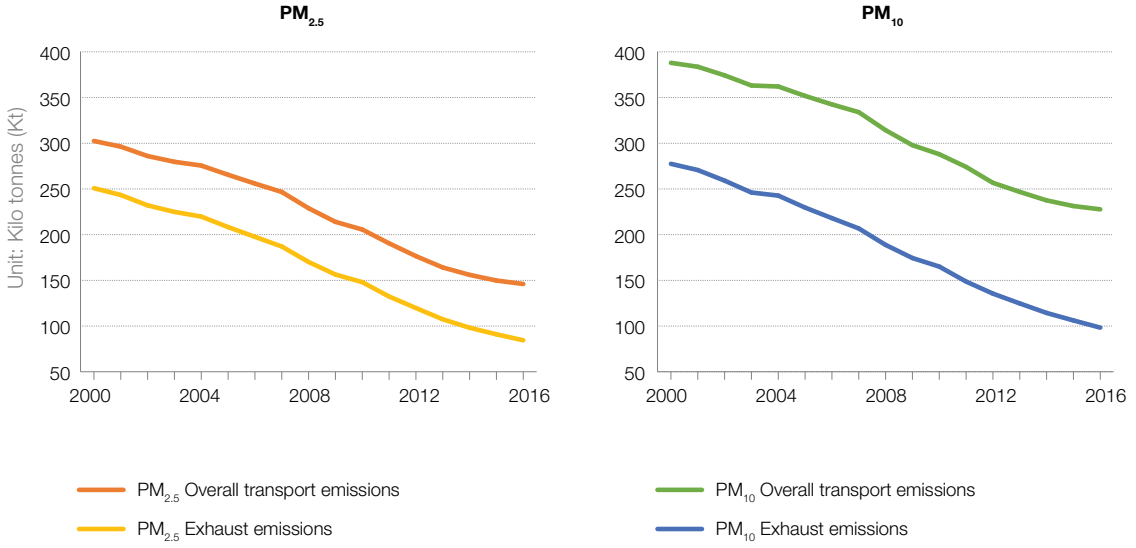
From 1 January 2019, vessels have been required to use fuel with a sulphur content not exceeding 0.5% while operating within the Coastal ECA, i.e. within China's territorial sea (including the Hainan Coastal ECA) as well as Hong Kong, Taiwan and Mainland China.

From 1 January 2022, vessels must use fuel with a sulphur content not exceeding 0.1% while operating within the Hainan Coastal ECA. Vessels are required to use either a distillate, an alternate fuel or install a scrubber that removes sulphur from the exhaust after combustion.

The implementation date for the 0.5% global sulphur cap is set for 2020, the International Maritime Organization (IMO) Marine Environment Protection Committee decided at its 70th session in London.

FIG.38a SINCE 2000, PM EMISSIONS FROM EXHAUST REDUCED BY OVER 35% IN THE EU

Source: European Environment Agency

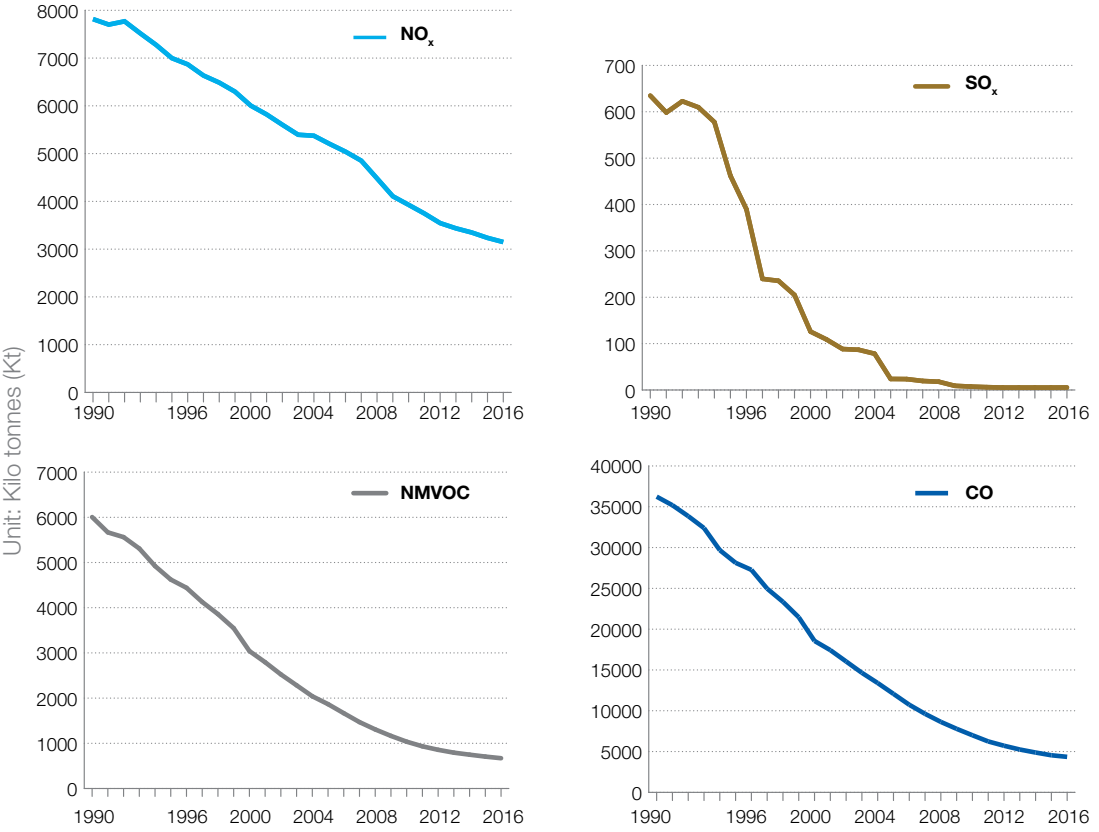


PM emissions are continuously decreasing as the result of cleaner diesel fuel, advanced engines and effective emissions control technology.

With the introduction of the Euro 6 standard, modern road vehicles with diesel engines are using highly efficient filters that remove 99.9% of PM.

FIG.38b SINCE 1990, FUELS ARE GETTING PROGRESSIVELY CLEANER RESULTING IN SIGNIFICANT EMISSIONS REDUCTIONS

Source: European Environment Agency

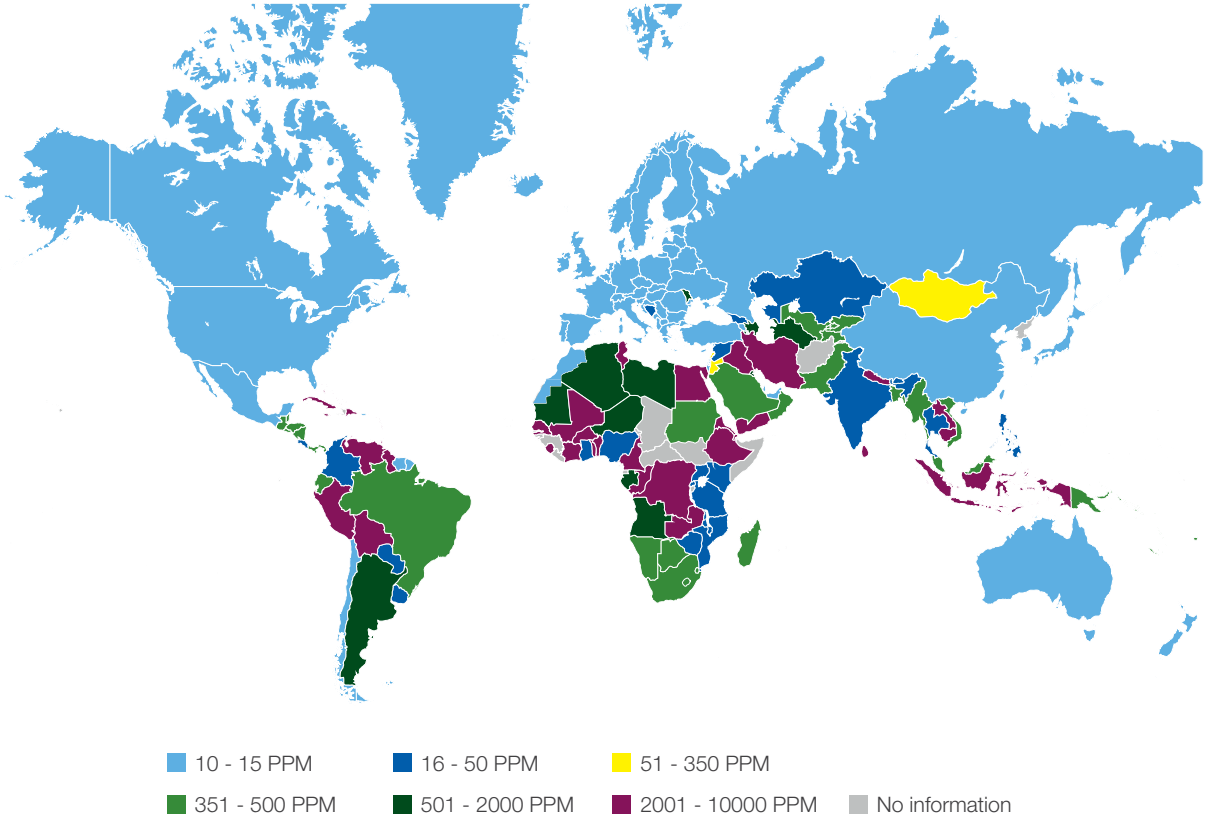


Since 1990, the refining industry contributed to cleaner exhausts currently containing over 80% lower SO_X, NMVOC, and CO emissions. NO_x emissions have decreased by over 60%. These significant improvements are the result of the partnerships with the automotive industry which aims at improving the fuel engine efficiency and leading to multiple environmental benefits.

NO_x (as NO_2) - Nitrogen Oxides
SO_x (as SO_2) - Sulphur Oxides
NMVOC - Non Methane Volatile Organic Compounds
CO - Carbon Monoxide

FIG.39 MAXIMUM ON-ROAD DIESEL SULPHUR LIMITS

Source: Stratas Advisors, March 2019

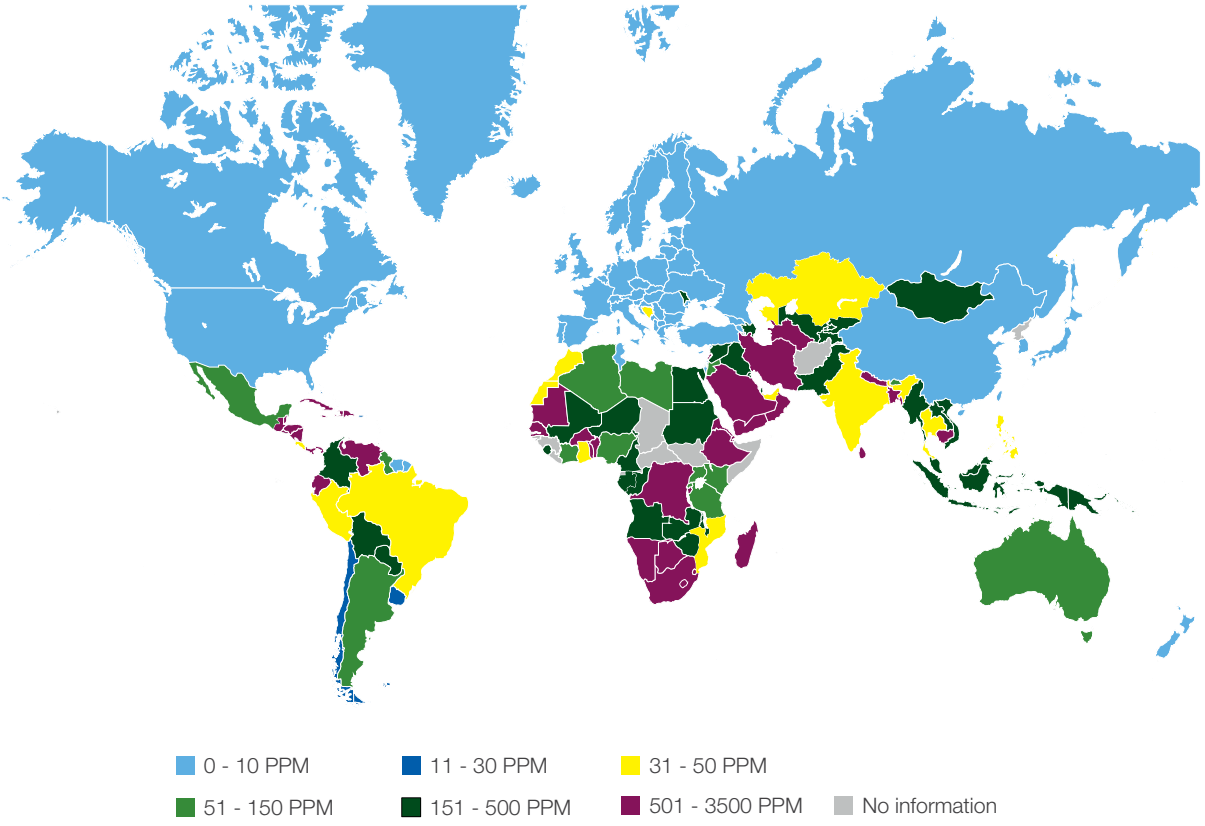


Countries may apply lower limits for different grades, regions/ cities, or based on average content.

Detailed information on limits and regulations can be found at www.stratasadvisors.com.

FIG.40 MAXIMUM GASOLINE SULPHUR LIMITS

Source: Stratas Advisors, March 2019

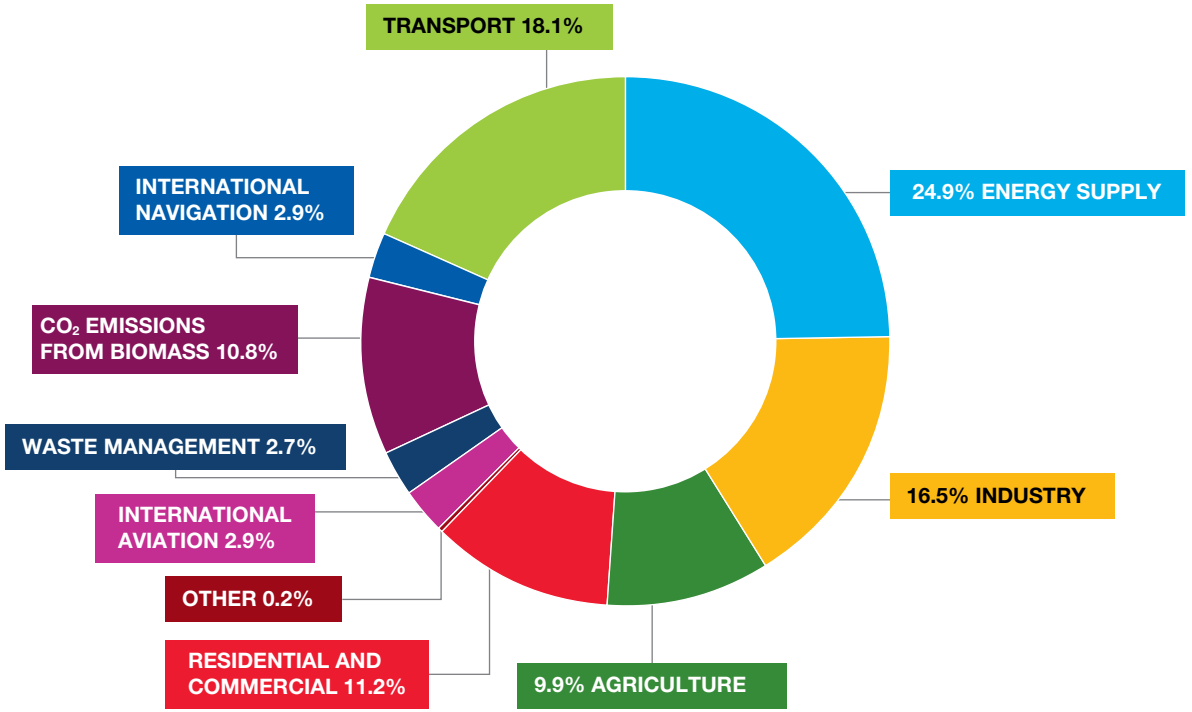


Countries may apply lower limits for different grades, regions/ cities, or based on average content.

Detailed information on limits and regulations can be found at www.stratasadvisors.com.

FIG.41 GHG EMISSIONS BY SECTOR IN THE EU IN 2016

Source: European Environmental Agency

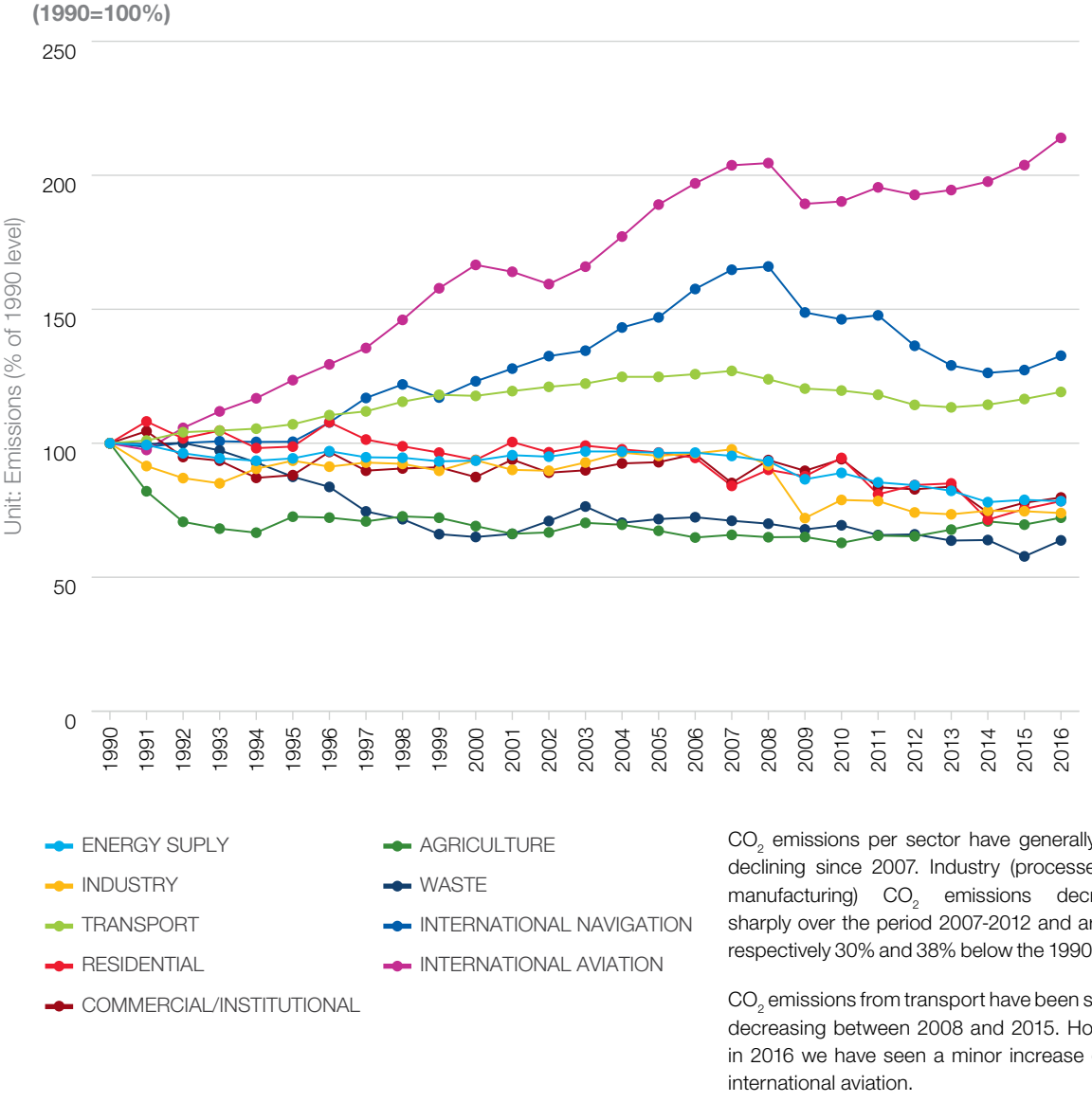


Energy supply and industry accounted for almost 41.5% of GHG emissions in the EU in 2016. Transport, including international shipping and aviation, supplied at 94% by oil refined products generates just under 24% of EU GHG emissions.

Note: Please note that due to rounding, figures may not add up exactly to 100%.

FIG.42 CO_2 EMISSIONS TREND BY SECTOR IN THE EU

Source: European Environment Agency

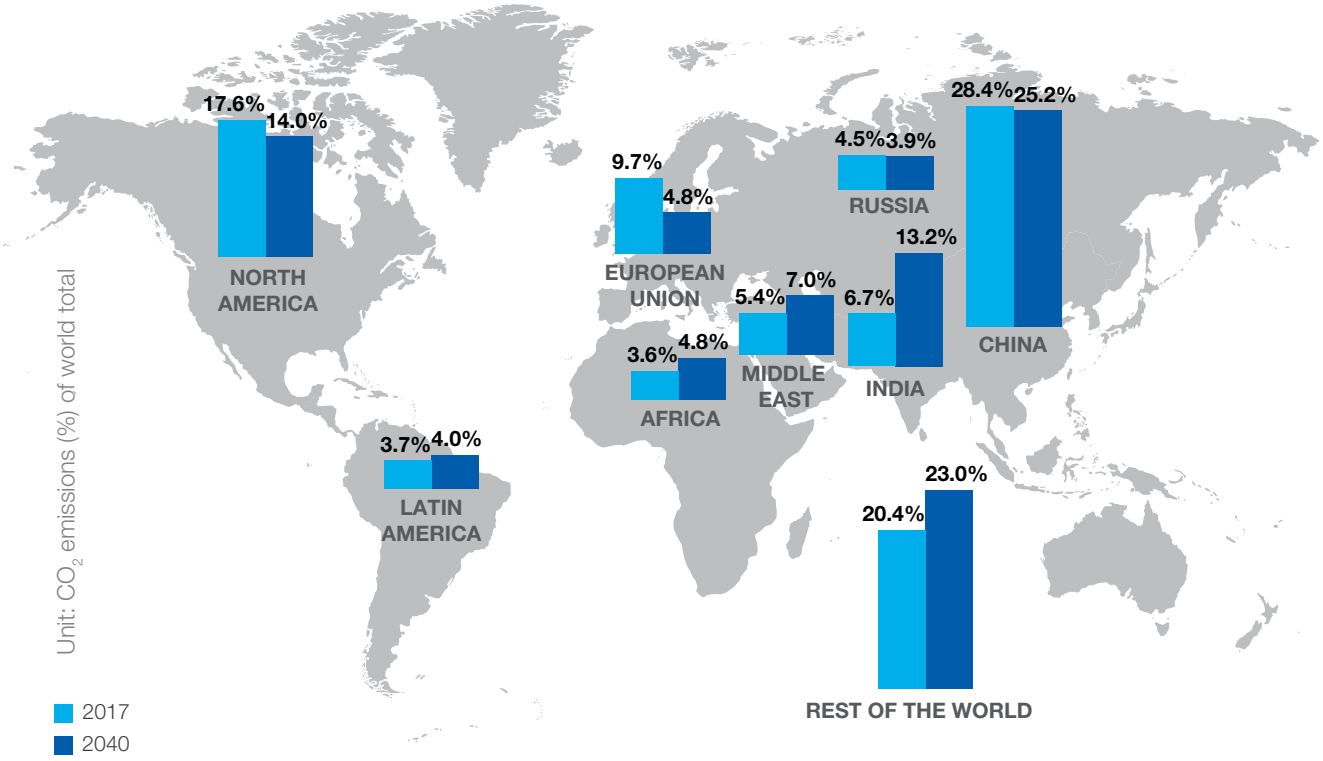


CO_2 emissions per sector have generally been declining since 2007. Industry (processes and manufacturing) CO_2 emissions decreased sharply over the period 2007-2012 and are now respectively 30% and 38% below the 1990 levels.

CO_2 emissions from transport have been steadily decreasing between 2008 and 2015. However, in 2016 we have seen a minor increase due to international aviation.

FIG.43 DECLINING EU SHARE IN GLOBAL CO_2 EMISSIONS

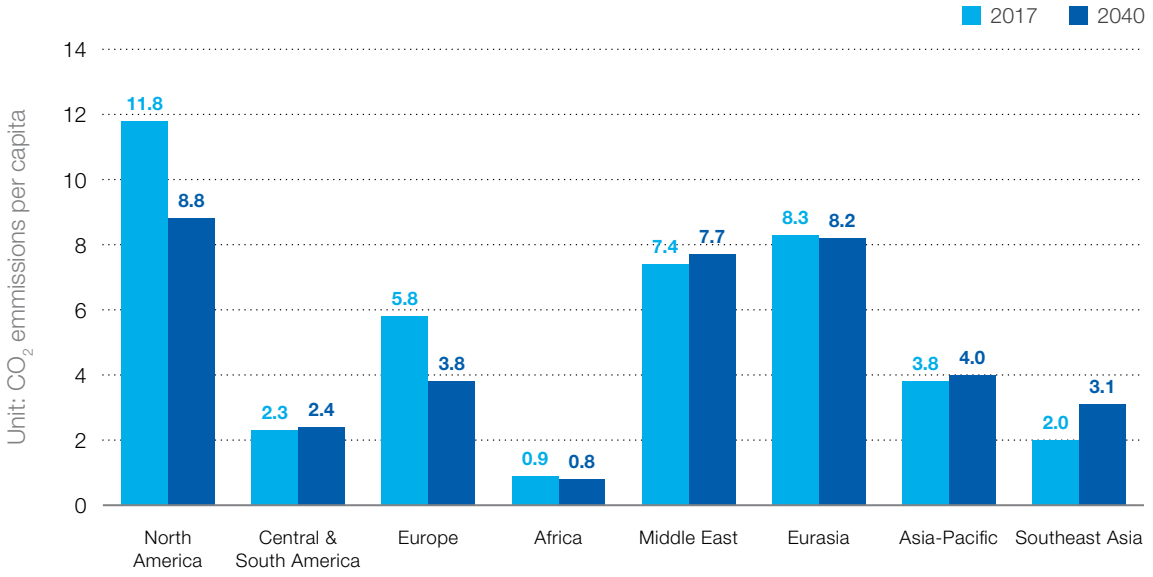
Source: International Energy Agency, WEO 2018



In 2017, the EU accounted for 9.7% of the global CO_2 emissions and this share is expected to be reduced to 4.8% by 2040. According to IEA, CO_2 emissions in North America, Russia and China are also forecasted to decrease by 2040 where in other parts of the world emissions will likely increase.

FIG.44 CO_2 EMISSIONS PER CAPITA/REGIONS

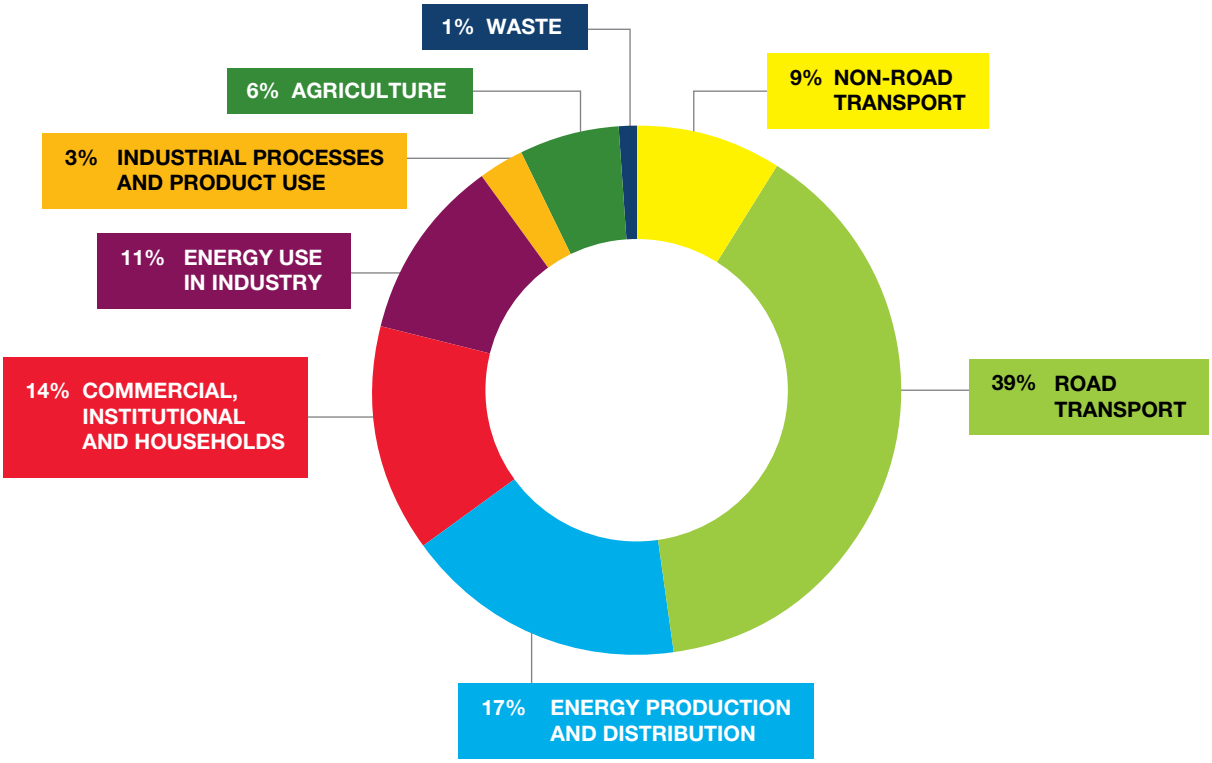
Source: International Energy Agency, WEO 2018



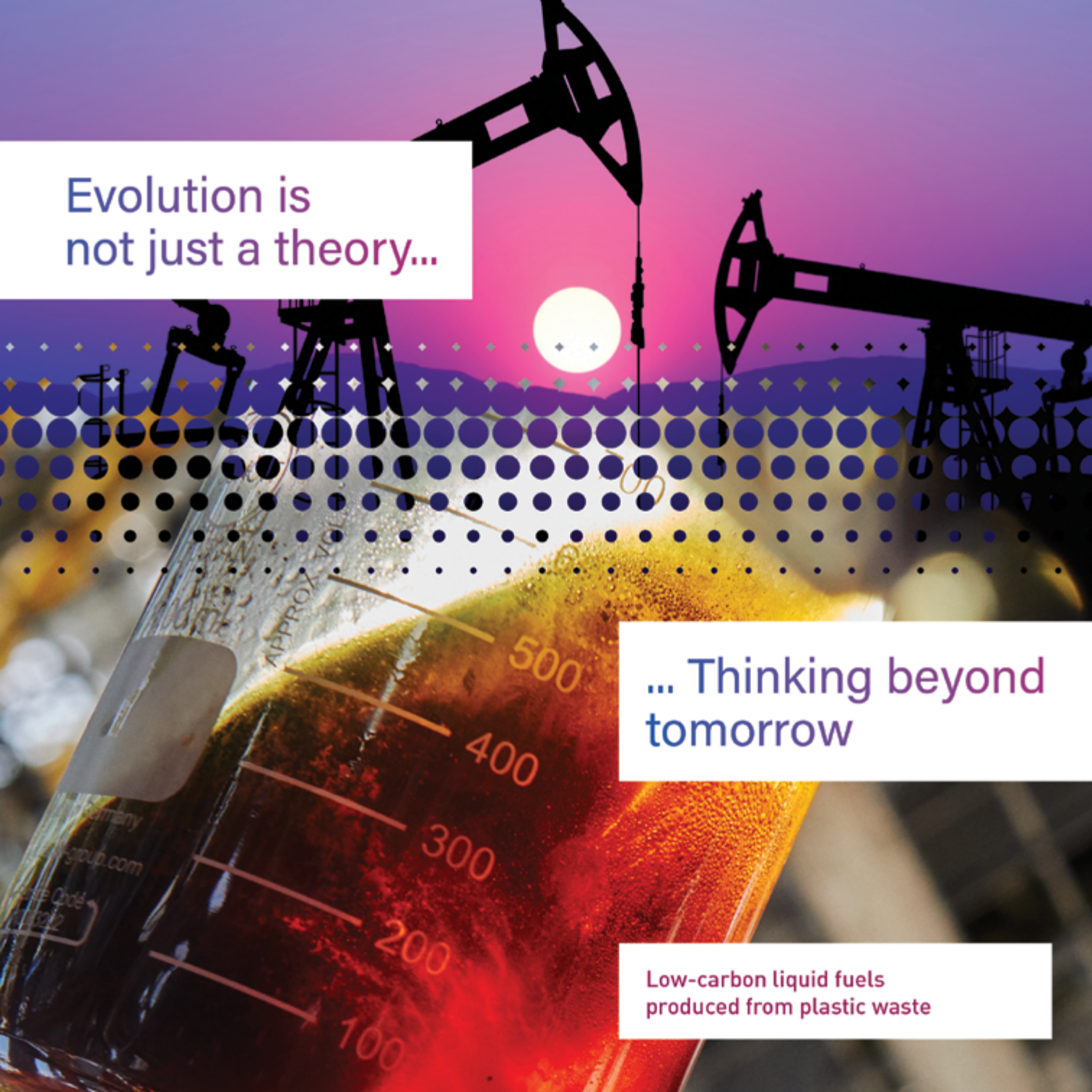
Europe and North America are the two regions where CO_2 emissions are expected to decrease. CO_2 emissions are expected to slightly increase in the other parts of the world.

FIG.45 NO_x CONTRIBUTION TO EU-28 EMISSIONS FROM MAIN SOURCE SECTORS IN 2016

Source: European Environmental Agency



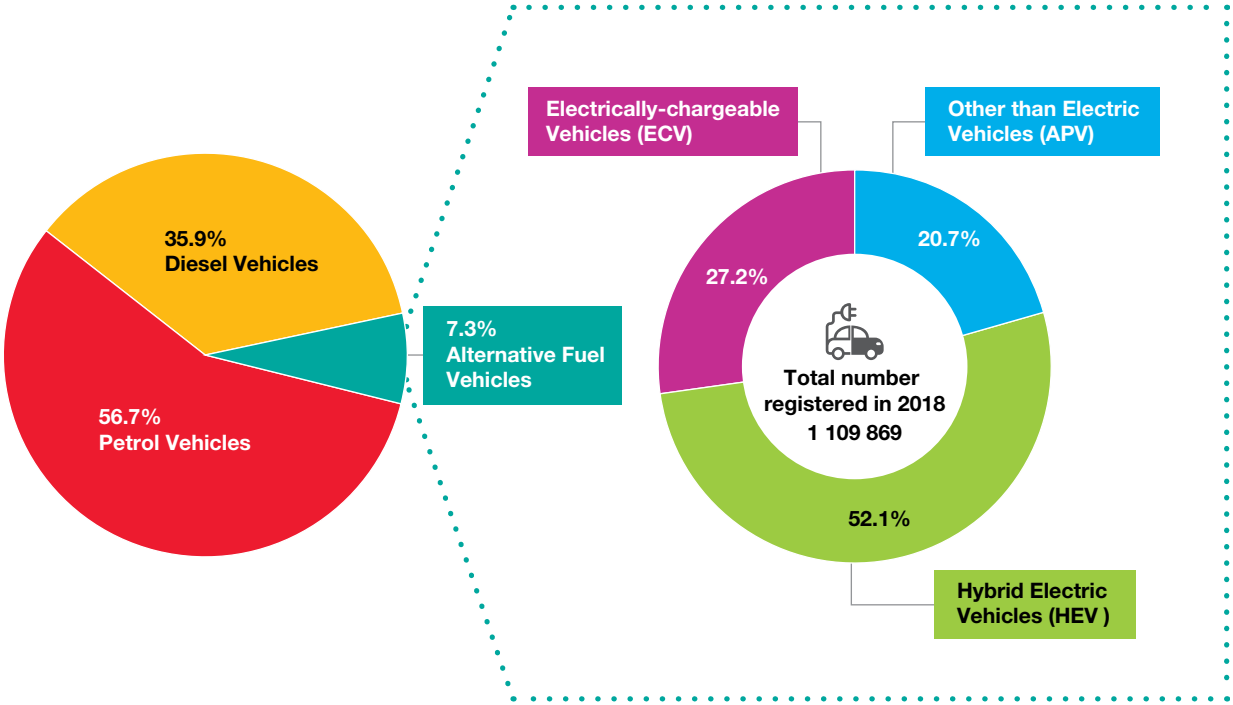
NO_x is a main contributor to the air quality problems found in a number of EU's urban areas. Whilst the road transport sector is the largest contributor with 39% of NO_x emissions in 2016, some other sectors such as energy production and distribution also largely contribute to the air quality challenge.


Evolution is
not just a theory...
... Thinking beyond
tomorrow
Low-carbon liquid fuels
produced from plastic waste
APPROX
500
400
300
200
100


Evolution is
not just a theory...
... Thinking beyond
tomorrow
Low-carbon liquid fuels
produced from renewables
250 ml

FIG.46 ALTERNATIVE FUEL VEHICLES ACCOUNTED FOR 7.3% OF TOTAL PASSENGER CAR REGISTRATIONS IN THE EU IN 2018

Source: ACEA

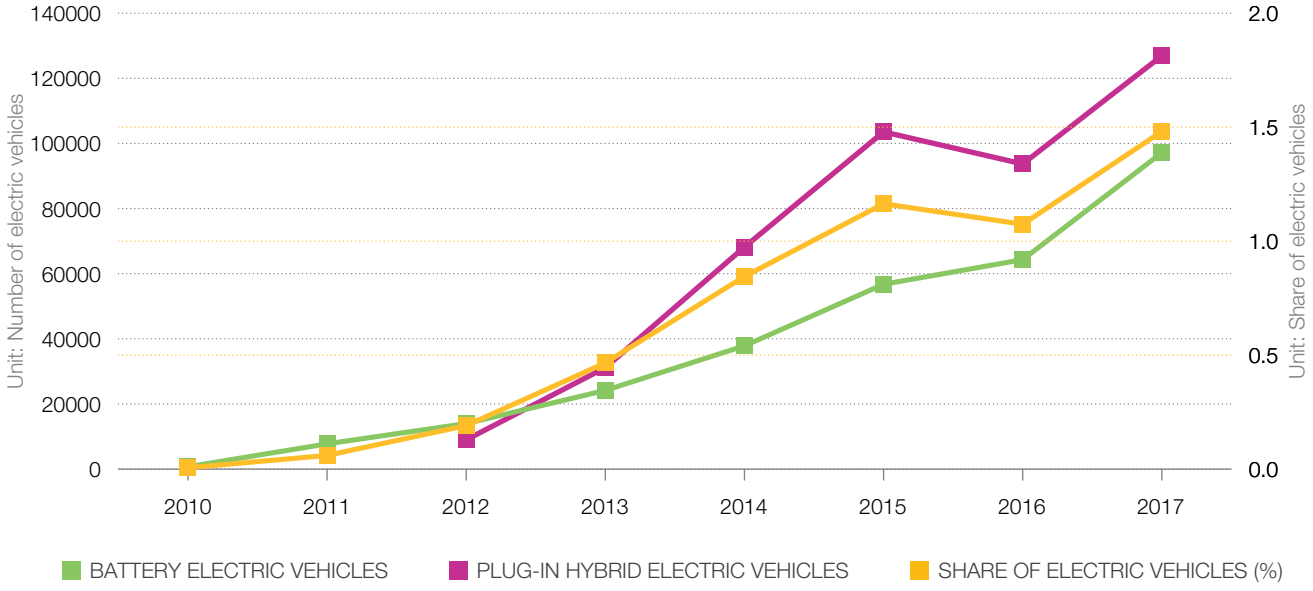


Overall in 2018, more than half of all new passenger cars registered in the EU ran on petrol representing a 6.4 percent point increase compared to 2017. Diesel vehicles accounted for 35.9% loosing 8.2 percent point of the market share. The number of alternative fuel vehicles has been steadily increasing reaching 7.3% in 2018.

Note: Please note that due to rounding, figures may not add up exactly to 100%.

FIG.47 ELECTRIC VEHICLES AS A PROPORTION OF THE TOTAL FLEET IN THE EU

Source: European Environment Agency



Electric cars are slowly penetrating the EU market. These include battery electric vehicles and plug-in hybrid electric vehicles. While the numbers are still small (in total about 224 000) and their market share about 1.5% of new registered passenger vehicles, the number of new electric car registrations in the EU has been increasing steadily over the last few years.

FIG.48 NUMBER OF PETROL STATIONS IN EUROPE
END OF 2018

Source: National Oil Industry Associations, FPS Economy, DG Energy

Unit: Number of petrol stations

COUNTRY	Number of petrol stations	COUNTRY	Number of petrol stations
Austria	2 699	Italy	20 800***
Belgium	3 096	Latvia	610
Bulgaria	3 200	Lithuania	822**
Croatia	N/A	Luxembourg	234*
Cyprus	305	Malta	78
Czechia	3 991	Netherlands	4 142
Denmark	2 034	Poland	7 765
Estonia	514	Portugal	3 114
Finland	1 848*	Romania	2 100**
France	11 068	Slovakia	962
Germany	14 459	Slovenia	553**
Greece	6 100	Spain	11 609
Hungary	2 068	Sweden	2 585
Ireland	1 789*	United Kingdom	8 442
EU TOTAL	**75 396**		
Norway	1 848		
Switzerland	3 367		
Turkey	12 871		
TOTAL NO + CH + TR	**18 086**		
TOTAL	**93 482**		

EU

NON EU

* Numbers for 2017

** Numbers for 2016

*** Service stations operative and multiproduct

There were over 92 000 petrol stations in the EU, Norway, Switzerland and Turkey operating in 2018, fuelling some 250 million cars and over 34 million trucks.

About FuelsEurope

FuelsEurope is a division of the European Petroleum Refiners Association, an AISBL operating in Belgium. This Association, whose members are all 40 companies that operate petroleum refineries in the European Economic Area in 2019, is comprised of FuelsEurope and Concawe divisions, each having separate and distinct roles and expertise but administratively consolidated for efficiency and cost effectiveness.

Members account for almost 100% of EU petroleum refining capacity and more than 75% of EU motor fuel retail sales.

FuelsEurope aims to inform and provide expert advice to the EU institutions and other stakeholders about European Petroleum Refining and Distribution and its products in order to:

- Contribute in a constructive way to the development of technically feasible and cost effective EU policies and legislation.
- Promote an understanding amongst the EU institutions and citizens of the contribution of European Petroleum Refining and Distribution and its value chain to European economic, technological and social progress.

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Consequently, reported margins should be taken as an indication, or proxy, of changes in profitability for a given refining centre. No attempt is made to model or otherwise comment upon the relative economics of specific refineries running individual crude slates and producing custom product sales, nor are these calculations intended to infer the marginal values of crude for pricing purposes.

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