APERC Oil Report 2021

APERC
Asia Pacific Energy Research Centre

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Asia Pacific Energy Research Centre (APERC)
Inui Building, Kachidoki 11F, 1-13-1 Kachidoki
Chuo-ku, Tokyo 104-0054 Japan
Tel: (813) 5144-8551
Fax: (813) 5144-8555
E-mail: master@aperc.or.jp (administration)
Website: https://aperc.or.jp/

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Foreword

The APERC Oil Report 2021 is designed to explore recent and emerging trends in APEC and global oil markets. The data analysis is inevitably complicated by the effects of COVID-19 pandemic and the implications for policymakers were complex because of many uncertainties caused by the pandemic.

Global oil markets responded and have largely adapted themselves to the impacts of the pandemic. The readiness of the oil business to cope with the oil security issue and concerns over both political and non-political dynamics has significantly improved since the COVID-19 outbreak in early 2020. Oil demand has recovered as economies have gained experience with the pandemic.

This study analyses several key issues in the oil market over the past decade (2009-18) and provides a short-term outlook (for the following five years, 2019-23). It seeks to highlight key emerging threats and opportunities so that APEC member economies can integrate these early indications into their policies.

I hope that the APERC Oil Report 2021 will help policymakers across APEC improve their understanding of the oil market and assist in their efforts to improve the sustainability, security, and affordability of their energy systems.

This oil report is part of the APERC fossil fuel reports series, which are published annually. I would like to express my sincere gratitude to the authors and contributors for their time and effort in writing and publishing this report. I am also grateful to APEC member economies for providing updated data through the APEC Expert Group on Energy Data and Analysis (EGEDA).

Kazutomo IRIE

President

Asia Pacific Energy Research Centre

January 2022

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Authors and contributors

APERC

Glen Sweetnam ● Dr. Ruengsak Thitiratsakul

Editor

Glen Sweetnam

Abbreviation and acronyms

Abbreviation	
mb/d	million barrels per day
bbl	barrel
PJ	petajoules
Acronyms	
APEC	Asia-Pacific Economic Cooperation
APERC	Asia Pacific Energy Research Centre
EIA	Energy Information Administration
EU	European Union
IEA	International Energy Agency
OPEC	Organization of the Petroleum Exporting Countries

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Summary and key trends

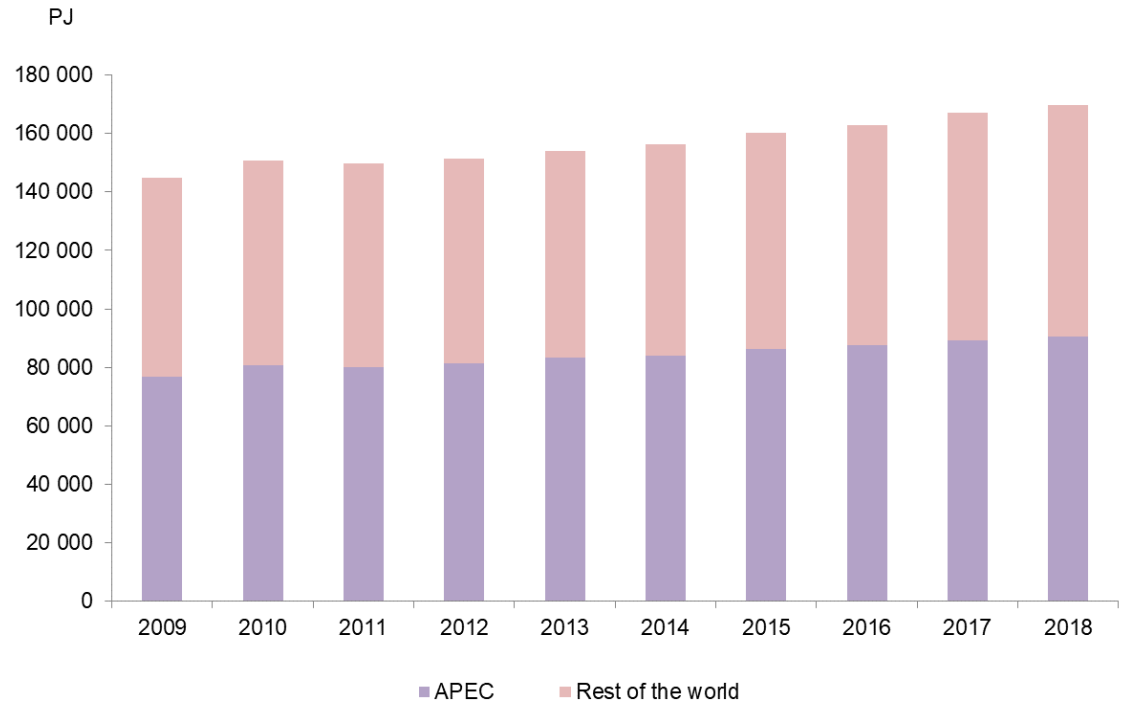
- APEC oil demand accounted for 53% of the total world demand of 169 611 PJ in 2018. Since 2013, global oil consumption has increased between 1.5%-2.6% per year, driven by lower oil prices.
- Transportation has been both the dominant and growing sector in APEC during the period. Demand in the sector has increased by 2.1% annually since 2009 and reached 55 111 PJ in 2018 or 61% of the total oil demand in the APEC region.
- Oil demand in the APEC region is projected to increase by 0.90% annually to reach 94 681 PJ in 2023 led by China and Southeast Asia.
- Global oil production has been increasing slightly slower than demand with an annual growth rate of 1.3% since 2009. The APEC region including its largest oil-producing economies like the USA and Russia accounted for 43% of global production. Over the past 10 years, the APEC region surpassed the rest of the world in production growth because of the contribution from the USA, Canada, and Russia.
- Within the APEC region, the USA and Russia were the largest oil-producing economies with 28 687 and 23 369 PJ in 2018, respectively. These two economies had a production share of 64% in the APEC region in 2018. In terms of production growth, the USA was by far the highest with an annual rate of 8.3% from 2009 to 2018. The incremental production increase in the USA since 2009 was 14 639 PJ, which was greater than the production of either Canada (11 185 PJ) or China (7 927 PJ), and more than triple of the total Southeast Asia production (4 660 PJ) in 2018.
- Oil production in the APEC region is projected to have a small growth at 0.39% annually from 2018 reaching 82 821 PJ in 2023.
- APEC's import dependency on crude oil and oil products has improved (decreased) over the years from 18% in 2009 to 14% in 2018, because of the indigenous production increases in the USA, Canada, and Russia.
- APERC projects that the impact of COVID-19 on the oil product market will be transitory and the oil market is expected to recover within a few years resulting in APEC import dependency stabilizing around 10%-12% between 2019-2023.
- Installation of new refining capacity is noticeable in all regions except Europe. The significant installations are led by China, non-OECD Asia, and the Middle East, in response to rising oil demand in these regions.
- Oil prices continued growing from the beginning of 2021 and they gained their momentum to test their maximum in the fourth quarter of 2021.

Chapter 1: Demand

Global context (2009-2018)

Global oil consumption has grown an average of 1.8% annually since 2009 and reached 169 611 petajoules (PJ) in 2018 (Figure 1.1). APEC, which consumes about 53% of the world's oil, increased its consumption at an annual average rate of 1.8% while the rest of the world grew at 1.7%. The growth in APEC was driven primarily by China (5.5%) and Southeast Asia (4.1%) while the lowest APEC growth rates were in Mexico (0.83%) and the USA (0.10%). In Japan, oil demand declined by 1.6% per year.

Figure 1.1: Global oil demand, 2009-2018



Source: APERC analysis and IEA (2021)

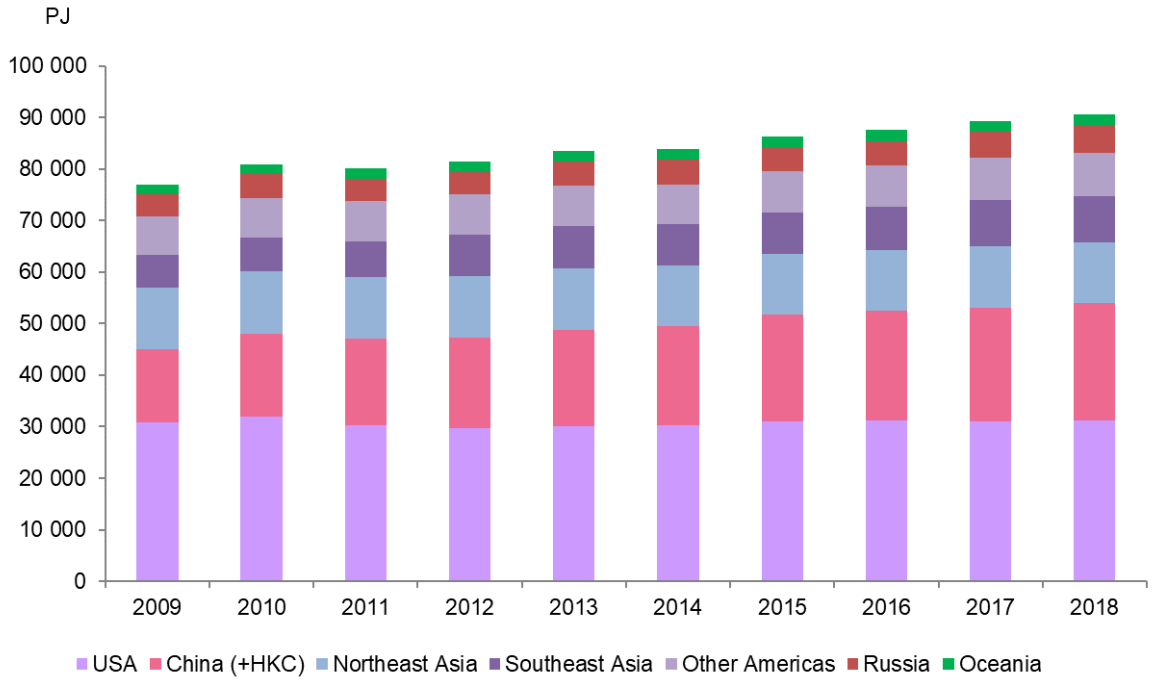
Since 2013, global oil consumption has increased between 1.5%-2.6% per year which was partially driven by lower oil prices. APEC accounted for an average of 54% of the global growth in oil demand from 2013-2018.

Demand trends in APEC (2009-2018)

Within the APEC region, the USA remained by far the largest oil-consuming economy with 31 136 PJ or 34% of the APEC total demand in 2018 (Figure 1.2). China was the second largest with 22 825

PJ or 25% of the region's demand. These two economies accounted for as much as 59% of the APEC total. while the USA share has decreased from a 40% to 34% from 2009 to 2018, China increased its demand by 62% (8 724 PJ) during this period and its share of APEC demand rose from 18% in 2009 to 25% in 2018. In contrast, US demand has remained essentially flat, increasing only 0.10% annually from 30 848 PJ in 2009 to 31 136 PJ in 2018. If the trend continues, China may become the largest oil consumer within APEC within the decade. Japan has steadily decreased its demand at an annual rate of -1.6% over the past 10 years. Japan's share in APEC demand fell from 9.1% in 2009 to 6.7% in 2018. On the other hand, Southeast Asia's demand grew to 9 076 PJ in 2018 with the second-highest growth rate in the APEC region of 4.1% per year.

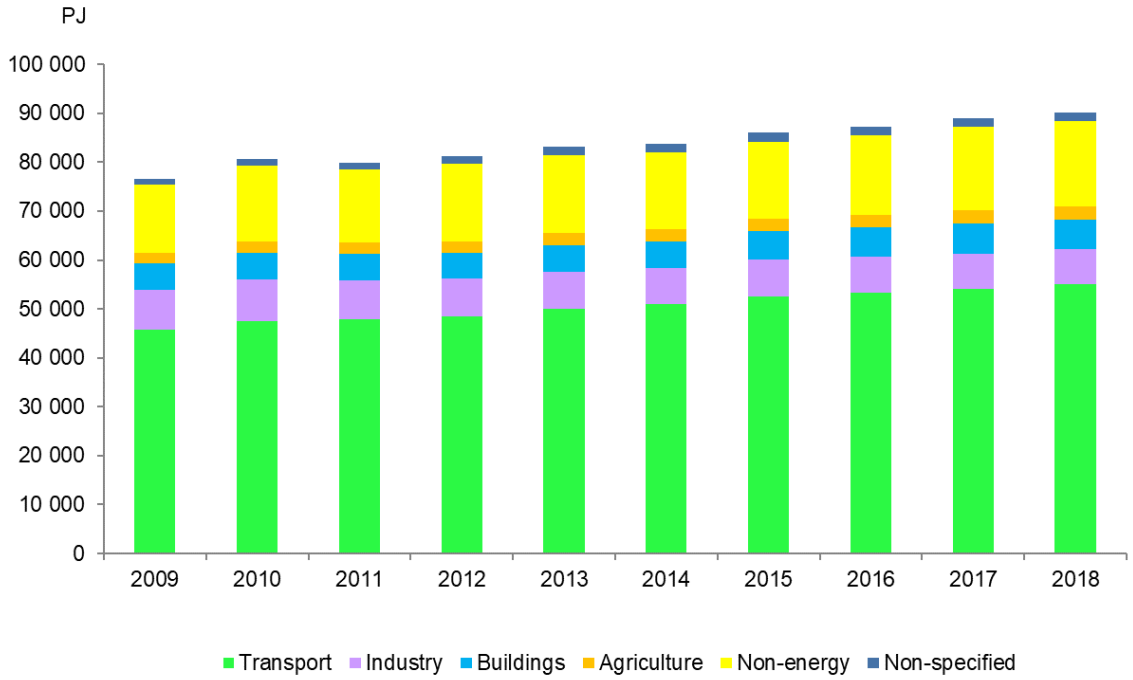
Figure 1.2: Oil demand in APEC, 2009-2018



Source: APERC analysis and IEA (2021)

Figure 1.3 shows APEC's oil demand by sector since 2009. Transportation has been the dominant sector during the period. Demand in the transportation sector has increased by 2.1% annually since 2009 and reached 55 111 PJ in 2018 or 61% of the total oil demand in the APEC region. Non-energy use, the main feedstock for petrochemicals, is the second-largest demand sector with 17 510 PJ. Backed by a strong, growing demand for petrochemical products in the APEC region, the oil used at petrochemical plants has increased by 2.6% annually and represented 19% of the total APEC oil demand. During 2009-2018, industry decreased slightly at the rate of -1.5% per year from 8 144 PJ in 2009 to 7 123 PJ in 2018, while the buildings (residential & services) sector has had annual demand growth of 1.1%, increasing from 5 510 PJ in 2009 to 6 062 PJ in 2018.

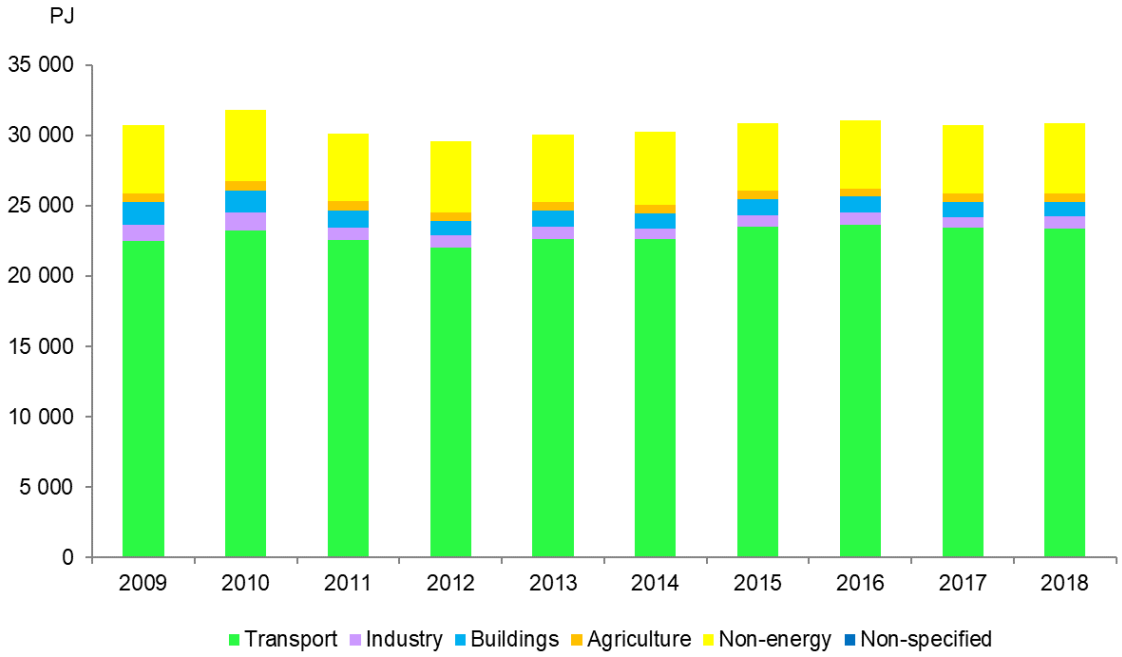
Figure 1.3 Oil demand in APEC by sector, 2009-2018



Source: APERC analysis and IEA (2021)

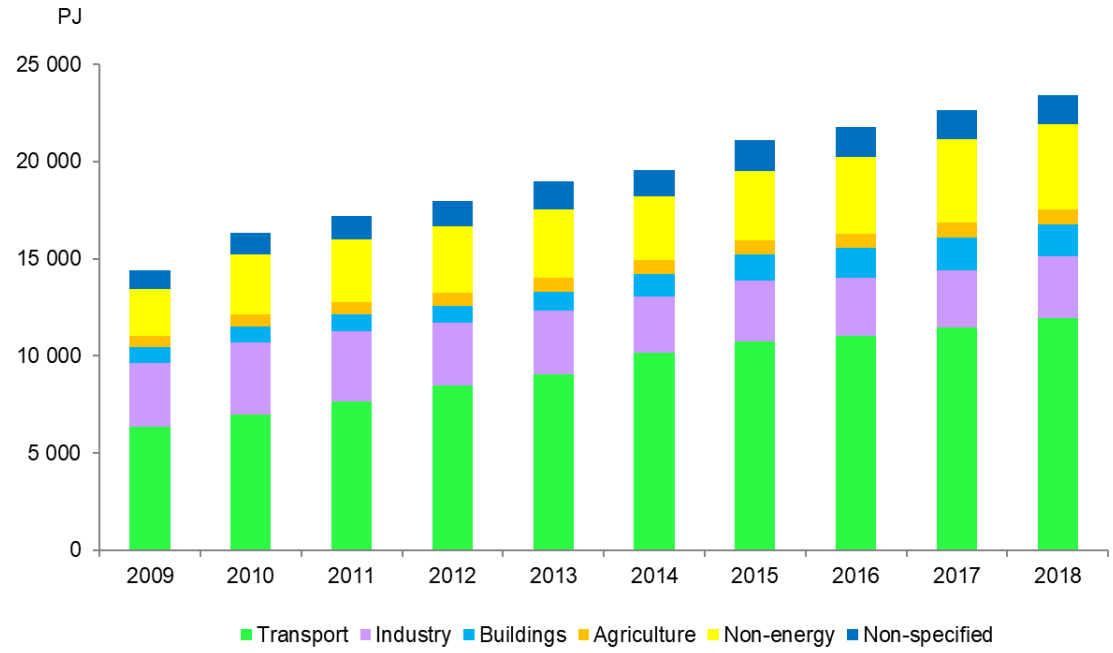
Sectoral demand in the USA and China reflects their very different market structures. In the USA, oil consumption is heavily concentrated in the transportation sector, which increased its share of total oil consumption from 73% in 2009 to 76% in 2018 (Figure 1.4). Like the USA, China's transportation sector consumes the largest portion of its oil demand, but the overall oil utilization is more diversified (Figure 1.5). The oil consumption in the transportation sector has increased over the years from 44% of the total oil demand in 2009 to 51% in 2018. China's second-largest consuming sector in 2018 is non-energy, which is mainly used to produce a variety of petrochemical products. Its share increases slightly from 17% in 2009 to 19% of the total oil demand in 2018. In China, demand for transportation and non-energy use increased by 7.3% annually and 6.9% annually, respectively for the past 10 years, while the industry sector decreased by -0.40% annually.

Figure 1.4: Oil demand in the USA by sector, 2009-2018



Source: APERC analysis and IEA (2021)

Figure 1.5: Oil demand in China by sector, 2009-2018

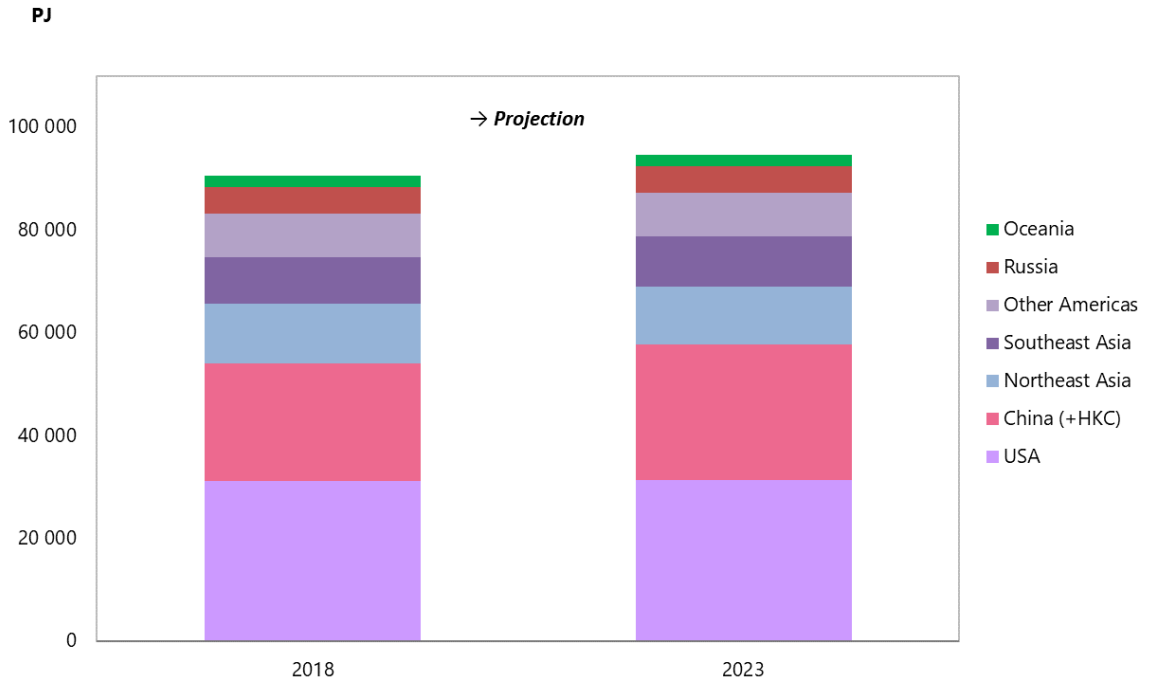


Source: APERC analysis and IEA (2021)

Demand outlook

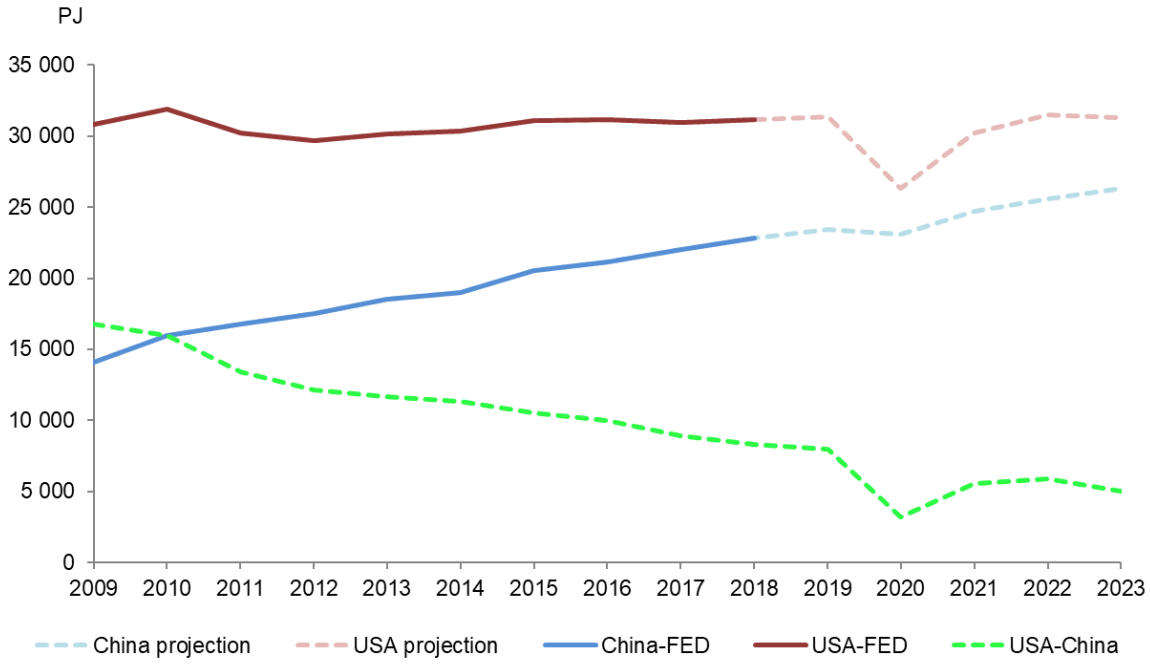
Within the APEC region, oil demand is projected to grow from 2018 by 0.90% annually to reach 94 681 PJ in 2023 (Figure 1.6). China's oil demand growth (3 488 PJ or 2.9% annually) will be by far the largest share (84%) of the APEC growth (4 147 PJ) in the five years from 2018 to 2023. Growing at roughly half the rate will be oil consumption in Southeast Asia APEC (7 of 10 ASEAN members) where its total growth will increase by 630 PJ or 1.4% annually. Demand in the USA is projected to grow a marginal 180 PJ (0.12% annually) while Japan is expected to decline by 486 PJ (-1.7% annually). The average demand growth in Oceania is 0.24% and other Americas is 0.30% while the Northeast Asia demand shows a negative growth at -0.60% largely due to Japan's declining consumption. As a result, the share of China and Southeast Asia demand in the APEC region will expand, albeit slightly, from 35% in 2018 to 38% in 2023. The share of APEC oil demand will gradually shift towards Asia in the coming years.

Figure 1.6: Oil demand outlook in APEC, 2018 and 2023



For the past decade, the US oil demand has been hovering around 30 000 PJ level while China's demand has continued to increase over the years, and it grew above 20 000 PJ for the first time since 2015. The difference between the two economies' oil consumption has diminished over the years and is about half what it was in 2009. We expect this trend to continue, further reducing the USA-China oil demand (Figure 1.7).

Figure 1.7: Oil demand comparison of the USA vs China, 2009-2018, and its projection, 2019-2023

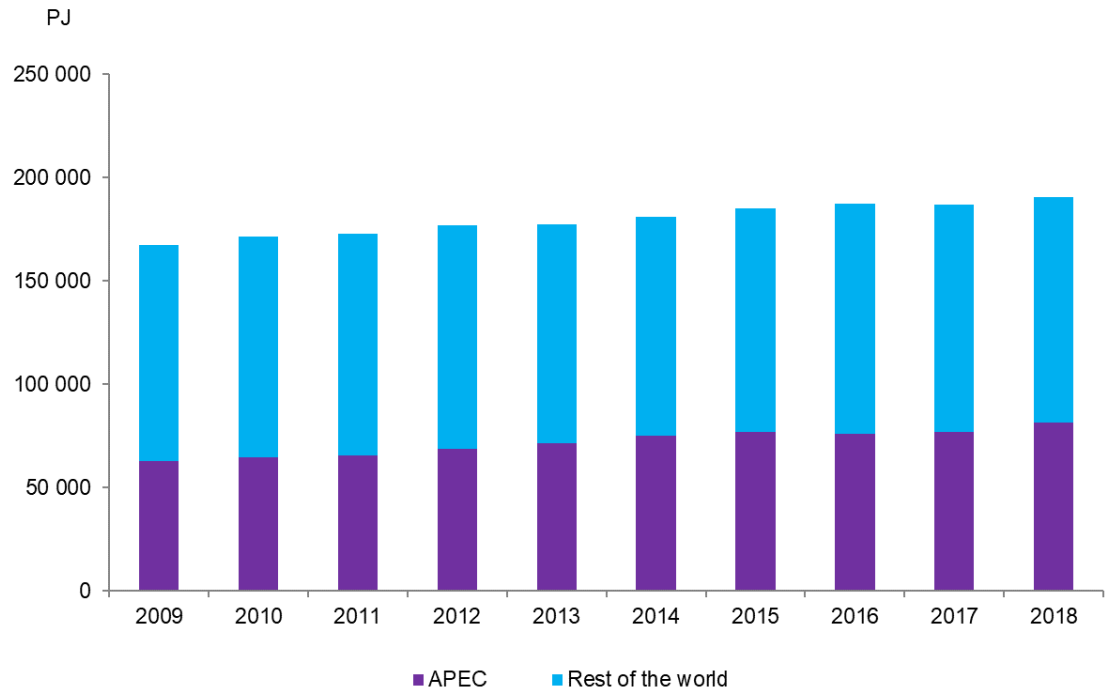


Chapter 2: Production

Global context (2009-2018)

From 2009 – 2018, global oil production[1] increased slightly slower than demand with an annual growth rate of 1.3% since 2009 (Figure 2.1). Global oil production in 2018 was 188 280 PJ. In comparison to global production, APEC oil production, including its largest oil-producing economies like the USA and Russia, grew at an annual rate of 1.5% for the past decade and accounted for 43% of global production in 2018. Oil production in the rest of the world grew more slowly at 1.0% per year. Over the past 10 years, the APEC region surpassed the rest of the world in production growth because of the contributions from the USA, Canada, and Russia (Figure 2.2). APEC's share of global oil production grew from 37% in 2009 to 43% in 2018.

Figure 2.1: Global oil production, 2009-2018



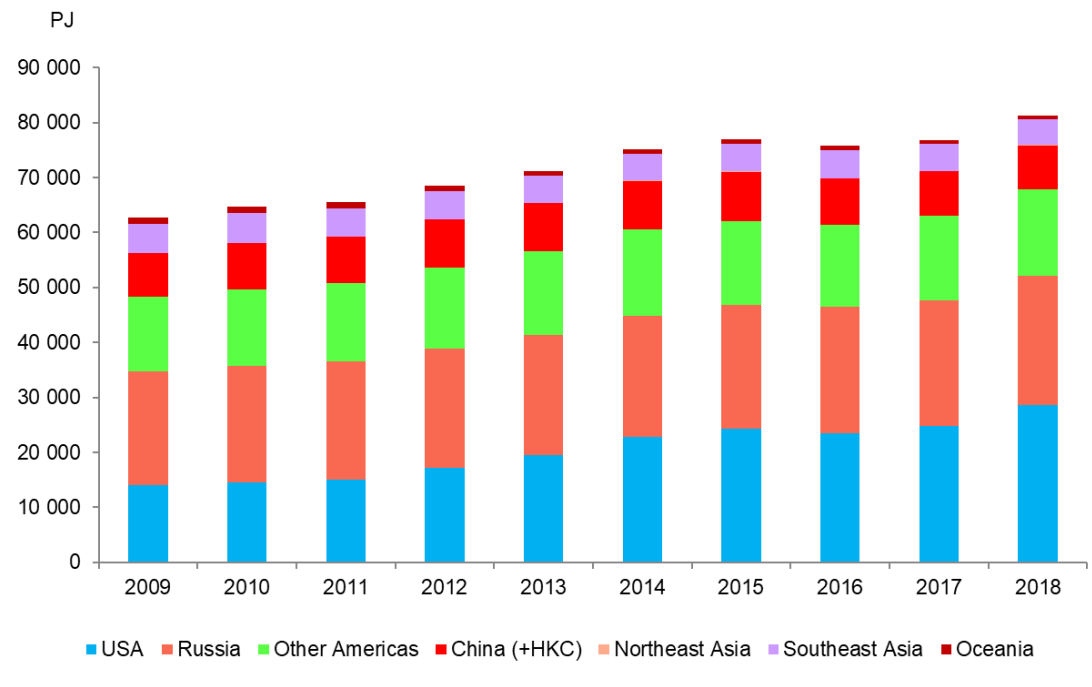
Source: APERC analysis and IEA (2021)

[1] Oil supply is the sum of indigenous production and net imports. Since net imports will be addressed in Chapter 3, this chapter will focus on production.

Oil production trends in APEC (2009-2018)

Within the APEC region, the USA and Russia were the largest oil-producing economies with 28 687 and 23 369 PJ in 2018, respectively (Figure 2.2). These two economies had a production share of 64% in the APEC region in 2018. In terms of production growth, the USA was by far the fastest with an annual growth rate of 8.3% from 2009 to 2018. The incremental production increase in the USA since 2009 was 14 639 PJ, which was greater than the total oil production of Canada (11 185 PJ), almost double that of China (7 927 PJ), and more than triple that of Southeast Asia (4 660 PJ) in 2018. Many APEC regions showed declining annual production growth rates including Oceania at -6.5%, northeast Asia at -1.7%, and southeast Asia at -1.3%. Russia experienced moderate production growth with an average of 1.4% per year during 2009-2018.

Figure 2.2: Oil production in APEC region, 2009-2018

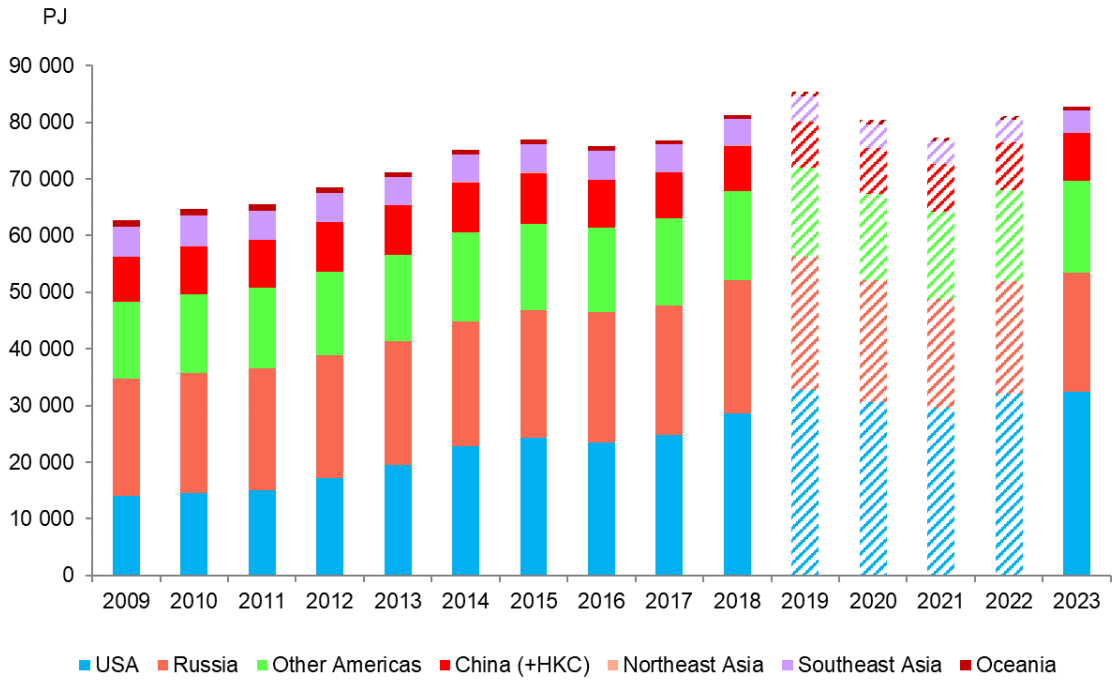


Source: *APERC analysis and IEA (2021)*

Production outlook

Oil production in APEC economies drop substantially in 2020 as the oil price fell in response to the pandemic-induced reduction in demand. But APEC oil production is projected to recover and average a small growth rate of 0.39% per year from 81 224 PJ in 2018 to 82 821 PJ in 2023 (Figures 2.3).

Figure 2.3: Oil production outlook in APEC, 2009-2023



Source: APERC analysis and IEA (2021)

Among the top three crude oil producers in APEC, only the USA, and Canada are projected to achieve positive annual production growth rates at 13% and 4.8%, respectively, in the five years from 2018 to 2023, while Russia's production is expected to decline at 10% per year. On a production share basis in the APEC region, these top three crude producers, are projected to continue to produce about 78% of the APEC total and maintain their dominant positions until 2023. However, while the USA increases its share from 35% in 2018 to 39% in 2023, Canada maintains its share at 14%, and Russia's share declines from 29% in 2018 to 25% in 2023. The combined 6 623 PJ production increase in the USA and Canada is expected to be boosted by the development of unconventional oil resources, while Russia and Southeast Asia will show a decline of 1 912 PJ altogether for the period 2018-2023. As a result, unlike demand, the production center in the APEC economies will shift more to North America in the future.

Chapter 3: APEC Import Dependency

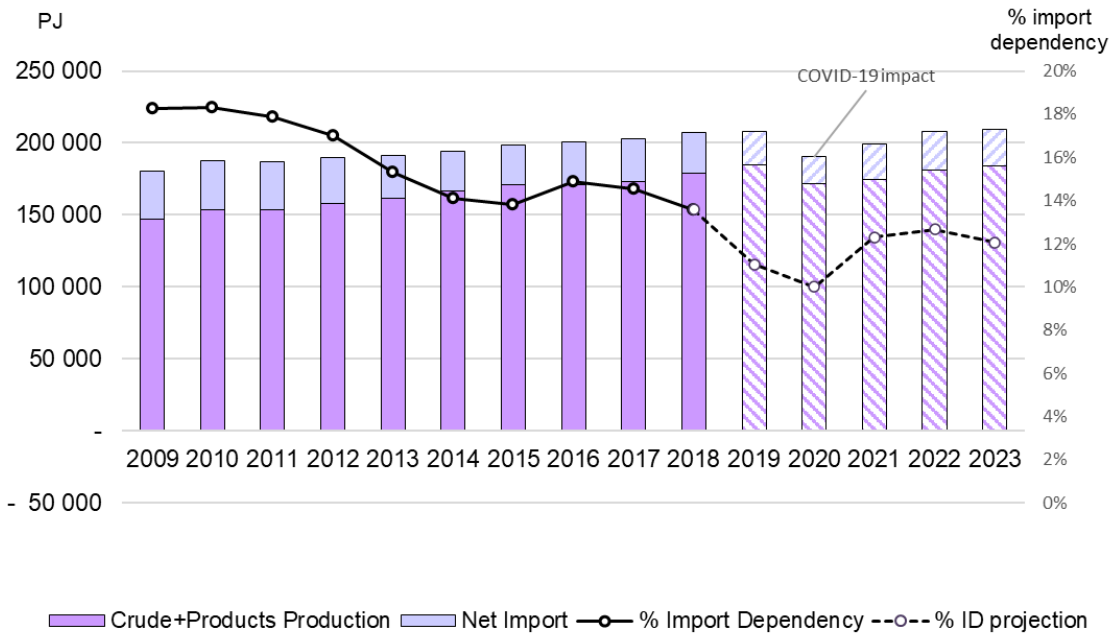
APEC's oil trade flows and oil import dependence are affected by changes in oil demand, indigenous crude oil production, and refinery economics. This chapter discusses APEC's import dependence and trade flows for both crude oil and petroleum products.

APEC import dependency

APEC's import dependency on crude oil and oil products has improved (decreased) over the years from 18% in 2009 to 14% in 2018 (Figure 3.1) driven by production increases in the US, Canada, and Russia. Over this period, while APEC crude oil production and exports grew by 29% (18 485 PJ) and 38% (8 122 PJ), respectively, crude oil imports increased at a much slower rate of only 14% (7 485 PJ) resulting in APEC's improved crude oil import dependency. Products trade followed the same pattern and contributed to decreasing import dependence with product exports growing by 60% (11 180 PJ) while imports grew by only38% (8 122 PJ).

The USA, APEC's largest oil consumer, accounted for 41% and 18% of total APEC crude and product imports, respectively, in 2009. However, the economy's increased output of tight oil has reduced its dependence on imports, and its share of crude and product imports in APEC improved to 29% and 13%, respectively, in 2018.

Figure 3.1: APEC crude oil and product import dependency, 2009-2018

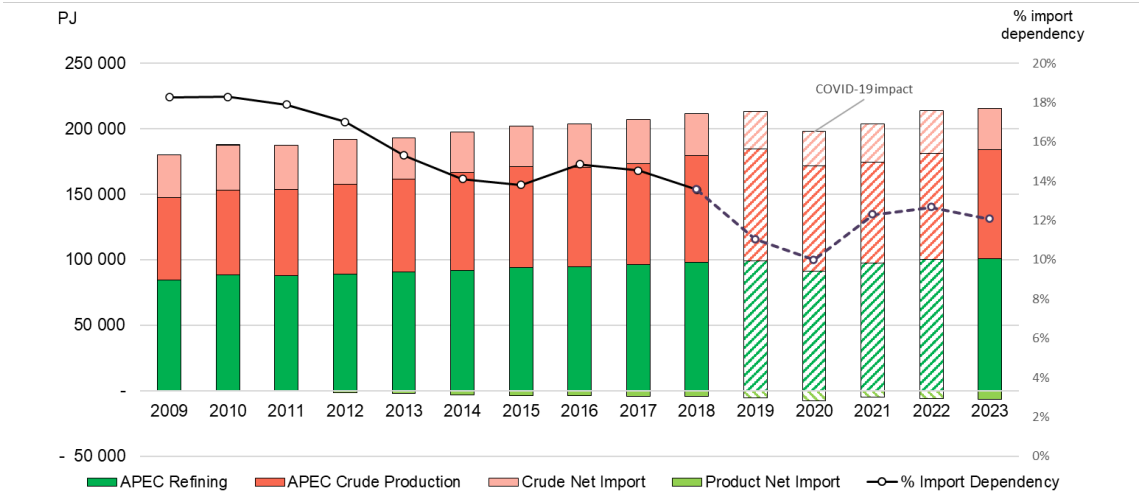


Note: Import dependency = net imports / (crude & products production + net imports)
Source: APERC analysis (2021)

However, while APEC's total indigenous crude oil production has continuously increased since 2009, it slowed down marginally in 2016 resulting in a small increase in APEC import dependency that year that tapered down to 14% import dependence in 2018. The key drivers for the fluctuation of the APEC import dependence starting in 2014 were the production changes in the USA, China, and Mexico.

Although this trend of improving crude import dependence has continued, the emergence of COVID-19 has interrupted this projection, distorting the APEC import dependency indicators since the pandemic began to spread in early 2020. The contagious nature of COVID-19 has necessitated mobility restrictions to protect people and stop the spread of the virus. The sharp decrease in oil demand and the collapse of oil prices has affected crude oil supply and disposition throughout APEC, especially in the big oil producer-exporters like the US, Russia, and Canada. Imports fell significantly, resulting in APEC import dependency falling from 14% in 2018 to 11% in 2019. Furthermore, APERC projects that the impact of COVID-19 on the oil product market will be transitory and the oil market is expected to recover within a few years resulting in APEC import dependency stabilizing around 10%-12% between 2019-2023.

Figure 3.2: APEC crude oil and product import dependency, 2019-2023



Source: APERC analysis and IEA (2021)

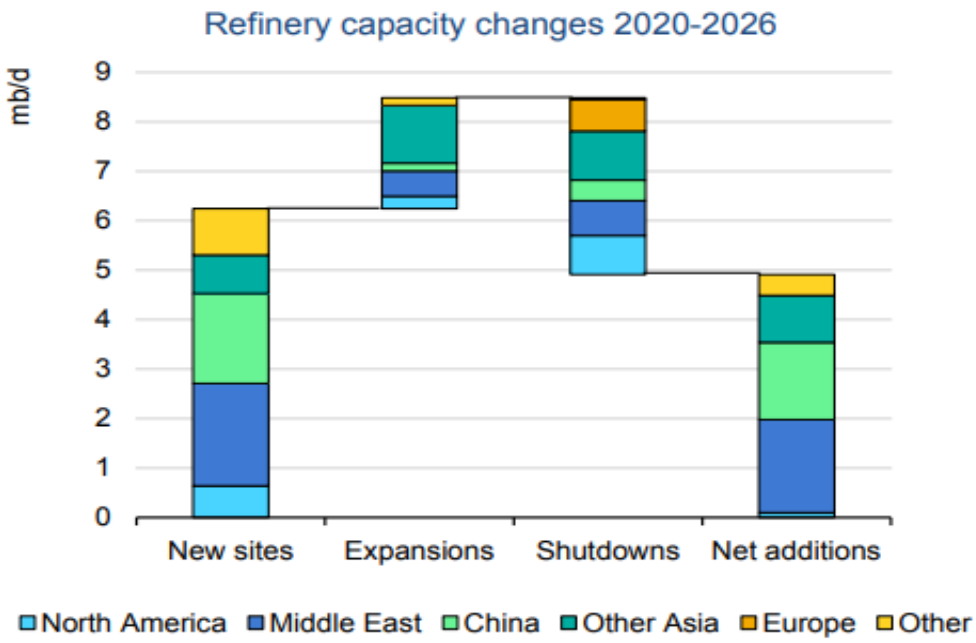
Unlike the decreasing US share in APEC imports, China's share on crude and product imports climbed to 31% and 12%, respectively, in 2018 from 16% and 11%, respectively, in 2009 as its oil demand soared at an annual average rate of 5.5% in response to strong economic growth.

The COVID-19 pandemic created uncertainty about future oil demand and subsequently caused widespread delays in the refinery capacity installation. However, it is projected that the demand drops due to the pandemic are not structural and demand projections show future growth. APERC analysis shows that the average demand growth at 0.90% annually from 2018 to 2023 will still be

attractive for many oil players in the oil demand growing economies such as in China and Southeast Asia to invest in the new refinery construction and expansions of existing refineries.

An IEA study projects significant installations of new refining capacity in all regions except Europe. New refinery construction is expected to be especially strong in China, non-OECD Asia, and the Middle East, in response to rising oil demand in these regions (Figure 3.3). Even with the capacity closures of around 3.6 mb/d during 2020-2026, it is anticipated that gross global refining capacity growth for the same period will be at a total of 8.5 mb/d bringing a net capacity installation increase of 4.9 mb/d. This will likely exceed refined product demand growth and result in excess refining capacity in the future. China, the world's largest crude importer, is expected to continue to increase its refining capacity by a net 1.5 mb/d in the five years from 2020. With the second-largest throughput capacity in the world, China has already increased oil-products exports such as gasoline and diesel oil mainly to the Asian market.

Figure 3.3: World refinery capacity additions, 2020-2026

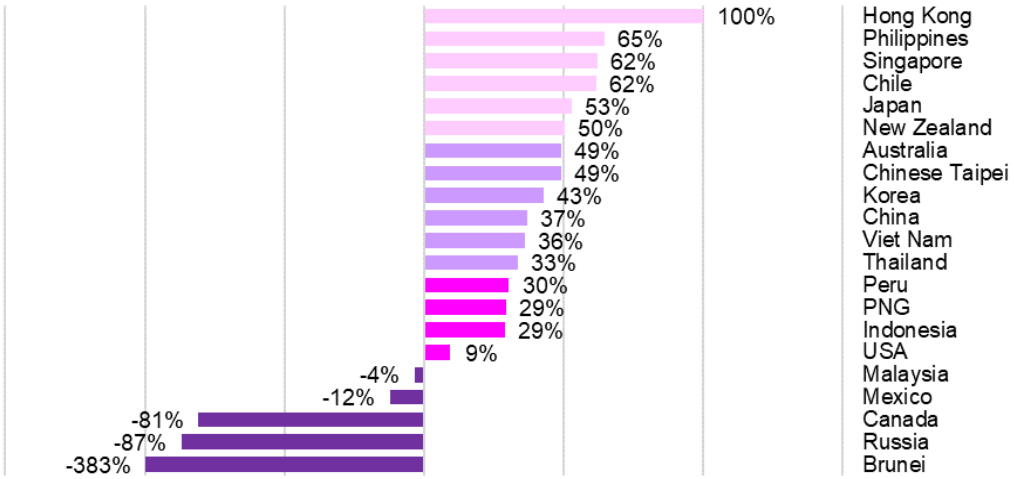


Source: IEA (2021)

The status of crude oil and petroleum product import dependency in APEC varies among economies, e.g., some economies have relied almost entirely on imports for their oil use (Figure 3.4), because of the lack of domestic crude production. China's oil import dependency in 2018 stood at 37%, up from 28% in 2009, driven by a considerable demand surge and relatively limited domestic production. An analysis of the crude oil and petroleum product volumes shows that China's crude oil import dependency alone increased significantly from 51% in 2009 to 71% in 2018 while petroleum product import dependency improved (decreased) from 5.1% in 2009 to

0.75% in 2018. The increase in crude oil dependency drove the economy's growing focus on overseas upstream investment. The USA, on the other hand, has experienced an improvement in self-sufficiency: import dependency has decreased in the past decade from 31% (crude = 61%, product = -1.3%) in 2009 to 9.5% (crude = 31%, product = -19%) in 2018 and convincingly shifting to be more oil independent. Five economies in APEC, namely Brunei Darussalam, Russia, Canada, Mexico, and Malaysia maintained their oil self-sufficiency status during 2009-2018.

Figure 3.4: APEC oil import dependency by the economy, 2018



Note: Net-exporters: Brunei (-383%), Russia (-87%), Canada (-81%), Mexico (-12%), and Malaysia (-4%)
Source: APERC analysis and IEA (2021)

Chapter 4: Price

Crude oil prices have fluctuated widely since 2007 (Figure 4.1). After hitting an all-time high of USD 147/bbl in July 2008 because of high global demand, driven mostly by China, the WTI price nosedived to USD 33/bbl in February 2009 largely due to declining oil demand caused by the global financial crisis. In the subsequent five years, economic recovery together with heightened geopolitical tensions including the Arab Spring in 2011 supported prices. Prices were relatively stable in the range of USD 80-120 between 2011 and the first half of 2014. This period of relatively stable, but high prices enabled a rise in US shale oil production, which had become competitive due to advances in hydraulic fracturing technology.

To confront the shale advancement, OPEC responded by cutting its production in November 2014 to regain market. The OPEC's influence caused crude prices to eventually fall below USD 30/bbl in February 2016. OPEC once again returned to production cuts in November 2016, this time with some non-OPEC economies including Russia. OPEC/non-OPEC (OPEC+) joint production cuts rebalanced the market and concern about Iranian oil export declines because US sanctions pushed up prices. Prices rose Brent surged to above USD 86/bbl in early October 2018 for the first time since October 2014.

However, the market seems to have turned into another downturn cycle since October 2018. A weak stock market worsened investor sentiment and Brent fell around 40% in about three months to USD 50.47/bbl on December 24, 2018. Since the beginning of 2019, the market moved back into an upward trend. OPEC+'s new production cut of 1.2 mb/d for six months started in January and OPEC's output in March hit a four-year low as Saudi Arabia reduced output to below their quota. Volatility returned to oil markets with a dramatic sell-off in late May seeing Brent prices fall from USD 70/bbl to USD 60/bbl.

The US-China trade dispute continued and led to more trade tariffs, resulting in an oil price drop to below USD 57/bbl in August 2019. ICE Brent futures prices increased on positive news on the US-China trade talks and reached USD 64/bbl following the OPEC+ meetings.

Unexpectedly, a COVID-19 outbreak at the end of 2019 shook the world and the pandemic turned the world economy upside down. Global oil demand decreased drastically, as people all over the world were quarantined and were restricted to travel. Oil prices began to lose all the gains accumulated since 2019.

Figure 4.1: Crude oil prices, 2007-2021

Source: Macrotrends (2021), Markets (2021), Indexmundi (2021)

As global refinery was forecasted to process 10% less crude oil in 2020, crude oil futures tumbled by USD 10/bbl during January in anticipation of a negative impact on demand from COVID-19. Even before the COVID-19 outbreak, the global oil supply was already 1 mb/d higher than demand because of continued oil production in the USA, Brazil, Canada, and Norway. The oil market situation worsened as demand weakened and oil prices collapsed.

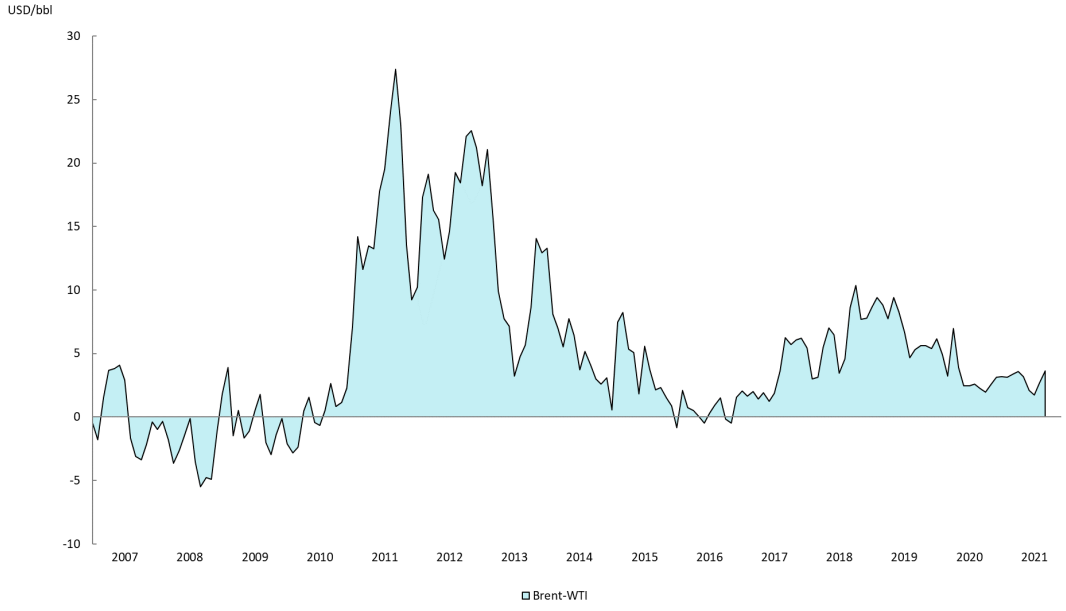
To stabilize the unsteady oil price, the OPEC+ countries planned on an additional 0.6 mb/d cut to their oil production as an emergency measure on the top of the 1.7 mb/d already agreed. However, OPEC and non-OPEC failed to reach an agreement on production cuts resulting in a Russia-Saudi Arabia price war in early March 2020 and the crude prices collapse by more than half within a month. Brent fell to USD 22/bbl and WTI fell to USD 20/bbl close to an 18-year low, around the end of March 2020.

Feeling the pressure of plummeting oil prices, OPEC+ finally reached an agreement on April 12, 2020, to cut oil production by 9.7 mb/d leading to an oil price rebound. Brent has recovered modestly from an 18-year low and traded at USD 31/bbl. However, the weaker than expected demand because of COVID-19 pushed prices for crude grades such as WTI Midland and West Canadian Select below USD 10/bbl and fell further. Negative oil futures prices were seen for the first time when NYMEX WTI settled at USD -37/bbl the day before the May contract expired. The oil prices began to recover at the end of 2020 when the COVID-19 vaccination campaigns had started and Brent and WTI prices reached USD 51/bbl and USD 49/bbl, respectively. Oil prices

continued growing from the beginning of 2021 and they gained their momentum to test their maximum in the fourth quarter of 2021. Brent closed at higher than pre-COVID levels at USD 79/bbl and WTI edged at USD 75/bbl at the end of September 2021. The oil price improvement reflects increasing oil demand due to the advancement of COVID-19 vaccination campaigns and economic recovery as well as the easing lockdown measures worldwide.

Meanwhile, the spread between the world's two most actively traded Brent and WTI has varied substantially in 2011 (Figure 4.2). The unparalleled spread in 2011-2013 is largely explained by a build-up of crude oil stocks in the USA because of the shale revolution and limited takeaway capacity, and the so-called Arab Spring – the former suppressed WTI and the latter inflated Brent. The spread temporarily widened since mid-2018 because of a shortage of pipelines to carry oil out of the Permian basin in West Texas in the USA. However, the WTI-Brent differential has narrowed as new pipelines to transport crude from the Permian Basin came online. The gap closed quickly during the COVID-19 pandemic, from an average USD 7.14/bbl in 2019 to USD 3.55/bbl in 2020 because of the pipeline in operation and the COVID-19 effect holding up shale production. The rising demand for WTI since the beginning of 2021 has driven WTI to be undersupplied and its price going up. The narrow Brent-WTI trend will likely continue in the fourth quarter of 2021 and into early 2022 before the US shale oil can increase its production back to fully respond to the high WTI prices and the Brent-WTI spread will then be widened again. As of September 2021, the Brent-WTI differential in 2021 stands at USD 2.95/bbl (9-month average), reduced by more than half from the 2019 average level.

Figure 4.2: Brent-WTI spread, 2007-2021



Source: Macrotrends (2021), Markets (2021), Indexmundi (2021)

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