

A study for Transport & Environment

Oil Dependency in the EU



Final Report

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Executive Summary

Introduction

Transport and Environment (T&E) commissioned Cambridge Econometrics to assess the level of dependency in the 27 EU Member States (EU-27) on imported oil, and how it exposes them to environmental and supply risks. This version of the report builds upon previous analysis originally carried out in 2016 and 2018¹ and comprises:

- 1) a review of historical data on oil dependency in the EU;
- 2) an assessment of the EU's consumption and imports of biofuels.

Findings from previous editions of the report² relating to the EU's exposure to geopolitical risk through its oil imports and the EU's dependence on non-EU oil companies, are summarised in the Executive Summary and Conclusions.

We summarise our key findings below.

Historical trends in EU oil dependency

The most recent data shows that crude oil and petroleum products account for close to half of final energy consumption in the EU.³ Most of this demand is from the transport sector, particularly from road transport.

Although domestic energy demand has fallen in recent years, crude oil extraction in the EU-27 has fallen at a faster rate. The departure of the UK from the EU has exacerbated this trend, since it had accounted for 70% of EU-28 crude extraction in 2018. **This has led to an increased dependency on oil imports. As of 2018, the EU-27 relies on imports for 96% of its crude oil supply.**

The EU's crude oil refining sector has capacity of around 688 Mt pa, representing around 13% of global crude refining capacity.⁴ However, crude oil production in the EU is relatively low, and in decline. Therefore, of the total tonnage of petroleum products imported to the EU, the majority (75%, 508 Mt) is imports of primary crude oil, which is used as feedstocks for EU refineries. **In 2018, total spending on crude oil imports in the EU was €211bn (equivalent to 1.5% of EU GDP, or €473 per capita).**

Since 2015, there has been an increase in the volume of oil imported, as the lower oil price has driven a reduction in domestic production and an increase in demand. In 2018, crude oil imports (in volume terms) were 8% higher than in 2014, and in 2017 they reached their highest level since 2008.

¹ Earlier editions of this report focused on the EU-28 Member States. In this report, 'EU' refers to the EU-27, as of 2020 (i.e. does not include the United Kingdom), unless otherwise specified.

² Transport and Environment (2016), 'A Study on Oil Dependency in the EU'.

<https://www.transportenvironment.org/publications/europe-increasingly-dependent-risky-oil-imports>

Cambridge Econometrics (2018), 'Oil Dependency in the EU'.

<https://www.camecon.com/what/our-work/oil-dependency-in-the-eu/>

³ In this report, we use the terms 'final demand' and 'final consumption' to refer to the sum of 'available for final consumption', 'international aviation' and 'international maritime bunkers', as these terms are defined in the Eurostat Energy Balances.

⁴ BP Statistical Review of World Energy 2019.

EU refineries have the capacity to meet most of the domestic demand for refined fuel. However, in 2018, over €77bn was spent on imports of refined fuels, such as diesel. Importing a large volume of refined fuel limits the potential for value added in the domestic petroleum refining sector.

The transport sector accounts for more than two thirds of the EU's final demand for oil and petroleum products.⁵ This poses a particular issue of reliance, as it is difficult to find substitutes for petrol and diesel in the short term and, as a result, consumers must absorb changes in oil prices.

Exposure to security of supply risk

An important aspect of oil dependency is the region, country or oil field from which the oil is imported. This is particularly so when considering exposure to security of supply risks and environmental risks.

In 2018, around 31% of EU crude oil imports came from Russia, a further 10% came from Nigeria and sub-Saharan Africa, 21% came from the Middle East and 9% from North Africa. **A high proportion of EU oil imports are from geopolitically unstable regions that have seen increases in terrorism, internal and border conflicts, or wars.** As a result, consumers and industries in the EU face an increased risk of oil supply interruptions and shortages.

Exposure to security of supply risk for oil imports varies substantially across Member States. Some EU Member States, such as Denmark and Italy, produce crude oil domestically and have several large ports. These additional supply options provide some flexibility to switch to other sources if infrastructure or geopolitical factors cut off supply from one country.

Other European Member States rely heavily on just one or two oil exporting countries, which increases their exposure to supply risks. This is particularly evident in the data for countries in central and eastern parts of Europe, especially Slovakia and Finland, which are reliant on Russia for over 90% of their supply of crude oil. Furthermore, the sources of crude oil available to landlocked Central European countries (such as Slovakia, the Czech Republic and Hungary) is limited because they have no ports for oil tankers and so are fully reliant on oil pipelines from Russia and the former Soviet Union. The Russian annexation of Crimea in 2014 increased geopolitical instability in the region and heightened concerns about the availability of Russian oil and gas supplies to these EU Member States.

Dependence on oil extraction and petroleum refining companies⁶

EU oil import dependency can also be analysed in terms of imports by company, specifically the share of EU oil imports sourced from non-European companies. Rosneft, Equinor (former Statoil), Saudi Aramco and NIOC are responsible for the highest share of crude oil sales to the EU. The headquarters and primary operations for all four of these companies are located outside of the EU.

⁵ We include the Eurostat Energy Balances categories of 'international aviation' and 'international maritime bunkers' in our calculation of transport sector energy consumption.

⁶ The findings in this subsection have not been updated for this edition of the report. Here we present instead findings from earlier editions of the report.

We estimate that over 80% of crude oil imports and 95% of refined oil imports to the EU are from non-European companies.⁷ Since much of the economic value added in the oil supply chain is based outside the EU, it is the oil exporting regions that benefit from the jobs and investment.

Domestic production of refined petroleum creates some economic benefits for EU Member States. However, these economic benefits are limited due to the nature of the industry, which typically has a small value chain and low labour intensity. Furthermore, some of the profits generated by these companies are likely to flow out of the EU economy to benefit shareholders abroad.

Biofuels

Liquid biofuels, previously viewed as a less carbon-intensive alternative to oil and petroleum products, have rapidly increased as a source of energy in the EU, with primary supply increasing by a factor of 43 over the period 2000 to 2018. This trend has primarily been driven by the road transportation sector, which accounts for 96% of all final consumption of liquid biofuels in the EU. Biofuels now constitute 6% of all final energy consumption in road transport.

A large fraction of these biofuels were produced from unsustainably sourced palm oil, producing biodiesel that is more polluting than its fossil fuel equivalent, once emissions from indirect land-use change (such as the clearing of rainforests for cultivation) are accounted for. Among refined biofuels imports for which we can trace the country of origin, **palm oil-based biodiesel accounted for over half of all EU refined liquid biofuels imports in 2018.**

However, the proportion could be even higher than this, **since the country of origin is unspecified for over half of EU biofuels imports tracked by Eurostat.** The lack of data makes it more difficult to conduct an assessment of critical issues relating to refined biofuels imports, such as the concentration of countries of origin, the type of feedstock used and the environmental damage that their production is causing. To better understand these risks, greater transparency in the reporting of these data is required, including an accessible centralised database for the new reporting requirements outlined in the Revised Renewable Energy Directive (EU/2018/2001).

Imports of raw material inputs to biofuel production have also increased substantially over the last 20 years; particularly of palm oil, of which 53% of imports are used in the production of biofuels.⁸ **Nearly a fifth of all liquid biofuels produced in the EU are derived from imported palm oil.**

Over the last decade, the EU has promoted a transition towards 'second generation' biofuels, based on agricultural and industrial waste materials, but uptake has been slow: second generation biofuels account for more than 2% of transportation energy consumption in only eight Member States. The EU is unlikely to ever reach sufficient productive capacity for these fuels for them to be a viable replacement for oil-based fuels.

⁷ For the purposes of this analysis, we refer to 'non-European companies' as companies with head offices based outside of the EU or Norway.

⁸ Transport and Environment (2019), 'The trend worsens: More palm oil for energy, less for food'.

<https://www.transportenvironment.org/sites/te/files/publications/final%20palm%20briefing%202019.pdf>

Conclusions The EU's dependency on crude oil and refined fuel imports is high and rising. Much of this oil comes from geopolitically unstable regions. This makes the EU economy, particularly its transport sector, vulnerable to supply and price shocks.

The European Commission has put in place measures to reduce these risks and improve Europe's energy security. The Oil Stocks Directive, for example, requires EU Member States to hold stocks of oil to reduce the effects of supply shortages. However, in the longer term, there is a need to reduce use of petroleum products in order to reduce exposure to security of supply risk. This would have the added benefit of helping to meet climate change commitments. According to the Carbon Tracker Initiative, we can only afford to emit carbon dioxide at 2019 rates for 13 more years if we are to have a 50% chance of staying below 1.5°C global warming.⁹

While the transition towards crop-based biofuel substitutes for petroleum products promised much, it has instead backfired, compounding life-cycle carbon emissions rather than reducing them. A more difficult transition towards second-generation biofuels awaits, but supply is unlikely to ever reach levels sufficient to meet the current demand for petroleum products.

⁹ Carbon Tracker Initiative (2019), 'Balancing the Carbon Budget – Why deflating the carbon bubble requires oil and gas companies to shrink'. <https://carbontracker.org/reports/balancing-the-budget/>

1 Introduction and background

The purpose of this study is to assess the EU's oil dependency and the risks associated with imported oil. This version of the report builds upon previous analysis carried out in 2016 and 2018.

The remainder of the report is split into four chapters.

- Chapter 1 presents recent trends in domestic oil consumption and oil imports. It discusses oil dependency in light of the recent fall in the oil price and discusses key EU policies introduced to alleviate the risks associated with oil import dependency.
- Chapter 2 presents insights from recent data on oil import dependency.
- Chapter 3 presents trends in EU biofuels consumption and imports.
- Chapter 4 concludes with the key messages emerging from the study.

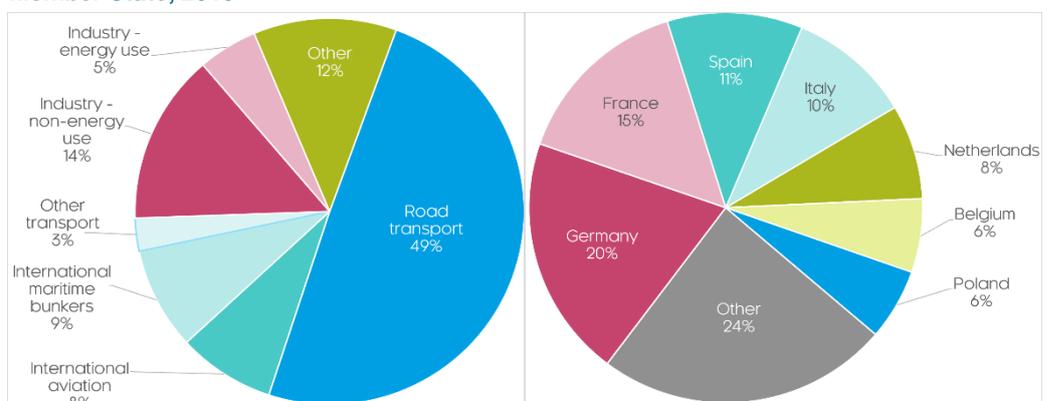
1.1 Historical use of oil and petroleum products in the EU

Sectoral demand for oil and petroleum products

In 2018, crude oil and petroleum products accounted for 45% of final energy consumption in the EU-27. As shown in Figure 1.1, more than two thirds of final demand for oil (349 Mtoe pa)¹⁰ comes from the transport sector. Road transport alone accounts for 49% of final demand for petroleum products (250 Mtoe pa).

Industry accounts for 19% of oil consumed in the EU. In 2018, industry use of oil for energy (i.e. burning fuel to generate heat) was 25 Mtoe pa (5% of final demand for oil products). In addition, large volumes of oil and petroleum products were used in industry for non-energy purposes. Most notably, the chemicals industry used over 60 Mt of refined petroleum products as raw material inputs for the manufacture of plastics and chemical products.

Figure 1.1: EU final consumption of oil and petroleum products by end user and by Member State, 2018



Source: Eurostat Energy Balances

Since 2000, there has been a gradual decline in final consumption of oil and petroleum products in the EU (on average by 0.4% pa). This reduction is due

¹⁰ Millions of tonnes of oil equivalent, a measure of the energy contained in a quantity of fuel.

to improvements in vehicle and industry energy efficiency, a transition to alternative fuels and, in more recent years, reduced demand as a result of the global economic downturn that followed the Global Financial Crisis. The COVID-19 pandemic has reduced oil demand still further, and may prove to have lasting effects as the globalisation of supply chains recedes, firm and consumer behaviour changes, and fears over air pollution increase.

Oil consumption from transport rose by 36% over the period 1990-2007, driven by increases in demand, and while consumption fell gradually over 2007-13, it has since slowly risen again as energy efficiency improvements in transport have, so far, been insufficient to offset recent increases in transport demand, and increases in the size and weight of vehicles. In 2017, GHG emissions from transport were also 36% above 1990 levels. These figures show that there is considerable action required to reach zero emissions from transport, as is required to meet the commitments made in the Paris Agreement.

Consumption of oil and petroleum products varies substantially across EU Member States. As shown in Figure 1.1, Germany, France, Spain and Italy, the four largest and most populous EU countries, account for over half of final EU oil consumption.

Oil intensity of GDP

Oil intensity of GDP is defined as the volume of oil consumed per euro of GDP, reflecting how much an economy is dependent on oil. There is a large variation in the oil intensity of EU Member State economies, with Malta, Cyprus and Bulgaria the most oil-intensive Member States. In all EU Member States, the oil intensity of GDP has declined over recent decades because of energy efficiency improvements, partly in response to policy efforts such as the introduction of vehicle emissions standards. However, since 2015, low oil prices have put some upward pressure on EU oil demand, which may persist in the longer term, if it is not sufficiently constrained by low carbon energy policy such as more stringent EU vehicle emissions regulations.

The impact of oil on the European economy

As most oil is imported, demand for oil (and oil-based products) results in large amounts of money leaving the European economy. Shifts in demand for oil, as well as its price, therefore impact upon the performance of the economy. Increasing demand, or a higher price (meaning that it costs European consumers and businesses more to meet their demand) leads to higher leakage from the domestic economy, and reduces the amount that Europeans have to spend on other goods and services, while the opposite is true of a lower price or a fall in demand.

1.2 Supply shocks and oil price volatility

Oil price volatility

Oil prices are inherently volatile. As shown in Figure 1.2, over the past fifteen years alone, oil prices rose steeply (to a high of over \$140/bbl in Summer 2008), then fell (to around \$30/bbl in early 2016), before rising again (to \$80/bbl in late 2018). In April 2020, oil prices fell steeply and some oil contracts registered negative prices in the US for the first time in history. Large fluctuations in the oil price lead to economic and financial uncertainty, which can reduce investor confidence and suppress economic growth.

Historically, dependence on oil in the EU during periods of high oil price shocks has led to economic instability. Oil price shocks in the 1970s and early 1980s, for example, prompted two deep recessions, high inflation and large trade deficits. The price spike in 2008 also raised price inflation in much of the EU, not least because of its impact on the cost of mobility, for which short-term price elasticities are typically low.

Figure 1.2: Brent crude oil spot price, 2000-2020



Source: US Energy Information Administration, Weekly Europe Brent Spot Price FOB.

Events show how oil prices are susceptible to negative as well as positive shocks. In the latter half of 2008, falling demand at the onset of the global economic downturn caused the oil price to plummet, from a high of \$141/bbl in July 2008, to a low of \$35/bbl in January 2009 (a 75% fall in just six months).

More recently, the shale gas boom in the US and a decision by OPEC to refrain from withholding supply led to another sharp fall in the oil price to a low of \$30/bbl in early 2016. Following a brief recovery, the Brent Crude oil price collapsed again to a low of \$14/bbl in April 2020, as a result of reduced demand, alongside continuing high levels of supply and a lack of available storage facilities, during the early months of the COVID-19 pandemic. A fall in oil prices provides a real-income boost to energy importers; but unexpected price shocks hit stock markets and damage business confidence.

Future oil prices

There is high uncertainty around the future oil price due to uncertainties about future long-term levels of oil demand and supply. In the wake of the global economic downturn caused by the COVID-19 pandemic, oil demand fell sharply, depressing prices. It is not clear to what extent oil demand will recover from this crisis - it is possible that some portion of economic growth will have been permanently lost due to the pandemic, leading to a so-called 'L-shaped' recovery.

In the long run, however, in the absence of substantial low-carbon policy efforts implemented on a global scale, it is expected that oil demand (and oil prices) will start to increase again as a result of economic growth, population growth and an increase in demand for passenger cars in the developing world.

In 2019, the International Energy Agency forecasted 0.4% average annual growth in oil demand until 2040 under its 'stated policies' scenario, and 1% growth under its 'current policies' scenario.¹¹

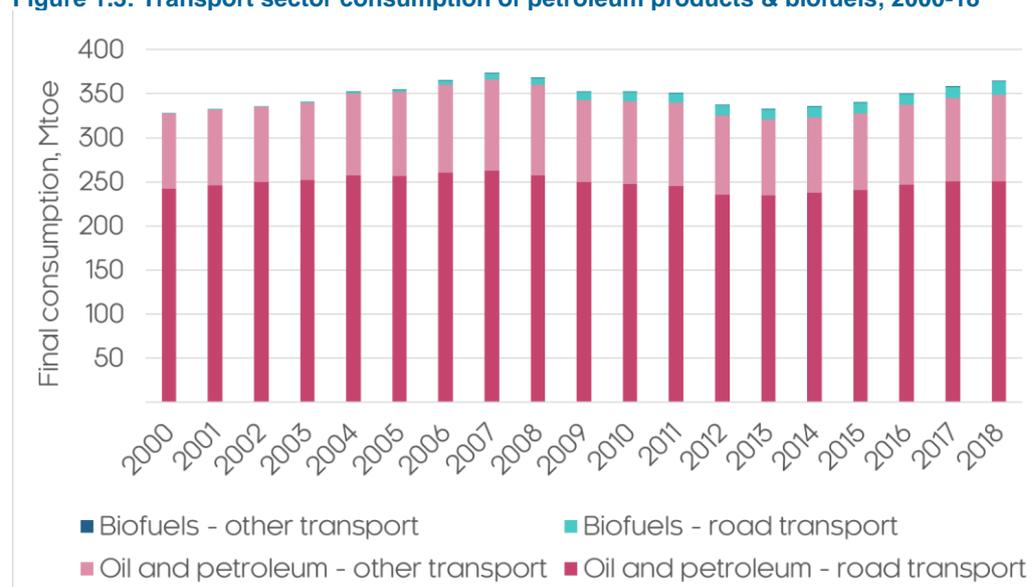
The action required to limit climate change is becoming more urgent, and ambitious action in this area could have a material impact on oil demand and prices. It is unclear what the ultimate impact of COVID-19 on the likelihood of such a policy shift will be. On the one hand, there is an opportunity to reassess the use of fossil fuels as energy sources: for one, the public health costs of local air pollution may weigh more heavily in the minds of policymakers than before. On the other hand, politicians may feel themselves under more pressure than previously to prioritise short-term economic concerns above long-term environmental planning.

Whatever the future oil price, it is clear that fuel efficiency improvements and measures to reduce demand for oil will improve the EU economy's resilience to future oil price shocks.

1.3 Historical consumption of biofuels in the EU

Biofuels are becoming an increasingly significant part of the EU's energy market, accounting for 1.5% of the total EU primary energy supply in 2018. This trend has largely been driven by the transport sector in response to changes in EU legislation, which have aimed to reduce the sector's reliance on fossil fuels. While the transport sector's consumption of oil and petroleum products has remained relatively stable since 2000, its consumption of liquid biofuels has increased 43-fold over the same time period, with road transport accounting for essentially all of this demand (Figure 1.3). As discussed in Chapter 3, the EU depends on imports of biofuels (as well as imports of the 'crude' raw material inputs to biofuels production) for a significant part of its supply.

Figure 1.3: Transport sector consumption of petroleum products & biofuels, 2000-18



Source: Eurostat Energy Balances

¹¹ International Energy Agency, 'World Energy Outlook 2019'.

1.4 EU policy context

Oil and petroleum products are an important part of the energy mix but the EU has become increasingly dependent on imported sources of oil to meet domestic demand. Energy policy in the EU will need to carefully consider the role for oil and petroleum products in the future energy mix and how risks associated with high dependence on oil imports can be mitigated. The table below summarises key policies that the EU has put in place to reduce its dependency on oil imports, including:

- The Energy Union Framework
- The Energy Security Strategy
- The Oil Stocks Directive
- Vehicle Emissions Regulation
- The Revised Renewable Energy Directive

Measure	Description
The Energy Union Framework	<p>In 2015, the Energy Union strategy was established to ensure that the EU's energy supply was secure, affordable and sustainable. Legislative proposals followed in October 2016. One aspect of the Energy Union includes an ambition to reduce dependence on energy imports and to diversify energy supply in order to reduce exposure to supply shocks from geopolitical risk. Import dependency is particularly high for crude oil (where imports in 2018 accounted for 96% of gross inland oil consumption, compared to 83% import dependency for gas supply and 44% import dependency for supply of solid fuels). Reducing reliance on oil imports will be key to achieving these specific Energy Union goals.</p> <p>The Energy Union also includes an ambition to improve energy efficiency (by at least 32.5% by 2030), to decarbonise the economy (to achieve a target of 40% emissions reduction by 2030) and to become a global leader in clean energy technologies. Low carbon transport policy and other policy measures to reduce domestic oil consumption will be an important factor in achieving these targets.</p>
EU Energy Security Strategy	<p>Many countries in Europe (and particularly in Eastern Europe) are reliant on just one or two sources of oil and gas supply and this over-reliance on a small number of sources creates security of supply vulnerabilities. The EU Energy Security Strategy aims to mitigate the risks associated with high dependence on insecure energy supplies and, to some extent, complements the aims of the Energy Union. The strategy was launched in May 2014, predominantly in response to the Russian annexation of Crimea, which disrupted European imports of Russian gas that transit through pipelines in Ukraine.</p>

	<p>As part of the Energy Security Strategy, the European Commission carries out stress-testing to assess the likely impacts of disruptions to key sources of oil and gas supply. Through this they have previously identified some key vulnerabilities in the EU oil and gas system.</p> <p>Longer term measures in the Energy Security Strategy include a goal to increase domestic energy production and diversify sources of supply by negotiating effectively with current and new trade partners.</p>
The Oil Stocks Directive	<p>Another initiative to help mitigate the impacts of oil supply shortages is the 2009 Oil Stocks Directive. The Directive requires all EU Member States to maintain stocks of crude oil and/or petroleum products equivalent to at least 90 days of net imports or 61 days of consumption (whichever is higher), which can be quickly and easily accessed during periods of supply crisis.</p>
Vehicle Emissions Regulation	<p>In 2019, the European Parliament and Council adopted legislation (EU/2019/631) setting emissions performance standards for new cars and vans. Targets from earlier legislation (95g CO₂/km and 147g CO₂/km, respectively) remained in force from 2020, while new targets were introduced for 2025 (15% lower than 2021 levels, for cars and vans) and for 2030 (37.5% and 31% lower than 2021 levels, respectively).</p> <p>In the same year, the EU also introduced its first-ever emissions standards for heavy-duty vehicles (EU/2019/1242), requiring them to be 15% more fuel efficient by 2025, and 30% more fuel efficient by 2030, compared to 2019-20 levels. This legislation also provided an incentive mechanism for the production of zero-emission and low-emission (i.e. more than twice as efficient as the average vehicle in 2019-20) heavy-duty vehicles. The targets are due to be reviewed in 2022, offering an opportunity to further accelerate the transition towards low-carbon trucking.</p>
The Revised Renewable Energy Directive	<p>The Revised Renewable Energy Directive (RED II), adopted in 2018, replaced the original 2009 RED, which had set a minimum target of 10% energy sources in the transport sector to be from renewable sources (such as renewable electricity and biofuels) by 2020. This original RED target led to increased use of crop-based biofuels, many of which were associated with greater carbon emissions than the fossil fuels they were intended to replace, due to indirect land-use changes as a result of forest and peatland clearing for the cultivation of energy crops such as palm.</p> <p>In response, the RED II removed these ‘first-generation’ crop-based biofuels from its mandatory target, focusing a new 7% target by 2030 on advanced fuels, including renewable electricity and ‘second-generation’ biofuels, which are</p>

produced using agricultural, industrial and food wastes and residues as inputs.

In addition to relative quantities of different fuels in transport, the EU also regulates the quality of those fuels through the Fuel Quality Directive (2009/30/EC). This legislation requires a minimum 6% reduction in the life-cycle carbon intensity of transport fuels from 2010-2020. The Fuel Quality Directive was amended in 2015 to include the reporting of emissions from indirect land-use change (ILUC). It also covers other elements of fuel quality, such as sulphur content.

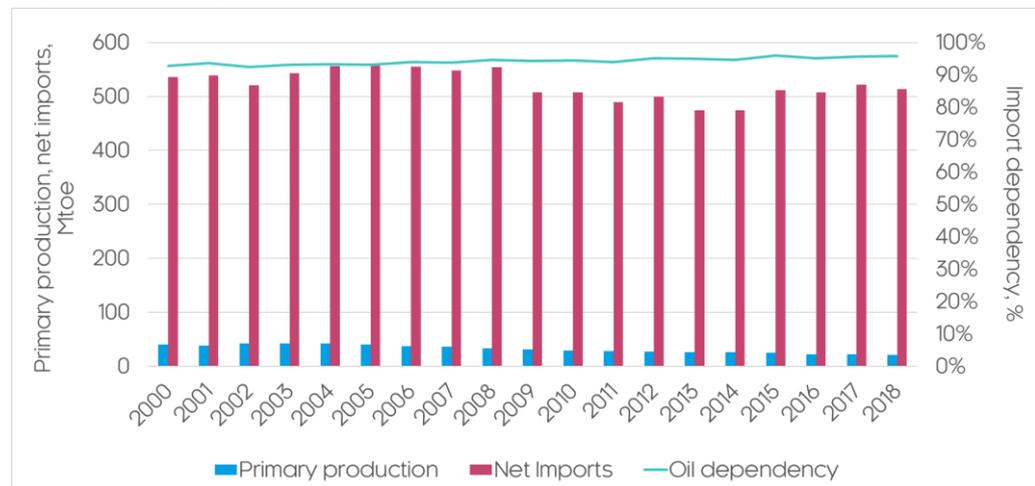
2 EU dependency on oil imports

2.1 Oil import dependency in the EU

Over the past 20 years, the EU has remained highly dependent on imports to meet its oil demand, with 96% of supply sourced from net imports in 2018. This reflects falling crude oil production within Europe, with domestic production falling by 46% since 2000, much more rapidly than the fall in demand for oil over the same period.

The slower rate of change in crude oil dependence in recent years largely reflects the fact that overall demand has stabilised, while the rate of decline in production has also recently slowed. However, the EU's share of global production is expected to continue to fall in the future – the EU's proven oil reserves reached a record low of 0.14% of global reserves in 2018.

Figure 2.1: Primary production and net imports of crude oil in the EU, 2000-2018



Source: Eurostat Energy Balances

Oil dependency has increased significantly since the departure of the UK from the EU in 2020, which had been responsible for 70% of crude oil production in the EU-28 in 2018. There are now only five countries in the EU that have a domestic crude oil extraction industry with output greater than 1 Mt per year: Denmark, Italy, Romania, Germany and Poland. Other than Denmark, Romania, Hungary and Croatia, all EU Member States depend on imports for more than 90% of their domestic crude oil supply.¹² In 2018, total spending on crude oil imports was €211bn, equivalent to 1.5% of the EU's GDP, or €473 per EU citizen.

Total EU crude oil imports have risen by 8% since 2014; total supply of oil has risen slightly as economic activity has increased, while the oil intensity of the economy has remained broadly constant and oil prices have remained relatively low. Oil and refined oil products' share of final energy demand has remained steady at around 45% in volume terms.

¹² Estonia, Cyprus, Malta, Latvia, Luxembourg and Slovenia neither produce nor consume crude oil, since they have no refinery capacity and rely entirely on imports of refined oil.

Gasoline and fuel oil remain the only petroleum products of which the EU is a net exporter. In 2018, just under a quarter of gasoline exports went to the United States and the majority was sourced from the Netherlands and Italy.

The total value of diesel oil imports reached €34.8bn by 2018. Similarly, gasoline imports to the EU have picked up in the past 5 years, and totalled €2.5bn in 2018.

As with the import of any commodity, money spent on oil imports flows out of the domestic economy to the benefit of foreign producers. In a previous edition of our report,¹³ we estimated that in 2017 80% of crude oil imports, and 95% of imports of refined oil products, were from non-European companies.¹⁴ While some European-registered companies operate global oil fields, the profits from these that flow back to the EU economy (e.g. in the form of returns to shareholders such as pension funds) tend to be small in comparison to the amount spent on imported oil. This is because shares in these companies are owned by investors across the globe, not just Europeans. Furthermore, some imports are sourced from state-owned oil companies which have no European shareholders.

The total value of trade¹⁵ in refined petroleum products has risen in the last few years, from €179bn in 2016 to €255bn in 2018, with gross imports from outside the EU rising from €54bn to €77bn. This change is almost entirely attributable to changes in prices, as volumes declined slightly over the same period. Net exports of refined petroleum products rose slightly, from €7bn to €12bn. Whilst revenues from EU oil and petroleum exports do benefit the domestic economy, they are small in scale, relative to expenditure on EU imports of crude oil and petroleum. The oil extraction and refining sectors also have relatively small supply chains and a low labour intensity, which limits the macroeconomic benefit of oil export sales revenue.

2.2 Sources of oil imports in the EU

The composition of major importers of crude oil into the EU has remained broadly steady in recent years. Russia continues to dominate, contributing 31% of total crude oil import volumes. The rest of the 'top 10' importers have maintained a steady market share of around 85-90%, usually led by Russia and the Middle Eastern and African OPEC members. Combined, OPEC members accounted for 40% of EU crude oil imports in 2018.

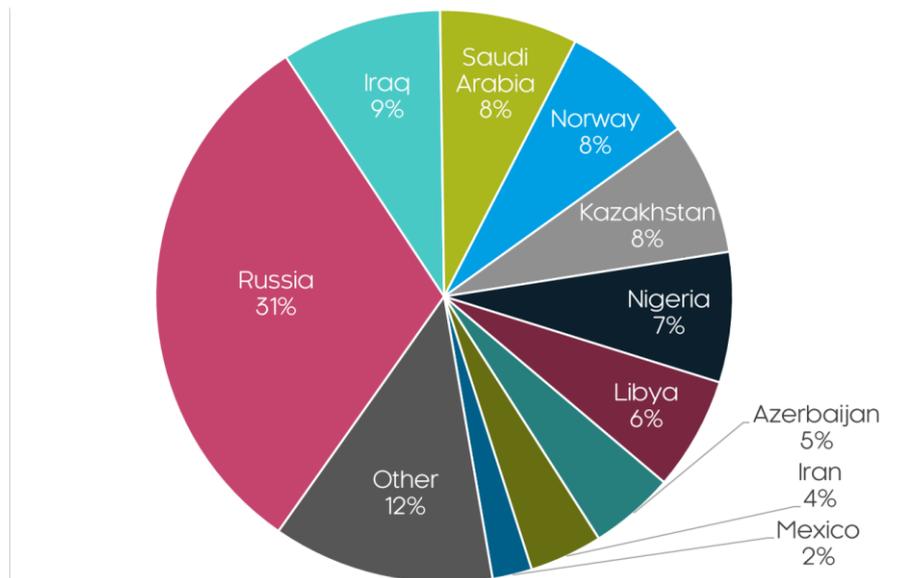
However, there are significant differences in the source of crude oil imports across Member States. In **Error! Reference source not found.**, we show the share of extra EU imports sourced from Russia by Member State. Many central and eastern European Member States are heavily reliant on Russian crude oil imports; for example, Poland sourced 79% of its extra-EU imports of crude oil from Russia in 2018, whereas Austria sourced only 3% of imports

¹³ Cambridge Econometrics (2018), 'Oil Dependency in the EU'. <https://www.camecon.com/what-our-work/oil-dependency-in-the-eu/>

¹⁴ In that analysis, 'non-European' companies were defined as those whose headquarters were located outside of the EU and Norway.

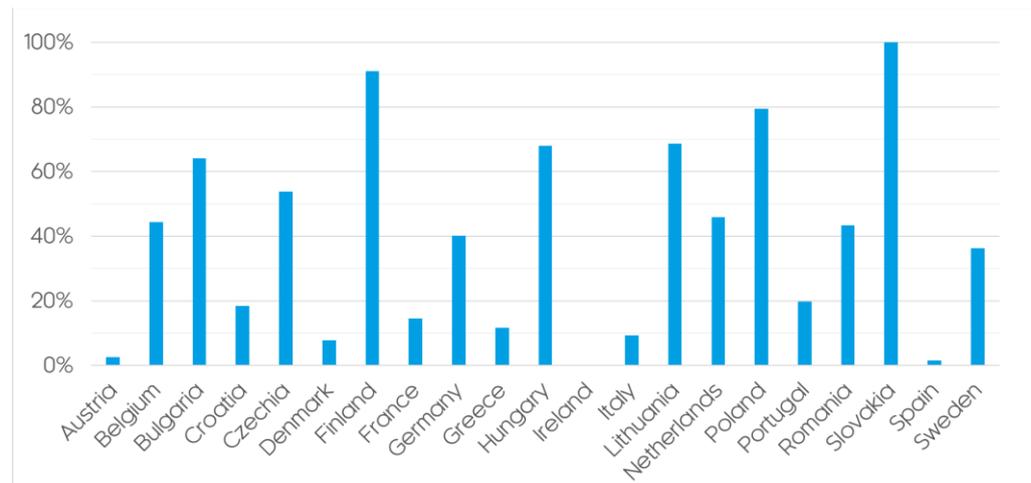
¹⁵ 'Total value of trade' here refers to the sum of imports from non-EU countries, exports to non-EU countries, and imports from EU countries. Exports to EU countries are excluded to avoid double counting.

Figure 2.2: Sources of EU crude oil imports, 2018



Source: Eurostat Energy Balances

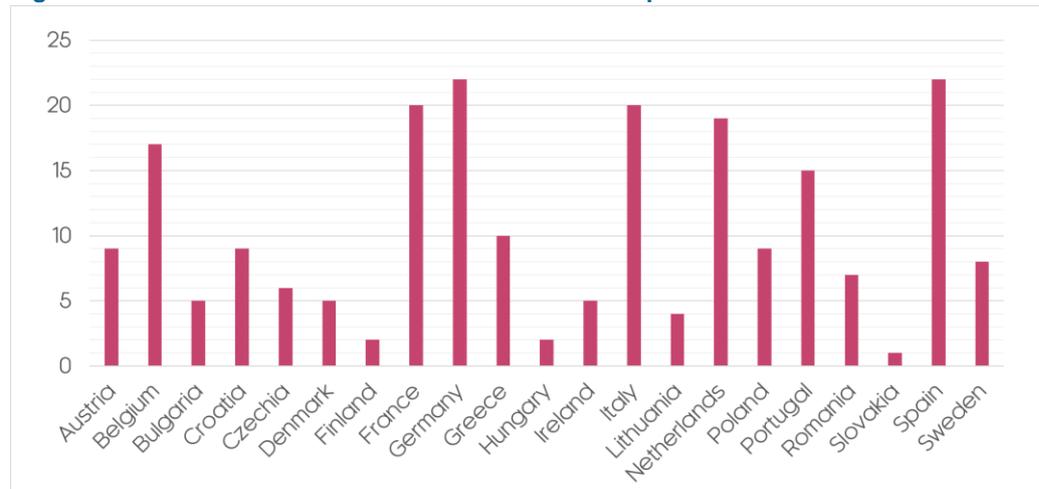
Figure 2.3: Share of extra-EU crude oil imports sourced from Russia, 2018



Source: Eurostat Energy Balances

from Russia. While Poland, Lithuania, Hungary and Bulgaria have gradually reduced their dependence on Russian imports in recent years, Finland and Slovakia's shares have remained at high levels, with above 90% of imports from Russia in 2018.

The diversity of supply, shown in Figure 2.4, is a further indicator of security of supply risk. While Germany imported crude oil from a diverse range of 22 non-EU countries, Hungary and Finland, in contrast, imported crude oil from just two countries, and Slovakia imported crude oil from Russia only.

Figure 2.4: Number of extra-EU sources for crude oil imports

Source: Eurostat Energy Balances

3 Biofuels imports to the EU

This century, the EU-27 has seen a rapid uptake of biofuels in the transportation sector as a replacement for traditional fossil fuels, as part of its efforts to meet its climate change commitments. This transition has partly been driven by a series of EU directives, notably the Renewable Energy Directive (2009/28/EC), which set targets for the use of renewable energy in transport.¹⁶

However, numerous studies over the last two decades have found that the emissions reductions achieved by crop-based biofuels are outweighed by increased emissions from indirect land-use change (ILUC), as their cultivation has led indirectly to the clearing of carbon-rich ecosystems such as rainforests and peatlands.¹⁷ Most crop biofuels in the EU are consequently more carbon-polluting than their fossil fuel equivalents when their full life-cycle emissions are considered.

The EU has since addressed part these concerns with new legislation, including the ILUC reform (2015/1513/EU) and the Revised Renewable Energy Directive (2018/2001/EU), which excludes crop-based biofuels from the binding part of the renewable fuels target, in favour of a 7% target for 2030 placed on advanced fuels, including 'second generation' biofuels, which can be produced from various industrial, agricultural and food wastes and residues, among other sources.

This chapter assesses recent trends in EU imports of liquid biofuels, and of the raw input materials for their production.¹⁸

3.1 Biofuels import trends in the EU

Liquid biofuels

Demand for liquid biofuels in the EU has increased substantially over the last 20 years, a trend that has been almost entirely driven by the transport sector. In 2018, the EU consumed 62% more biofuels than in 2009, and nearly 43 times more than in 2000 (Figure 3.1). Biofuels now account for 4% of transport energy consumption in the EU, and 6% of EU road transport consumption. In 2018, the transportation sector accounted for 96% of final consumption of biofuels in the EU.¹⁹

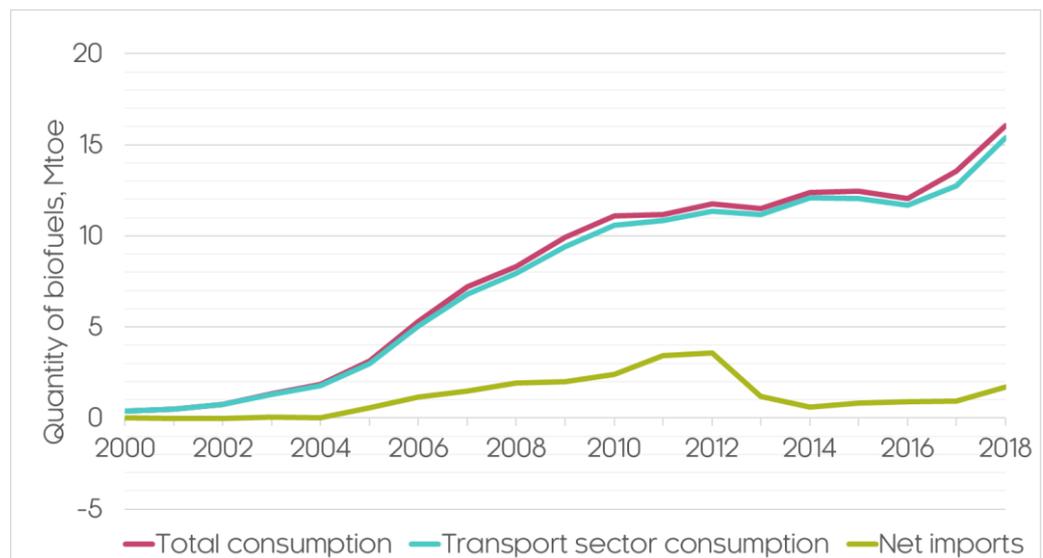
¹⁶ Other relevant directives include the Biofuels Directive (2003/30/EC), and the Fuel Quality Directive (2009/30/EC).

¹⁷ A list of relevant studies can be found at <https://www.transportenvironment.org/what-we-do/what-science-says-0>.

¹⁸ In this report, we use 'biofuels' to refer to liquid biofuels, unless otherwise specified. For raw materials, we analyse vegetable oils only (biodiesel inputs): these form a larger part of the raw material inputs to these biofuels include both sugars and cereals (for bioethanol) and vegetable oils (for biodiesel), this chapter only analyses the latter group, as biodiesel is a much more significant proportion of overall biofuels consumption in the EU, and poses a much higher ILUC risk (Cerulogy 2019).

¹⁹ Figures measured in tonnes of oil equivalent.

Figure 3.1: Liquid biofuels in the EU-27: consumption, transport consumption & net imports, 2000-18



Source: Eurostat energy balances

While the EU produces much of its own biofuels supply, imports gradually rose in importance until 2011, when net imports accounted for 25% of primary biofuels supply. This share then dropped dramatically from 2012, when the EU announced an anti-dumping investigation into Indonesian and Argentinian biodiesel, before imposing duties in 2013. When these were both overturned by the World Trade Organisation in 2018, imports of biofuels increased by 41% compared to their 2017 levels, so that, by 2018, net imports accounted for 10% of the EU's biofuels supply. New anti-dumping duties were subsequently re-imposed on Indonesia and Argentina in 2019; future import volumes in the near term will depend greatly on the ultimate success or failure of these new duties.

Vegetable oils

Whilst much of the EU demand for processed biofuels is met by domestic producers, these producers import significant proportions of their raw input materials. The last 20 years have seen a dramatic increase in net imports of vegetable oils, which are used as raw inputs in the production of biodiesel (Figure 3.2).²⁰ Palm oil alone explains nearly all of this figure, as its net imports more than doubled from 2009-18, while net imports to the EU of other oils fell close to zero in 2018. This increasing trend in palm oil imports has continued despite numerous policy efforts and consumer campaigns to reduce demand for palm oil products, due to concerns over ILUC effects on greenhouse gas emissions and biodiversity. Biofuels are a significant driver of these palm oil imports: a previous Transport & Environment briefing found that 53% of all

²⁰ Apart from palm oil, the major vegetable oil inputs into EU biodiesel production include sunflower, rape and soya bean oils. UN Comtrade bundles data for sunflower seed oil with safflower and cotton oils, and rapeseed oil with colza and mustard oils, due to their similar chemical structure.

palm oil consumed in the EU-28 in 2018 was ultimately used in the production of biodiesel.²¹

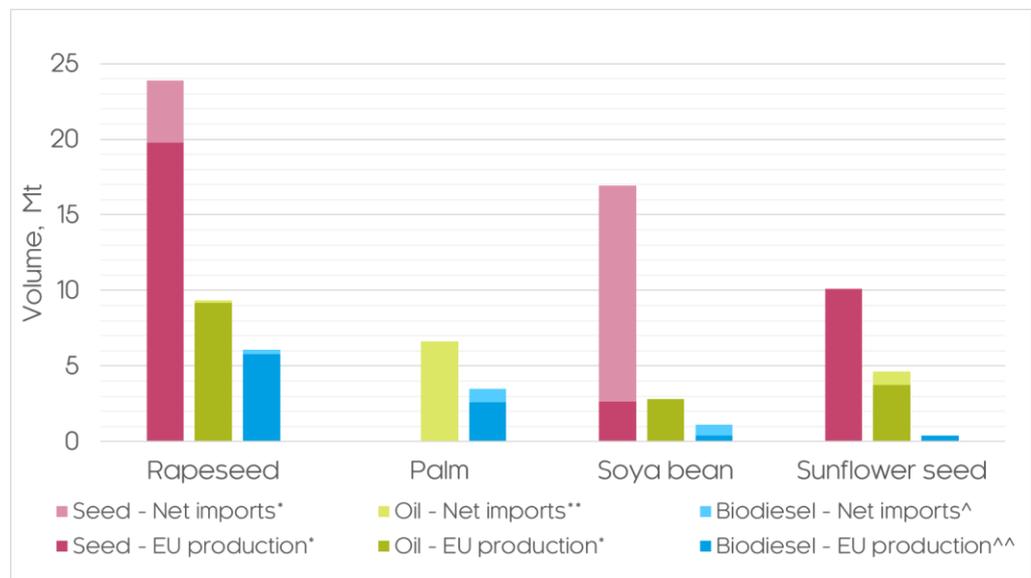
Figure 3.2: Net imports of selected vegetable oils, 2000-18



Source: UN Comtrade

Note: UN Comtrade bundles data for rape and sunflower seed oils with other oils that have a similar structure (colza and mustard, and safflower and cotton oils, respectively).

Figure 3.3: From seed to oil to biodiesel: sources of EU biodiesel supply and raw material inputs, 2018



* Oil World (EU-27 figures).

** UN Comtrade (EU-27).

^ Eurostat Energy Balances (EU-27).

We have assumed that biodiesel imported from Malaysia and Indonesia is derived from palm oil; Argentinian imports from soya bean oil; and EEA imports from rapeseed oil.

^^ EU Agricultural Outlook 2019-2030 (EU-28).

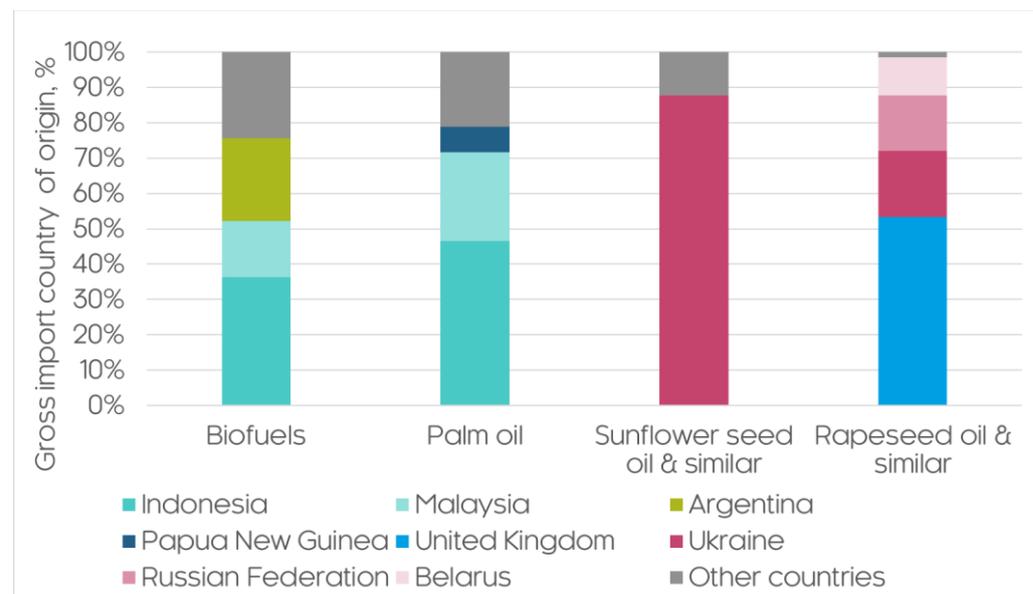
²¹ Transport and Environment (2019), 'The trend worsens: More palm oil for energy, less for food'. <https://www.transportenvironment.org/sites/te/files/publications/final%20palm%20briefing%202019.pdf>

The pattern is different for each of the main vegetable oil inputs into biodiesel (Figure 3.3). The EU uses rapeseed and palm oil for the large majority of its crop-based biodiesel production, with sunflower seed and soya bean oil making up a smaller part. Whereas the EU's supply of palm oil is entirely imported, it produces much of its own supply of sunflower, rape and soya bean oil. However, soya bean oil, in turn, is mostly produced from soya beans imported from non-EU countries. Based on these numbers, we estimate that net imports of palm oil accounted for 16% of the EU's total primary biofuels supply in 2018.²²

Import concentration

Nearly all EU imports of biofuels and vegetable oil originate from just a handful of countries, increasing fragility of supply and concentrating environmental damage from ILUC effects in regions with highly biodiverse ecosystems. In 2018, 76% of liquid biofuels import volumes to the EU-27 were sourced from just 3 countries: Argentina, Indonesia and Malaysia (Figure 3.4). Similarly, 79% of palm oil imports originate from the latter two countries and Papua New Guinea, where destruction of peatland and virgin rainforest has left lasting environmental damage, both through increased carbon emissions and disruption of local ecosystems. Imports of sunflower and rape oil are also highly concentrated, with 88% of the former sourced from the Ukraine in 2018, and 98% of the latter from just four countries.

Figure 3.4: Gross import concentration of biofuels & vegetable oils, 2018



Sources: Eurostat Energy Balances, UN Comtrade

3.2 Demand for biofuels in transport

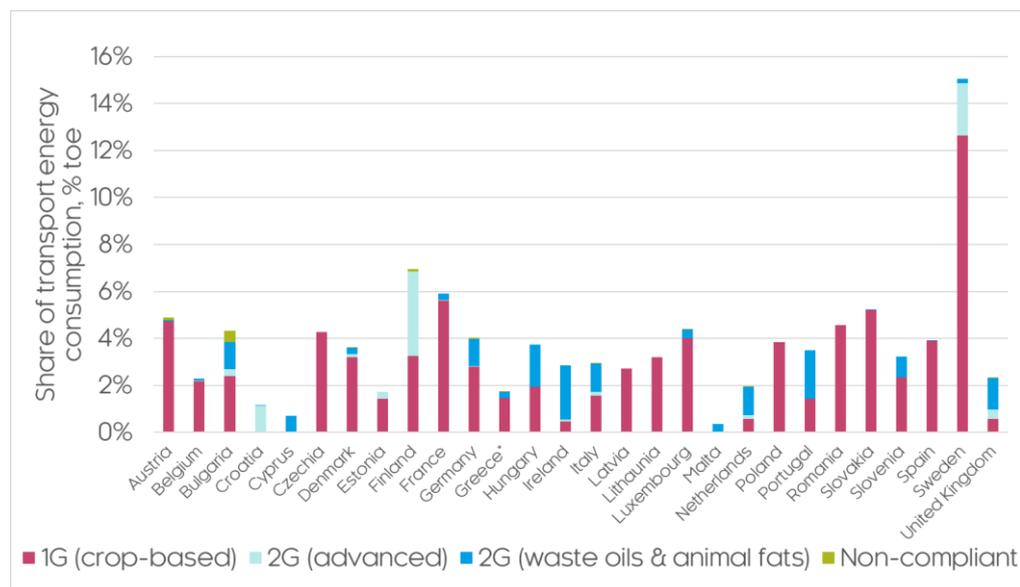
The increase in demand for biofuels in the EU over the last 20 years has largely been driven by the road transport sector. In every year since 2000, this sector has accounted for at least 93% of final biofuels consumption in the EU.

²² Using the figures shown.

1st and 2nd generation biofuels

There is a large variation across Member States in the amount and types of biofuels consumed in transportation (Figure 3.5). Sweden is a clear outlier, having been an early adopter of tax incentives to promote biofuels in the early 2000s. Biofuels in Sweden accounted for over 15% of transport fuel consumption in 2018, the vast majority of which were 1st generation biofuels. Both Sweden and Finland benefit from a steady supply of materials from the paper and pulp industry to produce relatively large quantities of so-called 'advanced' biofuels (produced from industrial wastes). Sweden, however, is still particularly reliant on biofuels products from food crops, even if much of that is now in the form of palm fatty acid distillate, a product from the palm oil refining process.

Figure 3.5: Share of biofuels in transport sector energy consumption by type, 2018



Source: Eurostat SHARES detailed results

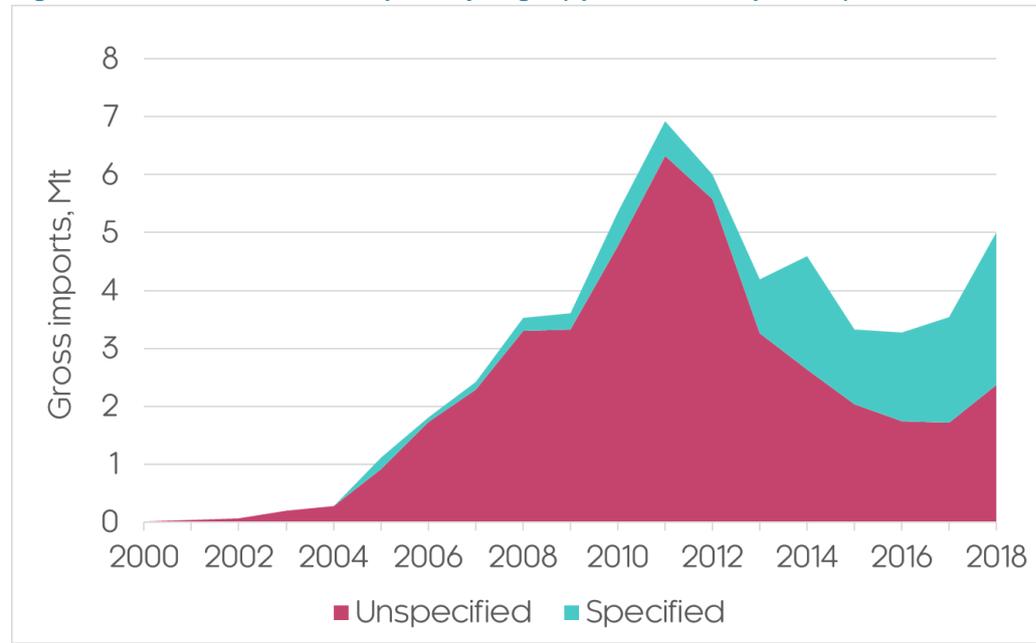
Few other Member States have had success in transitioning towards second-generation biofuels: other than Sweden and Finland, only Ireland and Portugal source at least 2% of their transport energy from such biofuels. Many more Member States lag behind, however, and still source a large share of their biofuels from food crops, particularly in Austria, Czechia, France, Luxembourg, Romania, Slovakia and Sweden, where at least 4% of transport energy comes from crop-based biofuel sources.

3.3 Transparency issues in biofuels import data

Much of the analysis presented in this chapter is hampered by inadequate data reporting from EU Member States to Eurostat on the origins of their imports of refined liquid biofuels. While the quality of data has improved somewhat since 2012 (when 93% of biofuels imports were unaccounted for), in 2018, the origins of 47% of gross import volumes of liquid biofuels from outside the EU were still unaccounted for (Figure 3.6).

Although Eurostat requests reporting countries to specify the country of origin of their imported biofuels, this is not a requirement.²³ While data for Italy, Belgium and Spain specified country of origin for the majority of their biofuels imports in 2018, many other Member States have a poor record in this respect, particularly Denmark, Finland, the Netherlands and Germany.

Figure 3.6: Gross EU biofuels imports by origin (specified or unspecified), 2000-18



Source: Eurostat energy trade data

Much stricter transparency requirements are needed if we are to take the concerns surrounding biofuels imports seriously. The Revised Renewable Energy Directive has taken an important step in this direction, obliging Member State authorities to publish information on origin and feedstock type of biofuels supplied by each fuel supplier on an annualised basis. We recommend that this data should be centralised and published in an accessible format, such as on the Member State authorities' official websites.

²³ 'Country of origin' in this case refers to the country where the good was originally produced, rather than any intermediary country through which the good was imported.

4 Key messages and conclusions

Our research into the EU's dependency on imported crude oil has identified the following key points:

1. The EU's dependency on crude oil imports is high and rising as domestic oil supplies have declined at a faster rate than demand. Imports in 2018 accounted for 96% of the EU's oil supply.
2. In 2018, total spending on crude oil imports in the EU was €211bn (equivalent to 1.5% of EU GDP, or €473 per capita). An additional €77bn was spent on refined fuel imports in 2018.
3. The EU's transport sector accounts for 69% of final demand for petroleum products. Road transport alone accounts for 49% of final demand for petroleum.
4. Much of the EU's imported oil comes from geopolitically unstable regions. This makes the EU's economy, particularly its transport sector, vulnerable to security of supply risks.
5. The EU's exposure to security of supply risks has increased in recent years. This is partly because the source of supply has shifted towards more geopolitically unstable regions. Notably, Russia's share of crude oil imports increased from 22% in 2001 to 31% in 2018. Meanwhile the share provided by Norway, a more geopolitically stable trade partner, fell by 54% over the same period.
6. Around 40% of the EU's oil imports are from the Middle East and African OPEC members. This region has a heightened risk of oil supply shortages due to war and terrorism.
7. EU Member States most exposed to security of supply risks include Slovakia and Finland, which are heavily reliant on pipelines from a single country, Russia, for their supply of crude oil.
8. The majority of the EU's spending on oil benefits foreign producers. In 2018²⁴ we estimated that, at the EU level, over 80% of companies benefiting from spending on crude oil imports and 95% of companies benefiting from spending on refined oil imports were based outside of the EU and Norway. Four of the five companies exporting the largest shares of crude oil to Europe (Rosneft, Lukoil, Saudi Aramco and Exxon) were non-European companies.
9. The EU has put some measures in place to reduce oil supply risks. The Oil Stocks Directive, for example, requires EU Member States to hold stocks of oil to reduce the effects of supply shortages.
10. However, the EU does not have proven reserves to increase domestic production. The EU will therefore need to reduce use of oil and petroleum products to further reduce exposure to oil supply risks and price shocks. Reducing demand has the added benefit of contributing towards meeting the EU's climate targets.
11. The EU's consumption of liquid biofuels has increased by a factor of 43 since 2000, as it has looked to reduce its dependency on fossil fuel energy sources in transport. Biofuels now account for 4% of transport energy

²⁴ The results in this paragraph are drawn from the previous edition of this report, published in 2018, and refer to 2017 figures. They have not been updated for this edition of the report.

consumption in the EU, and 6% of EU road transport energy consumption. Much of the supply of these biofuels, and the raw material inputs to their production, is imported from abroad, especially in the case of palm oil biodiesel.

12. However, biofuels produced from crops such as palm oil are not an adequate replacement for refined petroleum products, as imports of these are also sourced from a small number of countries, and, when indirect land-use change is taken into account, can be responsible for more carbon emissions than the fossil fuels they replace. Production of second-generation biofuels, based on waste materials, is unlikely to ever reach the levels required to replace the market for refined petroleum products.
 13. EU Member States' reporting of the country of origin of refined biofuels imports has historically been inadequate. Although the situation has begun to improve in recent years, in 2018 country of origin was still left unspecified for 47% of gross biofuels imports. Transparency in the trade of refined biofuels must improve if we are to seriously tackle the environmental issues associated with their production.
 14. Technological and efficiency improvements in the transport sector, including a shift to zero emissions vehicles and surface transport, could significantly reduce overall oil demand, so making the EU economy more resilient and energy secure. Recent analysis also shows that more fuel-efficient transport would deliver substantial economic and environmental benefits.²⁵
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²⁵ Cambridge Econometrics (2018), 'Fuelling Europe's Future'. Available online at:

<https://www.camecon.com/how/our-work/fuelling-europes-future/>

The study estimated that ambitious take-up of electric vehicles over the period to 2050 could lead to a 0.5% increase in EU GDP, up to 0.6 million additional jobs and an 90% reduction in CO₂ emissions from cars, by 2050 compared to current levels.