A study for Transport & Environment

Oil Dependency in the EU

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Executive Summary

Introduction

Transport and Environment (T&E) commissioned Cambridge Econometrics to assess the level of dependency in the 28 EU Member States (EU28) 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.

The project comprised three key tasks:

1) a review of historical data on oil dependency in the EU28;
2) an assessment of the EU's exposure to geopolitical and environmental risks through its oil imports;
3) an assessment of the EU's dependence on oil companies that are based inside and outside of Europe.

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 one third of gross inland energy consumption in the EU. 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 has fallen at a faster rate. **This has led to an increased dependency on oil imports**. **As of 2017, the EU relies on imports for 89% of its crude oil supply.**

The EU's crude oil refining sector has capacity of around 766 Mt, representing around 16% of global crude refining capacity[1]. However, crude oil production in the EU is relatively low, and in decline. Therefore, of the total volume of petroleum products imported to the EU, the majority (75%, 534 Mt) is imports of primary crude oil, which is used as feedstocks for EU refineries. **In 2017, total spending on crude oil imports in the EU was €180 bn (equivalent to 1.2% of EU GDP, or €353 per capita). In 2018, oil prices have risen by 34% compared to 2017. Assuming import volumes remained constant, crude oil imports would rise to €241bn, equivalent to €473 for every person in the EU.**

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 2017, oil imports (in volume terms) were 8% higher than in 2014 and at the highest level since 2008[2].

EU refineries have capacity to meet most of the domestic demand for refined fuel. However, in 2017, over €45bn was spent on imports of refined fuels, such

[1] European Commission (2018), 'Oil Refining'. See: https://ec.europa.eu/energy/en/topics/oil-gas-and-coal/oil-refining

[2] European Commission (2016). See: https://ec.europa.eu/energy/en/statistics/eu-crude-oil-imports

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 two-thirds of the EU's final demand for oil and petroleum products. 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 2017, around 29% of EU crude oil imports came from Russia, a further 8% came from Nigeria and sub-Saharan Africa, 20% 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 the UK, produce crude oil domestically and have a number of large ports. These additional supply options provide 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 Eastern European countries (Poland, Slovakia and Hungary), which are reliant on Russia for over 90% of their supply of crude oil. Furthermore, the sources of crude oil available to landlocked Eastern European countries (such as Slovakia, the Czech Republic and Hungary) is limited because they have no ports for oil tankers and so are completely 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 companies

The final aspect of this study involved assessing EU oil imports by company, specifically the share of EU oil imports sourced from non-European companies. Rosneft, Equinor (former Statoil), Saudi Aramco and NIOC are the four companies that we estimate to be responsible for the highest share of crude oil sales to the EU. The headquarters and primary operations for all four of these companies are outside of the EU.

We estimate that over 80% of crude oil imports and 95% of refined oil imports to the EU are from non-European companies[3]. Since much of the economic value added in the oil supply chain is based outside of 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

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

intensity. Furthermore, some of the profits generated by these companies are likely to flow out of the EU economy to benefit shareholders abroad.

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 some 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[4], 80% of proven fossil fuel reserves must remain in the ground and unburned if we are to stay below 2°C global warming.

[4] Carbon Tracker Initiative (2014), 'Unburnable Carbon – Are the world's financial markets carrying a carbon bubble'. http://www.carbontracker.org/wp-content/uploads/2014/09/Unburnable-Carbon-Full-rev2-1.pdf

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.

The remainder of the report is split into five 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 data on EU oil imports by company.
- Chapter 4 concludes with the key messages emerging from the study.

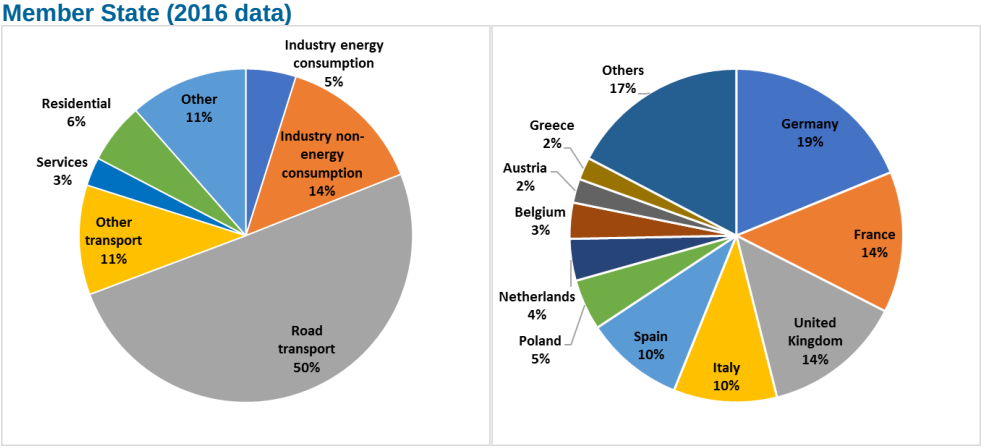
1.1 Historical use of oil and petroleum products in the EU

Sectoral demand for oil and petroleum products

Crude oil and petroleum products account for around one third of gross inland energy consumption in the EU. As shown in **Error! Reference source not found.**, two-thirds of final demand for oil (344 Mt pa) is from the transport sector. Road transport alone accounts for 50% of final demand for petroleum products (284 Mt pa).

Industry consumes around 19% of oil supplied to EU markets. In 2016, industry use of oil for energy (i.e. burning fuel to generate energy) was 27 Mt pa (5% of total final demand for oil). 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 refined petroleum products as a raw material input for the manufacture of plastics and chemical products[5].

Figure 1.1 EU final consumption of oil and petroleum products by end user and by Member State (2016 data)



Source: Eurostat Energy Balances

Since 2000, there has been a gradual decline in total final consumption of oil and petroleum products in the EU (on average by 0.6% per annum). This is due to improvements in vehicle and industry energy efficiency, a transition to

[5] Eurostat Energy Balances, 2016 data

alternative fuels and, in more recent years, reduced demand following the recent global economic downturn.

Oil consumption and emissions 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. In 2016, GHG emissions from transport were 18% above 1990 levels. This shows 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 **Error! Reference source not found.**, Germany, France and the UK, the three largest and most populous EU economies, account for just under half of final EU oil consumption.

Oil intensity of GDP

Oil intensity of GDP is the volume of oil consumed per € 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. The most oil-intensive EU Member States are Bulgaria, Cyprus and Latvia, where taxes on fuel and final prices at the pump are relatively low, and where older, more inefficient vehicles tend to remain in the fleet for longer than average. In all EU Member States, the oil intensity of GDP has declined over recent decades due to energy efficiency improvements, including the introduction of vehicle emissions standards. However, since 2015, low oil prices have put some upward pressure on EU oil demand which may persist into 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 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.

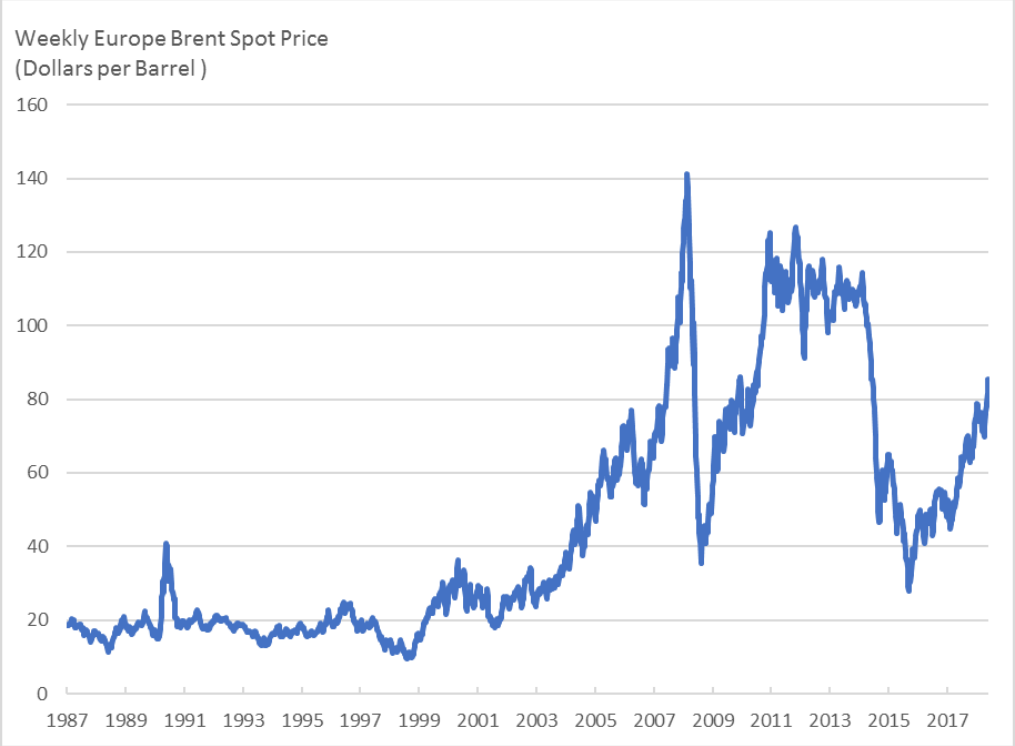
1.2 Supply shocks and oil price volatility

Oil price volatility

Oil prices are inherently volatile. As shown in the chart below, over the past eight years alone, oil prices have risen steeply (to a high of over $140/bbl in Summer 2008) and plummeted (to a low of around $30/bbl in early 2016) and risen again (to $80/bbl in late 2018). Large fluctuations in the oil price lead to economic and financial uncertainty, which can reduce investor confidence and supress 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 Historical crude oil price



Source: Thomson Reuters (2018), Weekly Europe Spot Brent Price.

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 6 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. A fall in energy prices provides a real-income boost to energy importers but the unexpected depressing effect on consumer prices adds to the macroeconomic challenges posed by a very low-inflation environment in Europe.

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. There is likely to be upward pressure on demand, as many low-income countries develop, populations increase and demand for passenger cars increase. Balancing this is a climate of uncertainty over future resource availability, as new shale discoveries come on stream and new technologies reduce the costs of extraction. In addition, action required to limit climate change are becoming more stringent (due to short-term inaction), and ambitious action in this area (e.g. a stringent global carbon tax) could have a material impact on oil prices.

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 oil price shocks.

1.3 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

Policy measure	Policy description in the context of oil import dependency
The Energy Union Framework	In 2015, the Energy Union strategy was established to ensure that the EU's energy supply was secure, affordable and sustainable followed by legislative proposals 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 oil (where imports in 2016[6] accounted for 88% of gross inland oil consumption, compared to 70% import dependency for gas supply and 40% import dependency for supply of solid fuels). Reducing reliance on oil imports will be key to achieving these specific Energy Union goals. 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.
EU Energy Security Strategy	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, compliments the aims of the Energy Union. The

[6] At time of writing, 2016 is the most recent year for which data is available

	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. 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. 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.
The Oil Stocks Directive	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.
Vehicle Emissions Regulation	In 2013, the European Commission introduced a target for 2021 that limits CO_2 emissions from new cars to 95g CO_2/km and emissions from new vans to 147g CO_2/km on a test-cycle basis. This is based on an average new vehicle in the fleet. New targets for post-2020 efficiency standards are currently being negotiated, and are likely to represent a 30-40% reduction in emissions in 2030 compared to 2021. To achieve these targets, EU vehicle manufacturers will need to implement energy-efficient improvements to vehicle technologies and increase the share of low-carbon powertrains (such as electric vehicles) in the sales fleet.

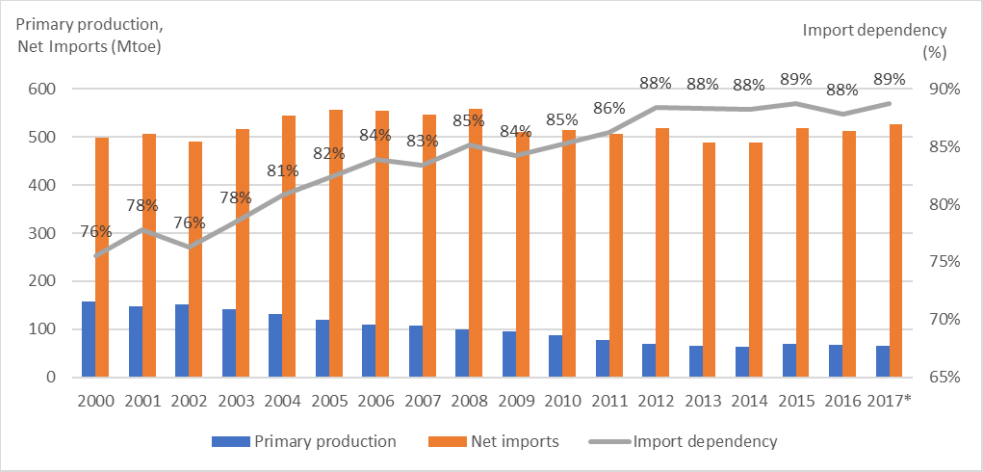
2 EU dependency on oil imports

2.1 Oil import dependency in the EU

Over the past 15 years, the EU's dependency upon imports to meet its oil demand has increased, with 89% of demand sourced from imports in 2017. This reflects falling crude oil production within Europe, with domestic production falling by 41% since 2000, much more rapidly than the fall in demand for oil over the same period. However, the rate of decline in European production has slowed in the past 5 years.

The slower rate of change in crude oil dependence in recent years largely reflects the fact that overall demand has also been stable. and the decline in production has also slowed in recent years. However European production is expected to continue to fall in the future – the EU's oil reserves were only 0.3% of global proven reserves in 2017, a record low.

Figure 3: Primary production and net imports of crude oil in the EU (2000-2015)



There are only five countries in the EU that have a domestic crude oil extraction industry with output greater than 1 Mt per year: the UK, Denmark, Germany, Romania and Italy. The UK accounts for two thirds of EU domestic crude oil production and as such has the lowest crude oil import dependency in the EU at 16%. All other EU Member States depend on imports for 90-100% of their domestic crude oil supply. Although Estonia, Cyprus, Malta, Luxembourg and Slovenia have no refinery capacity and rely entirely on refined oil imports

In 2017, total spending on crude oil imports was €180bn, equivalent to 1.2% of the EU's GDP, and €353 per person across the EU as a whole. In 2018[7], oil prices have risen by 34% compared to 2017. Assuming import volumes remained constant, crude oil imports would rise to €241bn, equivalent to €473 for every person in the EU.

Total EU crude oil imports have risen by 8% since 2014; demand for 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

[7] based on average Brent crude oil price for January to October

relatively low. Oil and refined oil products' share of gross inland energy consumption has remained steady at 35% in volume terms.

Gasoline remains the only petroleum product of which the EU is a net exporter. In 2016, a third of those exports went to the United States and the majority was sourced from the UK and the Netherlands.

Net imports of diesel oil more than doubled over the period 2001 to 2017. By 2017, the total value of diesel oil imports was €34.8bn. Similarly, gasoline imports to the EU have picked up in the past 5 years, and totalled €2.8bn in 2017.

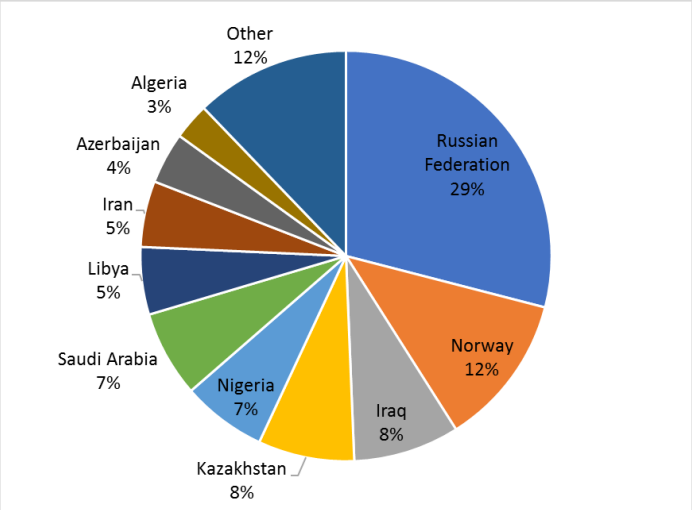
As with the import of any commodity, money spent on oil imports flows out of the domestic economy to the benefit of foreign producers. While some European-registered companies operate global oil fields, the profits from these that flow back to the EU economy (e.g. in the form of returns to shareholders 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 trade in refined petroleum products has fallen in the last few years, from €61bn in 2014 to €45bn in 2017. However, this largely reflects a decline in intra-EU trade of refined products. Extra EU imports of refined products only fell slightly over this period, from €16bn to €13bn. 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 and Norway continue to dominate, contributing 29% and 12% respectively of total crude oil imports. The rest of the 'top 10' importers have maintained a steady market share, mostly led by

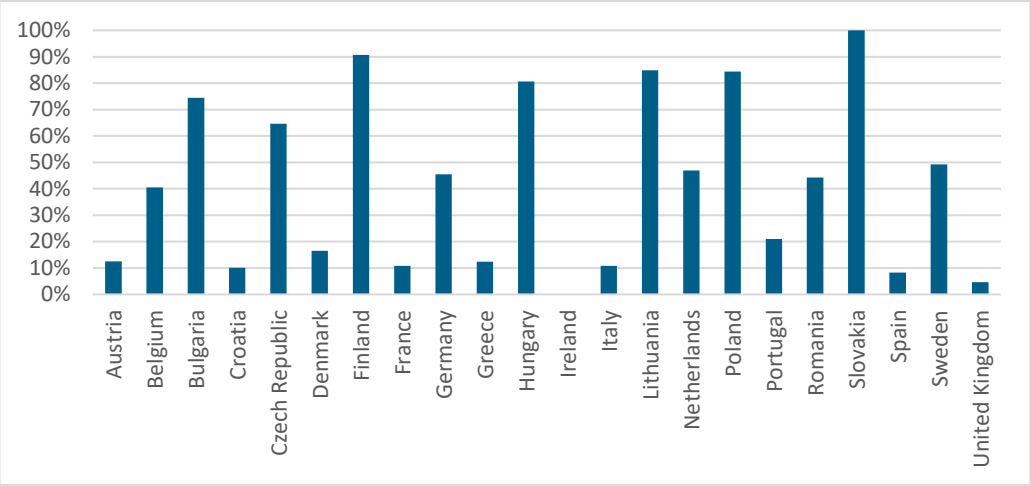
Figure 4: Sources of EU crude oil imports in 2017



the Middle eastern and African OPEC members. Combined, OPEC members account for 40% of EU crude oil imports.

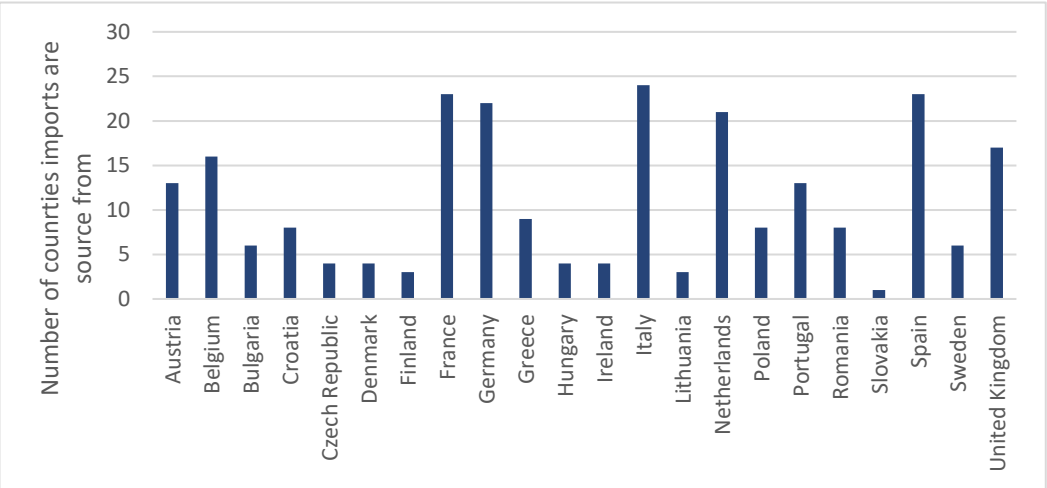
However, there are significant differences in the source of crude oil imports between Member States. In Figure 5, we show the share of extra EU imports sourced from Russia by member state. Many central and eastern European Member States are very reliant on Russian crude oil imports; for example, Poland sourced 85% of its extra-EU imported crude oil from Russia in 2016, whereas the UK only sourced 1% of imports from Russia.

Figure 5: Share of extra EU imports sourced from Russia



The diversity of supply further illustrates this; in 2016, while Germany imported crude oil from 22 countries outside of the EU, Hungary, in contrast, imported crude oil from just four countries (and around 80% was sourced from Russia).

Figure 6: Number of Extra-EU sources for EU28 crude oil imports.



3 Oil company revenues and profits

Most crude oil consumed within the EU is imported from abroad. However, it is sometimes argued that the EU still benefits from domestic spending on oil and petroleum products because some of the oil is refined within the EU and revenues could accrue to European companies. Gross Value Added (GVA) in the European petroleum refining sector is around €25bn[8]. The industry supports some employment in the EU, while profits from the companies could benefit European shareholders.

However, it is noted that many companies that export crude oil and refined petroleum to the EU are unlikely to contribute at all to European GVA, as their operations are entirely based outside of the EU. Even of the companies that do operate refineries in the EU, many are not European-registered companies. In many cases, these companies' headquarters are abroad, and they operate more refineries, employ more people and contribute more to Gross Value Added (GVA) in non-European countries[9].

In this chapter, the share of EU oil expenditure that accrues to companies that are not European-based companies (i.e. the headquarters are outside of the EU and Norway), or that have no operations based within the EU, are estimated.

3.1 Oil imports by company

Crude oil imports by company

A simple analysis was undertaken to estimate the proportion of EU spending on crude oil and petroleum imports that accrues to different companies. Many of the world's largest oil companies disclose information about the location of their oil production and refining facilities. We used this data to calculate the share of EU crude oil imports from each oil company.

The methodology involved three key stages:

1) Collating data on crude oil production from financial statements and balance sheets for large oil companies.
2) Using this data to estimate shares of oil production (and oil exports) by company for each oil exporter.
3) Multiplying the export shares (by company) and the oil import data (by country) to derive an estimate for oil imports by source country and company.

Where there are joint ventures or cases where oil fields are owned and operated by different companies, the oil revenues are split according to shares of production by company.

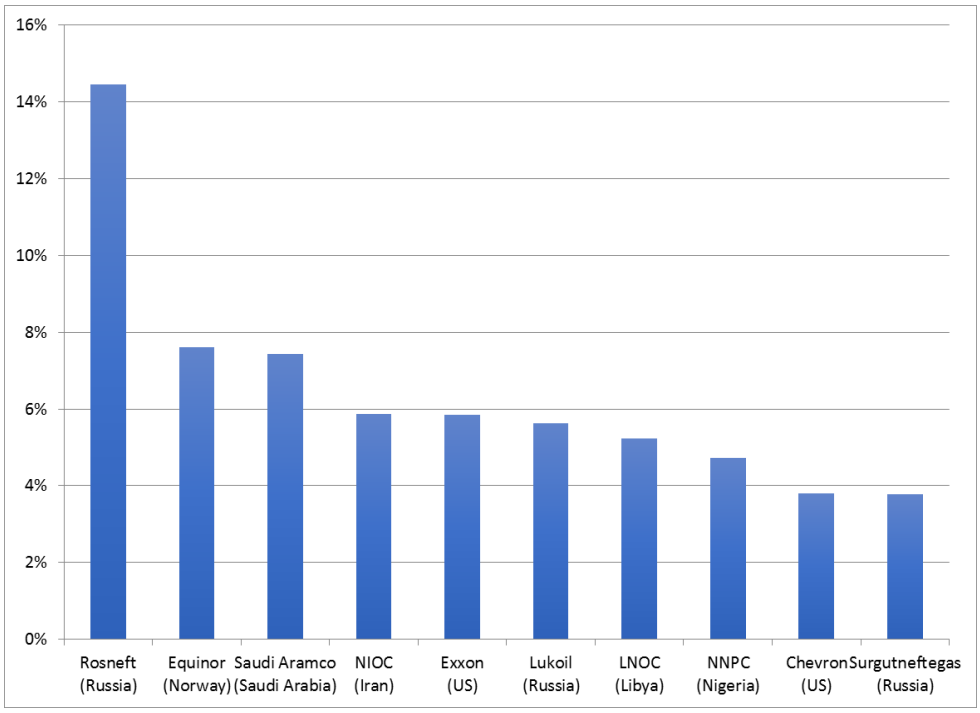
Results at the aggregate EU level are shown in Figure 4.1.

Note(s): Results do not include intra-EU trade.

[8] Eurostat, National Accounts aggregates by industry (up to NACE A*64) (nama_10_a64)

[9] For example, Lukoil is a member of FuelsEurope. However, 90% of its oil extraction activities and 68% of its oil refineries are in Russia. Furthermore, over three-quarters of its employees are based in Russia and many of the company's other employees are also based in non-European countries.

Figure 3.1 Companies exporting largest volumes of crude oil to the EU in 2017



It is estimated that, in 2017, Rosneft accounted for the highest share of crude oil imports to the EU and most of those imports were sourced from Russia. This was closely followed by Equinor and then Saudi Aramco. In aggregate, it is estimated that non-European companies accounted for over 80% of EU spending on crude oil imports.

Around half of EU oil imports are from fully or partially state-owned oil companies. Oil imports from fully state-owned enterprises include an estimated 8% share from Saudi Aramco (Saudi Arabia), 6% share from NIOC (Iran), a 5% share from LNOC (Libya) and a 4% share from NNPC (Nigeria).

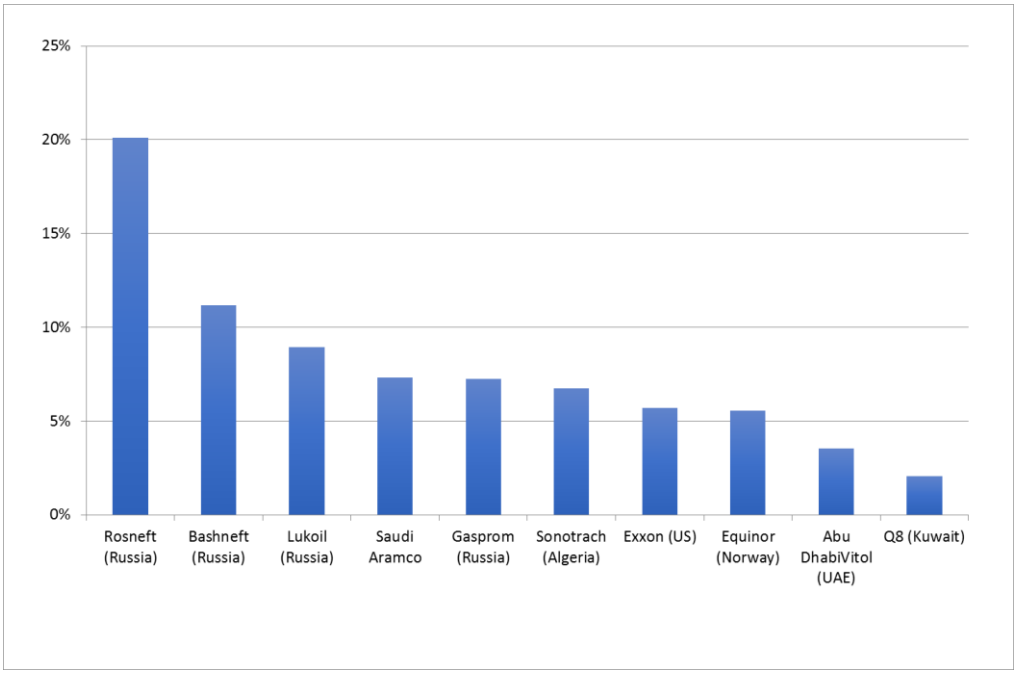
Refined petroleum imports by company

To estimate the share of refined petroleum exports revenues that accrue to different companies, a similar calculation was carried out. In this case, oil refining capacity was used to estimate refined oil production shares and export shares by company.

Import sources for refined petroleum are more diverse than for crude oil. While crude oil import revenues are concentrated among a few firms, refined petroleum revenues are shared among a much larger group of companies. For example, the top ten companies exporting refined petroleum products to the EU account for around 50% of total exports to the EU. By comparison, the top ten companies exporting crude oil to the EU account for 80% of the total import supply.

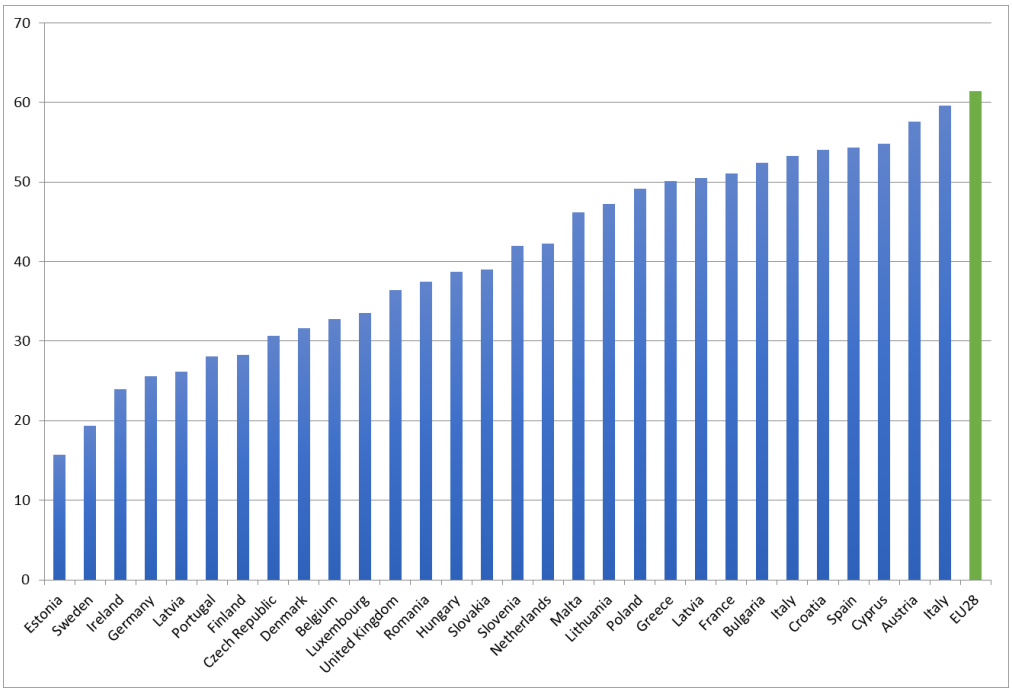
Rosneft, Bashneft, Lukoil are the three companies that account for the largest share of EU spending on imports of refined fuels. Together, these three Russia-based companies account for around 40% of the EU's refined fuel imports.

Figure 3.2 Top ten companies supplying imported refined petroleum to the EU in 2017



At the EU level, we estimate that 95% of refined fuel imports are from non-European companies. However, inter-EU trade in refined oil products is relatively high and, as a result, at the Member State level, the share of refined products from companies operating refineries in Europe is higher, as shown in Figure 4.3.

Figure 3.3 Proportion of refined petroleum imports sourced from companies that do not operate refineries in Europe



Note(s): Member State results include intra-EU imports; EU28 results do not include intra-EU imports.

3.2 Conclusion

The economic benefits of EU spending on oil will mostly accrue to the countries where oil extraction and refining facilities are located. That is where investment supply chains are most likely to be located and where the highest number of jobs will be created. This poses risks to the EU, particularly as a high share of oil imports are from geopolitically unstable countries. In some instances, oil revenues from state-owned companies could be used to prolong wars.

Companies that do not have any operations in Europe account for the majority of EU crude oil and refined fuel imports. It is estimated that, at an aggregate level, around 80% of crude oil imports and 95% of refined petroleum imports to the EU accrue to non-European companies[10]. With production and operations of these companies based abroad, the EU is likely to see little to no benefit from this expenditure. Furthermore, many of the companies that account for large shares of EU spending on oil (such as Saudi Aramco and Gazprom) are state-owned companies that do not have any EU-based shareholders that could benefit directly.

Although domestic production of refined fuel contributes to EU Gross Value Added (GVA), it is noted that, for this sector in particular, value chains are small and labour-intensity is low. This means that an increase in domestic production of refined fuel is likely to have limited economic benefits, leading to only small increases in employment and intermediate demand in the EU.

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

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 2017 account for 89% of the EU's oil supply.
2. In 2017, total spending on crude oil imports in the EU was €180 bn (equivalent to 1.2% of EU GDP, or €353 per capita). An additional €45bn was spent on refined fuel imports in 2017.
3. The EU's transport sector accounts for 61% of final demand for petroleum products. Road transport alone accounts for 50% of final demand for petroleum.
4. Much of the EU's imported oil comes from geopolitically unstable regions[11]. 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, the share of oil from Russia increased from 22% in 2001 to 32% in 2017. While the share of oil from Norway, which is more geopolitically stable, fell by 45% 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 the Czech Republic, Poland, Slovakia and Hungary, most of 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. We estimate that, at the EU level, over 80% of companies benefiting from spending on crude oil imports and 95% of companies benefitting from spending on refined oil imports are 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) are 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. Efficiency improvements in the transport sector, including a shift to zero emissions vehicles and surface transport, could significantly reduce overall

[11] In 2014, around 30% of EU crude oil imports came from Russia, a further 16% came from Nigeria and sub-Saharan Africa, 16% came from the Middle East and 8% from North Africa.

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[12].

[12] 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 CO_2 emissions from cars, by 2050 compared to current levels.

Appendices

Appendix A Oil imports by company and country

Table B.1 Share of EU crude oil imports, by company (based on 2017 data)

Oil company headquarters	Oil company	Other information	Estimated share of EU oil imports
Russia	Rosneft	Partially state-owned oil company	14%
	Lukoil		5%
	Gazprom	Not member of FuelsEurope; state-owned oil company	3%
	Surgutneftegas	Not member of FuelsEurope;	4%
	Tatneft	Not member of FuelsEurope;	2%
	Bashneft	Not member of FuelsEurope;	1%
USA	Exxon		6%
	Chevron	Not member of FuelsEurope	4%
Norway	Equinor		8%
	Aker BP	Not member of FuelsEurope	1%
Saudi Arabia	Saudi Aramco	Not member of FuelsEurope; state-owned oil company	8%
Libya	LNOC	Not member of FuelsEurope; state-owned oil company	6%
Iran	NIOC	Not member of FuelsEurope; state-owned oil company	6%
Algeria	Sonatrach	Not member of FuelsEurope; state-owned oil company	3%
Netherlands	Shell		2%
Mexico	Pemex	Not member of FuelsEurope;	2%

		state-owned oil company	
Nigeria	NNOC	Not member of FuelsEurope; state-owned oil company	5%
Brazil	Petrobras	Not member of FuelsEurope; part state-owned oil company	1%
Kazakhstan	KazMunayGas	State-owned oil company	1%
France	Total		3%
	Perenco		1%
Austria	OMV		1%
Italy	ENI	part state-owned oil company	3%
Kuwait	Q8		2%
UK	BP		2%
Malaysia	Petronas	Not member of FuelsEurope; state-owned oil company	1%
Venezuela	PDVSA	Not member of FuelsEurope	1%
Angola	Sonangol	state-owned oil company	1%
SOCAR	Azerbaijan	state-owned oil company	
N/A	Others		11%

Table B.2 Share of EU refined petroleum imports, by company (based on 2017 data)

Oil company headquarters	Oil company	Other information	Estimated share of EU oil imports
Russia	Rosneft	Not member of FuelsEurope; partially state-owned oil company	21%
	Gazprom	Not member of FuelsEurope; state-owned oil company	8%
	Lukoil		9%
	Bashneft	Not member of FuelsEurope	12%
USA	Exxon		6%

	Valero	Not member of FuelsEurope	2%
	Marathon	Not member of FuelsEurope	1%
	Phillips		1%
	Motiva	Not member of FuelsEurope	1%
	Chevron	Not member of FuelsEurope	1%
	Tesoro	Not member of FuelsEurope	1%
Algeria	Sonatrach	Not member of FuelsEurope; state-owned oil company	7%
Norway	Equinor		6%
India	IOC	Not member of FuelsEurope; state-owned oil company	1%
Kuwait	Q8		2%
UAE	Vitol	Not member of FuelsEurope	4%
Saudi Arabia	Saudi Aramco	Not member of FuelsEurope; state-owned oil company	8%
Libya	LNOC	Not member of FuelsEurope; state-owned oil company	1%
Kazakhstan	KazMunayGas	Not member of FuelsEurope; state-owned oil company	0%
South Korea	SK	Not member of FuelsEurope	1%
Belarus	Belarusian Oil Company	Not member of FuelsEurope	0%
	JSC Mozyr	Not member of FuelsEurope	0%
Israel	Bazan	Not member of FuelsEurope	1%
Netherlands	Shell		1%
	Tamoil	Not member of FuelsEurope	1%
Egypt	EGPC	Not member of FuelsEurope; state-owned oil company	1%

Turkey	Tüpraş	Not member of FuelsEurope	1%
Venezuela	PDVSA	Not member of FuelsEurope; state-owned oil company	0%
Switzerland	Petroplus	Not member of FuelsEurope	1%
N/A	Others		20%

Appendix B Regional classification

Region	Country
Central Asia	Kazakhstan
	Kyrgyzstan
	Tajikistan
	Turkmenistan
	Uzbekistan
European Union	Cyprus
	Bulgaria
	Czech Republic
	Hungary
	Poland
	Romania
	Slovakia
	Denmark
	Estonia
	Finland
	Ireland
	Latvia
	Lithuania
	Sweden
	United Kingdom
	Croatia
	Greece
	Italy
	Malta
	Portugal
	Slovenia
	Spain
	Austria
	Belgium
	France
	Germany
	Luxembourg
	Netherlands
Middle East	Iran
	Bahrain
	Iraq
	Israel
	Jordan
	Kuwait
	Lebanon
	Oman
	Qatar
	Saudi Arabia
	State of Palestine

Region	Country
Other Europe	Armenia
	Azerbaijan
	Georgia
	Turkey
	Belarus
	Moldova
	Ukraine
	Iceland
	Albania
	Switzerland
	Montenegro
	Serbia
	Macedonia
	Liechtenstein
	Bosnia and Herzegovina
Russia	Russia
Northern Africa	Algeria
	Egypt
	Libya
	Morocco
	Sudan
	Tunisia
	Western Sahara
Norway	Norway

	Syria
	United Arab Emirates
	Yemen

Region	Country
South America and Caribbean	Antigua and Barbuda
	Bahamas
	Barbados
	Cuba
	Curacao
	Dominica
	Dominican Republic
	Grenada
	Haiti
	Jamaica
	Puerto Rico
	St Kitts and Nevis
	St Lucia
	Saint Martin
	St Vincent and the Grenadines
	Trinidad and Tobago
	Turks and Caicos Islands
	Argentina
	Bolivia
	Brazil
	Chile
	Colombia
	Ecuador
	French Guiana
	Guyana
	Paraguay
	Peru
	Suriname
	Uruguay
	Venezuela

Region	Country
Sub-Saharan Africa	Burundi
	Comoros
	Djibouti
	Eritrea
	Ethiopia
	Kenya
	Madagascar
	Malawi
	Mauritius
	Mozambique
	Réunion
	Rwanda
	Seychelles
	Somalia
	South Sudan
	Uganda
	Tanzania
	Zambia
	Zimbabwe
	Angola
	Cameroon
	Central African Republic
	Chad
	Republic of the Congo
	D. R. Congo
	Equatorial Guinea
	Gabon
	Sao Tome and Principe
	Botswana
	Lesotho
	Namibia
	South Africa
	Swaziland
	Benin
	Burkina Faso
	Cape Verde
	Cote d'Ivoire
	Gambia
	Ghana
	Guinea
	Guinea-Bissau
	Liberia

	Mali
	Mauritania
	Niger
	Nigeria
	Senegal
	Sierra Leone
	Togo

Region	Country
North and Central America	Belize
	Costa Rica
	El Salvador
	Guatemala
	Honduras
	Mexico
	Nicaragua
	Panama
	Bermuda
	Canada
	Greenland
	Saint Pierre and Miquelon
	United States
Oceania	Australia
	New Zealand
	Norfolk Island
	Fiji
	New Caledonia
	Papua New Guinea
	Solomon Islands
	Vanuatu
	Guam
	Kiribati
	Marshall Islands
	Micronesia, Federated States of
	Nauru
	Northern Mariana Islands
	Palau
	American Samoa
	Cook Islands
	French Polynesia
	Niue
	Pitcairn
	Samoa

Region	Country
Other Asia	China
	Hong Kong
	Macao
	North Korea
	Japan
	Mongolia
	South Korea
	Taiwan
	Afghanistan
	Bangladesh
	Bhutan
	India
	Maldives
	Nepal
	Pakistan
	Sri Lanka
	Brunei Darussalam
	Cambodia
	Indonesia
	Lao People's Democratic Republic
	Malaysia
	Myanmar (Burma)
	Philippines
	Singapore
	Thailand
	Timor-Leste
	Vietnam

Tokelau
Tonga
Tuvalu
Wallis and Futuna

Region	Country
North and Central America	Belize
	Costa Rica
	El Salvador
	Guatemala
	Honduras
	Mexico
	Nicaragua
	Panama
	Bermuda
	Canada
	Greenland
	Saint Pierre and Miquelon
	United States
Oceania	Australia
	New Zealand
	Fiji
	Papua New Guinea
	Solomon Islands
	Vanuatu
	Kiribati
	Marshall Islands
	Micronesia, Federated States of
	Northern Mariana Islands
	Cook Islands
	Samoa
	Tonga

Region	Country
Other Asia	China
	Hong Kong
	Macao
	North Korea
	Japan
	Mongolia
	South Korea
	Taiwan
	Afghanistan
	Bangladesh
	Bhutan
	India
	Maldives
	Nepal
	Pakistan
	Sri Lanka
	Brunei
	Cambodia
	Indonesia
	Laos
	Malaysia
	Myanmar (Burma)
	Philippines
	Singapore
	Thailand
	Timor-Leste
	Vietnam