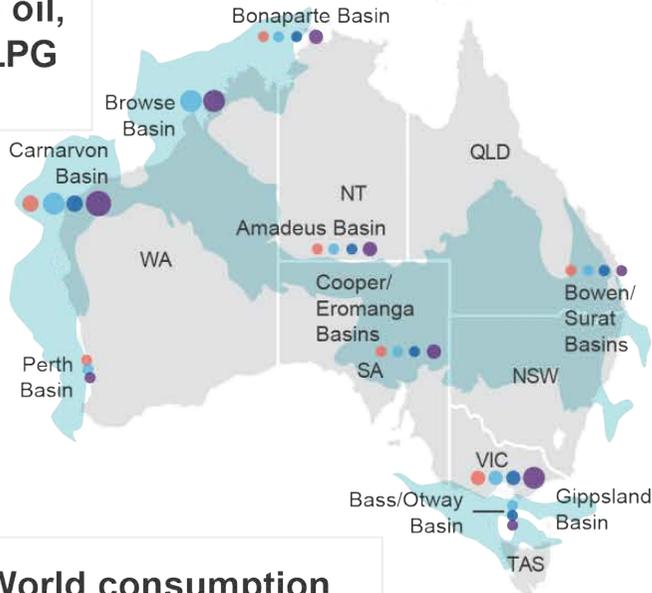
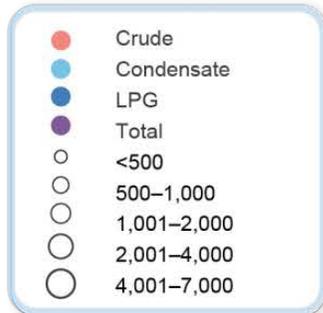
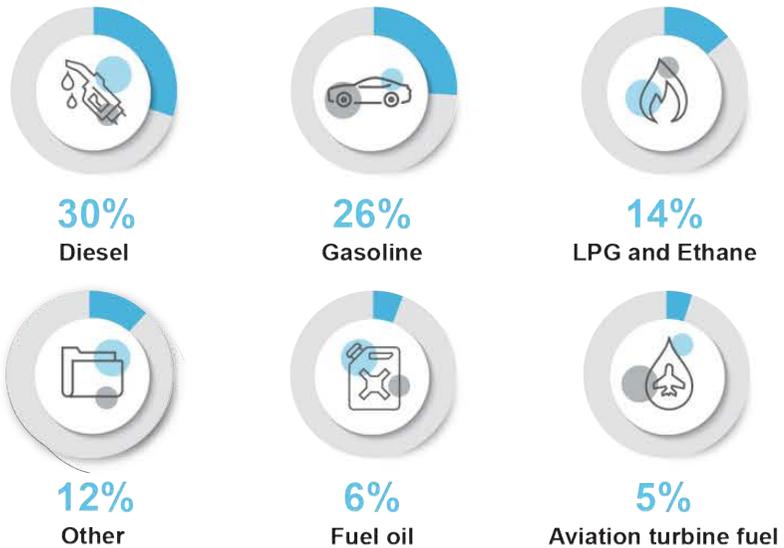


Oil

Australia's crude oil, condensate and LPG resources (PJ)



World consumption



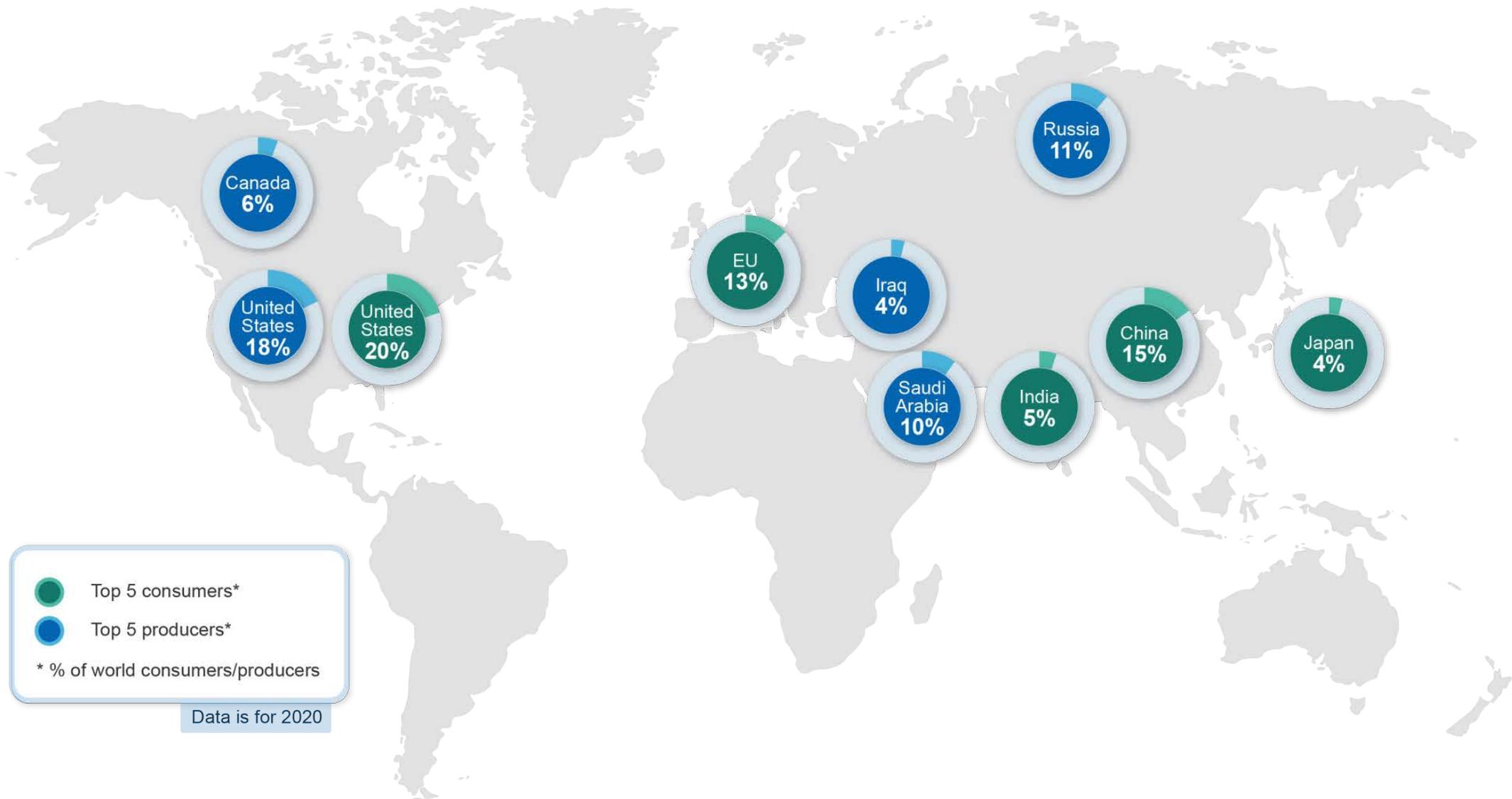
Oil facts



- Carnarvon basin produces around **2/3 of Australia's crude & condensate**
- Over the last 5 years the Brent spot price ranged from **US\$17-\$86 a barrel**
- In 2020, around **29%** of refinery feedstock was domestically produced.

Australia's oil





8.1 Summary

- Oil prices are estimated to average US\$70 a barrel in 2021 – a 66% increase from 2020. Recovering global consumption amid a tight market boosted prices, with a strong surge in the second half of the year. Brent crude prices are forecast to stabilise around \$US70 a barrel over the forecast period.
- Australian crude oil and feedstock exports in 2021–22 are forecast to increase by 11% to 306,000 barrels a day, before returning to 300,000 barrels a day in 2022–23.
- High oil prices are expected to lift Australian oil export earnings by 69% to \$12.6 billion in 2021–22. Earnings for 2022-23 are forecast to be \$11.3 billion.

8.2 World consumption

Consumption on the path to recovery, but the pandemic remains a key risk

Global oil consumption in 2021 is estimated to have averaged 96 million barrels a day — a 5.7% increase from 2020, but 3.3% lower than 2019 levels. Consumption has been significantly impacted by the COVID-19 pandemic, with lockdowns and mobility restrictions affecting global industrial activity, commuting and leisure travel during the year. Eased containment measures in major oil consuming nations, alongside the continued rollout of vaccines, and rebound in economic growth, has aided strong overall demand growth in 2021. Global oil consumption in the September quarter 2021 surged by 2.6% compared to the June quarter 2021, and by 6.1% compared to the September quarter 2020.

Demand for transport fuels is continuing to recover. Eased restrictions and strong vaccination programs in the US and Europe allowed for strong gains in road and aviation travel over the Northern Hemisphere summer holiday season this year, increasing fuel demand. Aviation fuel demand for China's domestic travel industry boomed for large periods in the year, although it was dampened by various COVID-19 outbreaks — which saw localised containment measures re-introduced in some provinces. The International Air Transport Association expects that global passenger

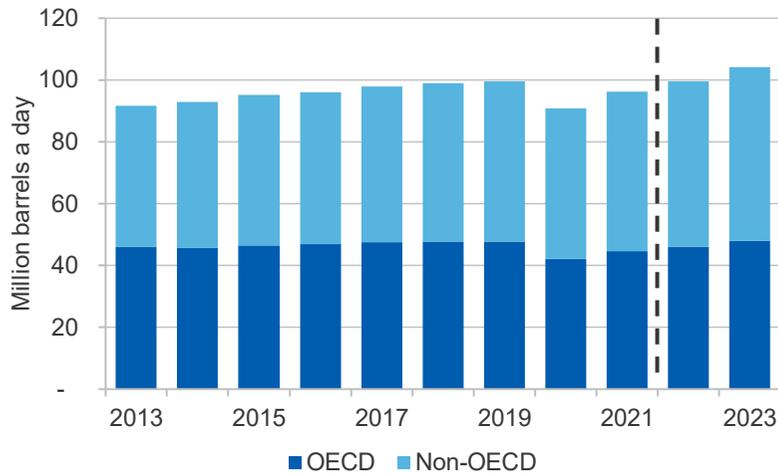
traffic will not return to 2019 levels until 2024. By the end of November 2021, flight departures in the Eurocontrol area were roughly 76% of November 2019 levels, while departures in the US measured 89% of 2019 levels.

While vaccination programs are well underway globally — with major economies now even offering 'booster' shots — COVID-19 will continue to dominate as a downside risk to consumption over the outlook period. COVID-19 developments during the emergence of colder weather, including the upcoming Northern Hemisphere winter, are of particular concern for the recovery in demand for transportation and industrial fuels. At the time of writing, the detection of the Omicron strain had caused several nations to reintroduce international travel restrictions. The efficacy of available vaccines against the Omicron variant, and future COVID-19 strains, remains uncertain, as does the potential of renewed lockdowns and widespread travel restrictions. This will remain a key threat to recovery in global consumption in 2022, particularly for global jet fuel demand.

Industrial consumption has rebounded strongly this year, with sturdy growth in economic conditions aiding global petrochemical manufacturing. Consumption for the September quarter 2021 stabilised at close to pre-COVID-19 levels. Record natural gas prices (see *gas* chapter) in Europe and Asia over the last few months have triggered a growing interest in switching from gas to liquid fuels for industrial activities, as energy companies attempt to lower costs. If these trends continue, global demand for fuel oil, diesel and naphtha could surge in early 2022. An unseasonably cold Northern Hemisphere winter could boost this demand further.

In 2022, total world oil consumption is forecast to rise by 3.5% to 100 million barrels a day, aided by more positive economic outlooks, recovering mobility, and petrochemicals sector demand led by China and the US. Consumption is forecast to rise above pre-pandemic levels in 2023, to 102 million barrels a day, as global aviation demand strengthens (Figure 8.1).

Figure 8.1: Oil consumption, OECD and non-OECD



Source: Department of Industry, Science, Energy and Resources (2021); International Energy Agency (2021).

Improving mobility driving sustained consumption growth in OECD nations

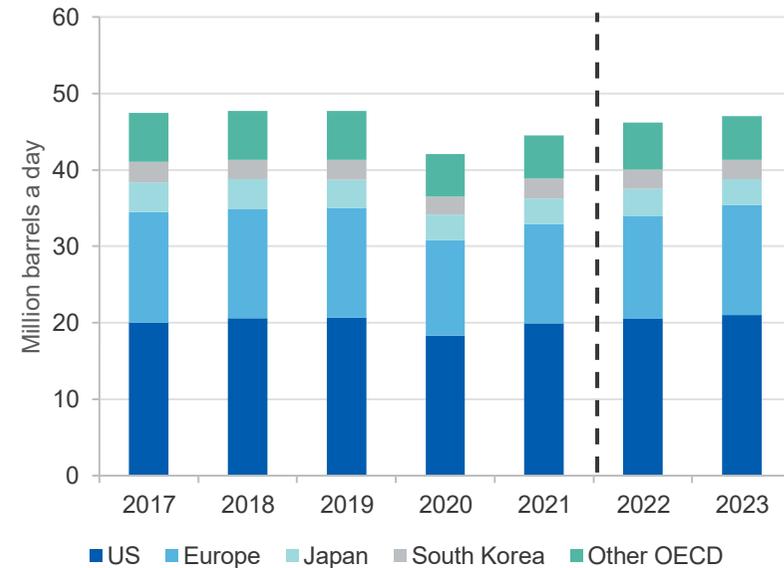
Despite weak outcomes early in the year, as a resurgence of COVID-19 infections limited demand for transport fuels in major nations, OECD oil consumption is swiftly recovering from the historic lows of 2020. Strong consumption gains occurred in the US and Europe between June and August 2021, as the easing of COVID restrictions resulted in more travel during the summer vacation season. Demand for gasoline and jet fuel remained strong in both regions well into the September quarter 2021.

A recovery in consumption in OECD Asia Pacific nations was hampered in the second half of the year by the surge in COVID-19 Delta variant cases, which forced Australia, New Zealand, Japan and South Korea to reimpose regional containment measures. However, Japan saw an uptick in industrial fuel consumption in the September quarter 2021, as well as some demand gains from the Summer Olympics. OECD demand in 2021 is estimated at 45 million barrels a day — a 6.0% increase from 2020, but a 6.7% decrease from pre-pandemic levels in 2019.

Strong COVID-19 vaccination rates and the availability of ‘booster’ injections in OECD nations should support continued positive growth in consumption. However, COVID-19 developments — including the reintroduction of any containment measures — remain a downside risk to the consumption forecast. By the end of November, infection rates in some European countries were again surging, with the possibility of introducing ‘fourth wave’ lockdowns in many nations, increasing.

Looking forward, consumption is forecast to increase by 3.7% to average 46 million barrels a day in 2022 and grow by a further 1.9% in 2023 (Figure 8.2). Beyond the outlook period, OECD consumption may never surpass 2019 levels, due to the improved fuel efficiency in passenger cars and increasing penetration of electric vehicles (EVs).

Figure 8.2: OECD total consumption, by major nations



Source: Department of Industry, Science, Energy and Resources (2021); International Energy Agency (2021).

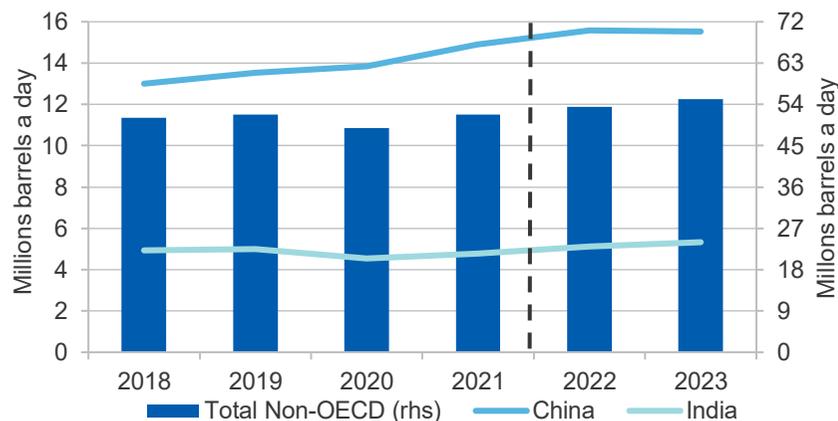
Non-OECD consumption is being driven by rising Chinese demand

Non-OECD consumption is estimated to have increased by 3 million barrels a day to average 52 million barrels a day in 2021.

Chinese oil usage recovered strongly in 2021, led by strong growth in gasoline, fuel oil and petrochemicals demand. Outbreaks of the COVID-19 Delta variant triggered widespread local containment measures in several Chinese provinces in early August and again in early November. The Chinese Government is maintaining a zero tolerance policy to COVID-19, in order to control outbreaks. These measures in August did not appear to affect industrial oil demand, however demand for jet fuel fell as a number of airports closed. Improving economic activity and vigorous policies to control future COVID-19 outbreaks should see demand in the world's second largest consuming nation continue to rise in 2022.

India has seen a significant recovery from its May 2021 COVID-19 Delta variant outbreak. By the September quarter 2021, infection control had improved, resulting in an easing of government restrictions on movement and a considerable recovery in road and aviation fuel demand. Mobility data for September 2021 reached 122% of pre-pandemic levels.

Figure 8.3: Non-OECD consumption



Source: Source: Department of Industry, Science, Energy and Resources (2021); International Energy Agency (2021)

While it is anticipated demand will continue to grow, strengthened by improving industrial activity, the pace of India's vaccination rollout and new COVID-19 variants provide heightened uncertainty to demand forecasts.

In 2022, non-OECD consumption is forecast to rise to 54 million barrels a day — surpassing 2019 pre-pandemic levels. The global shortages gripping coal and gas markets are likely to impact both China and India heading into 2022. This could see an even stronger fuel oil demand in early 2022, as power generators switch away from gas and coal. Demand is forecast to reach 55 million barrels a day in 2023 (Figure 8.3).

8.3 World production

Production set to ramp up in 2022

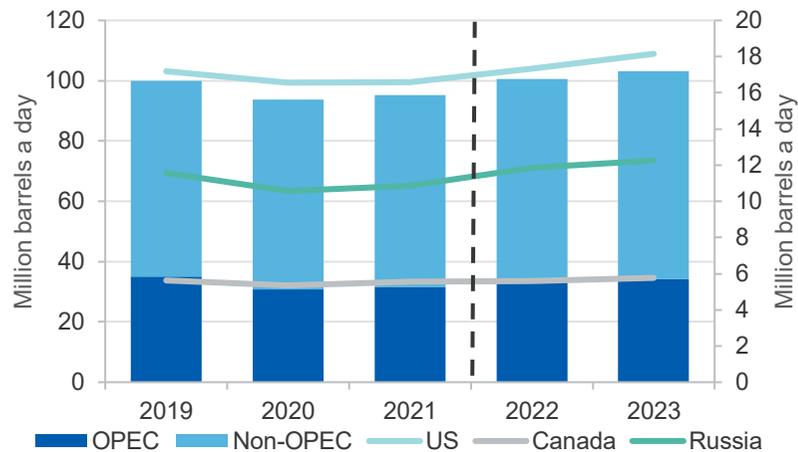
In 2021, global oil production is estimated to have risen by 1.5% compared to 2020 levels, to 95 million barrels a day, with the rise largely driven by gradual increases in OPEC+ output in the second half of the year. The supply approach of OPEC+ has achieved impressive drawdowns in global inventories — with OECD inventories plunging to their lowest levels since 2015.

Global supply is forecast to rise further in 2022 — with assumed increases in monthly oil output from OPEC+, and a ramp up in US shale production. A build in global inventories is likely to commence early in the year. Global production is forecast to increase by 5.6% to average 101 million barrels a day in 2022, before further increasing to 103 million barrels a day in 2023 (Figure 8.4).

OPEC+ supply progressively increasing

In response to a drastic surge in global oil inventories and plummeting prices in April 2020, OPEC+ reached an agreement to reduce production by 9.7 million barrels a day. Throughout 2020 and early 2021, OPEC+ compliance with output cuts was high, with the member countries that exceeded monthly quotas compensating with lower production in later months.

Figure 8.4: Global oil production



Notes: This assumes OPEC+ members fully comply with increased production quotas from August 2021.

Source: Department of Industry, Science, Energy and Resources (2021); International Energy Agency (2021).

Between May 2020 and July 2021, OPEC+ reduced their production cuts from 9.7 million barrels a day to 5.8 million barrels a day. On 18 July 2021, OPEC+ members announced they had reached an agreement for a significant winding back of the 2020 production cuts over the remainder of 2021 and into 2022. OPEC+ agreed to increase production every month — commencing in August 2021 — by 0.4 million barrels a day, until the cuts are eliminated by September 2022. The group agreed to meet monthly to reaffirm members’ commitments to ensure adequate supply and maintain market stability. Since establishing the agreement, the group has remained cautious and has not adopted any changes, with the group citing the continued risks of the COVID-19 pandemic to global oil demand. This is despite calls from the US and other major consuming countries to boost supply more significantly in November and December 2021 amid surging energy prices.

OPEC+ has warned that increases in its production targets could result in the market becoming over supplied in early 2022. In September/October

2021, there were reports that the group did not meet the agreed target, as some nations — such as Nigeria and Angola — struggled to meet their quotas due to under-investment and operational issues in their upstream sectors. At their latest meeting on 2 December, OPEC+ agreed to continue with the 0.4 million barrel a day increase for January. However, the group will be closely monitoring pandemic and market developments and have stated they may make immediate adjustments if necessary before their next scheduled meeting on 4 January 2022. Results of these production decisions are a key source of global supply uncertainty.

The potential re-entry of Iran — which is currently exempt from output cuts — into the global oil market, would have a significant impact on world production. At the end of November 2021, international negotiations to revive the Joint Comprehensive Agreement Plan of Action resumed. At the time the deal was made in 2015, Iran’s crude output rose by 1 million barrels a day over a 9 month period. These discussions will be a key factor to watch in 2022.

OPEC production is estimated to average 32 million barrels a day in 2021, up 2.4% from 2020. Assuming the July 2021 agreement is continued and production targets remain until September 2022, production is forecast to rise 6% to average 34 million barrels a day in 2022.

Non-OPEC production growing modestly

Output from non-OPEC nations is slowly being restored, with production estimated to have increased by 0.72 million barrels a day in 2021. Heavy maintenance programs to catch up on works delayed from 2020, as well as lengthy outages due to the difficult operating environment caused by COVID-19, have dampened production recovery this year.

After steep falls in 2020, US production is recovering more slowly than expected, despite the sector typically being highly responsive to prices. The modest recovery, even with the rise in oil prices, suggests US producers are taking precautions against the impact of renewed lockdowns. The US also endured a number of extreme weather events, further dampening recovery. Severe winter temperatures caused major disruptions to drilling operations in Texas in February. Hurricane Ida

passed through the Gulf of Mexico in late August. From 28 August through to 6 September, more than 80% of oil production in the Federal Offshore Gulf of Mexico (GOM) was shut in. By early October, greater than 95% of GOM supply was reported to be back online, with the remaining outages likely to last into early 2022.

It is expected that the post-Ida recovery will be supported by a ramp up in shale/tight oil production. Growth will come largely as a result of onshore operators increasing rig counts. In 2022, US output is forecast to rise by 4.5% to average 17 million barrels a day. While output is expected to rise, investment levels in the US shale sector remain a key concern. A shift towards upholding stronger Environmental, Social and Governance (ESG) values, amidst the Biden Administration's plans to address climate change, places downside risks on future output.

Other main drivers of non-OPEC supply growth in 2022 are anticipated to be Russia, Brazil, Canada and Norway. In 2022, non-OPEC production is expected to surpass pre-COVID-19 levels, averaging 67 million barrels a day, before rising to 69 million barrels a day in 2023.

8.4 Prices

Prices endured steep surge, followed by volatility, in second half of 2021

Oil prices have seen a tremendous upwards trajectory in 2021, following the dramatic falls in the first half of 2020. An uptick in global demand amid recovering economic activity, a disciplined approach from OPEC+, and a lagged recovery from other major producers, has facilitated stock draw downs and boosted prices. The average Brent oil price in January was US\$55 a barrel, but by November prices had surged to average US\$81 a barrel. Prices dipped in early April, as some countries (such as India) reimposed COVID-19 containment restrictions, and fluctuated again in August, when a surge in the Delta variant COVID-19 cases gripped the globe. The rise was particularly steep between September and November, with prices topping US\$85 a barrel on multiple days in October and November. These were the highest levels recorded since October 2018. During November 2021, price volatility increased, as a surge in new Delta

variant outbreaks prompted the governments of some European nations to reinforce containment measures. China also reported its largest outbreak caused by the Delta variant in November, with the Chinese Government introducing localised restrictions. On November 26, with the news of the detection of the Omicron variant, prices plunged. Brent crude dropped 12% to US\$72 a barrel. The average Brent price for the December quarter is estimated at US\$79 a barrel. Overall, Brent oil prices are estimated to have averaged US\$70 a barrel in 2021 — a 66% increase from last year (Figure 8.5).

The sharp price rise seen in the second half of 2021 is the result of a number of significant global market developments. Crude oil prices have been swept up in the broader energy market rally, where high gas and thermal coal prices (see *gas* and *coal* chapters) in Europe and Asia have prompted interest in gas-to-oil fuel switching for power generation. This potential increase in demand comes in addition to the ongoing recovery in oil consumption linked to the global economic recovery. Global supply has remained tight, following supply disruptions in US offshore crude production in the wake of Hurricane Ida, and the high compliance with output cuts among OPEC+ members. The tight market has facilitated sustained draws of global inventories. From May to September, total OECD oil stocks were drawn by nearly 170 million barrels.

In November 2021, the US Government announced it will release 50 million barrels of oil from its Strategic Petroleum Reserves (SPR), in coordination with China, India, South Korea, Japan and the United Kingdom. Of the 50 million barrels, 32 million barrels be an exchange delivered from mid-December through April 2022 that will eventually return to the SPR in the years ahead. 18 million barrels will be an acceleration of a sale of oil that was previously authorised by the US Congress. The SPR release was designed to alleviate rising local gasoline prices, with the average U.S. regular gasoline retail price in October at its highest monthly average since September 2014. Speculation of the announcement led to some decline in global prices in the weeks prior to it being formally announced.

Figure 8.5: Brent oil prices in 2020 and 2021



Source: Bloomberg (2021); Department of Industry, Science, Energy and Resources (2021).

Brent prices forecast to average US\$73 a barrel in 2022

Developments concerning the Omicron variant, as well as the SPR release and any change in output decisions of OPEC+, could result in oil prices remaining somewhat volatile heading into 2022. However, considering the observed market shifts when outbreaks of the Delta variant occurred in 2021, and some recovery in early December, it is anticipated that prices will rebuild some of their losses in early 2022. As 2022 progresses, consumption is expected to grow. Production is also forecast to lift, with both a rise in output from the US and forecast monthly output increases from OPEC+. It is anticipated that these market shifts will help to rebuild global oil stocks and put gradual downward pressure on prices. The release from the SPR will increase domestic supplies in the US, and so could result in a

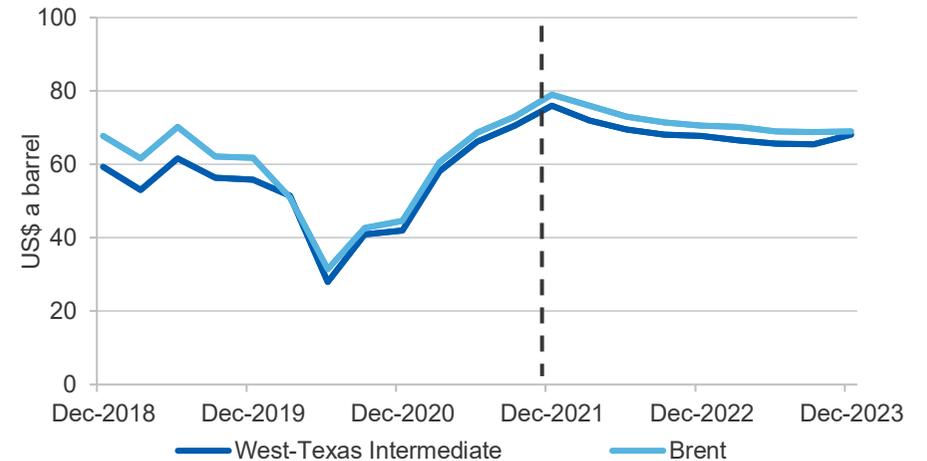
In 2022, Brent prices are forecast to average US\$73 a barrel (Figure 8.6).

COVID-19 developments, including new virus variants, will continue to provide demand side uncertainty and affect market sentiment over the forecast period. At the time of writing, the Omicron variant was surfacing in

major nations and causing volatile behaviour in oil prices, as the threat of renewed lockdowns and restrictions on mobility weighed on market sentiment. While it is anticipated that global consumption will continue on an upward trajectory throughout 2022, the effectiveness of vaccines against new virus strains, along with government responses when new outbreaks occur, has strong potential to impact global demand and affect prices. The slower pace of vaccine deployment in emerging economies heightens the possibility of additional restrictions in response to outbreaks. Pandemic related uncertainty will be a key factor to observe over the outlook period.

On the supply-side, price forecast uncertainty is largely driven by the production decisions of OPEC+. Given an evolving demand outlook, with risks posed by pandemic, the group could make major adjustments to production targets, thus affecting future output. Additional uncertainty exists beyond September 2022, when the current agreement for production quotas is due to end. It is expected that US producers will ramp up drilling activity in response to the price recovery in 2021. The increased US output will impact future prices.

Figure 8.6: Price outlook



Source: Bloomberg (2021); Department of Industry, Science, Energy and Resources (2021).

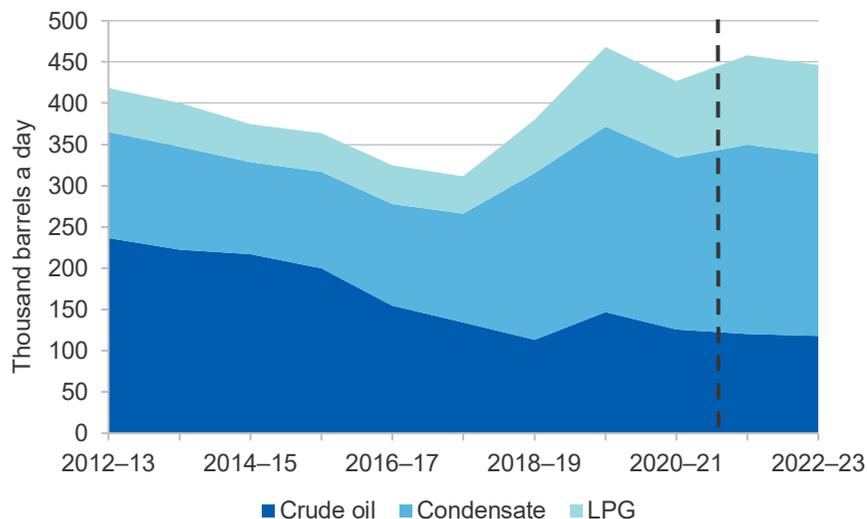
8.5 Australia

Project investment decisions to influence future production

In 2020–21, Australian crude and condensate production declined to 334,000 barrels a day — a 10.1% decline from 2019–20 (noting that source data for Australian production has been revised— see *historical data tables*). Condensate output was negatively impacted when the Prelude FLNG project was offline from February 2020 to January 2021. Gorgon also experienced a number of technical issues throughout 2020 and early 2021, further disrupting production. Issues at Gorgon were resolved at the end of July, so output is likely to lift in 2021–22. In 2020–21, condensate accounted for 49% of total Australian crude oil, condensate and LPG production. LPG accounted for 22% (Figure 8.7).

Production is forecast to increase to 349,000 barrels a day in 2021–22, as output recovers at existing major fields and projects. Output is expected to return to 339,000 barrels a day in 2022–23.

Figure 8.7: Composition of Australian oil production



Source: Australian Bureau of Statistics (2021); Department of Industry, Science, Energy and Resources (2021)

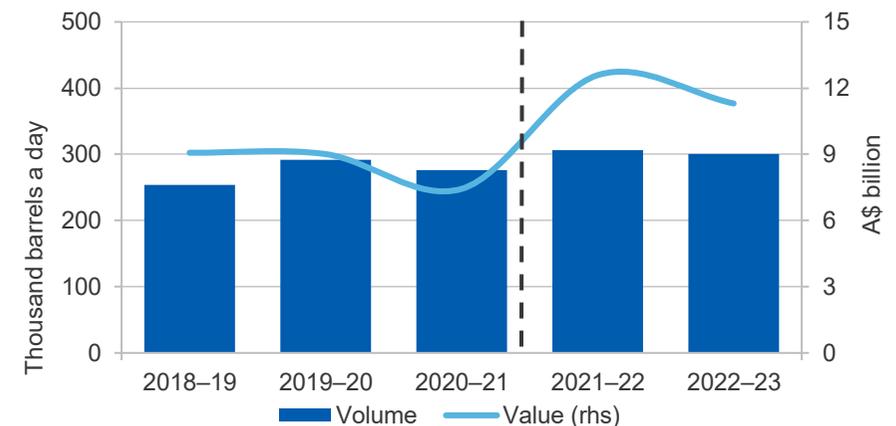
Final Investment Decisions (FIDs) for several large oil and gas projects expected in the coming year, may affect crude, condensate and LPG production beyond the forecast period (see *Resources and Energy Major Projects: 2021 Report*).

Santos is anticipating an FID on the Dorado oil project in the Bedout sub-basin off the coast of Western Australia, in 2022. This project has an estimated initial capacity of 75–100k barrels a day — nearly a quarter of 2020–21 Australian crude oil and condensate production. In June 2021, Santos announced the project had entered the front-end engineering and design (FEED) phase. First production is expected by 2026.

Australian export earnings to lift with higher prices

Australian crude and condensate export values were \$7.4 billion in 2020–21. Export values declined by 17.5% from 2019–20, reflecting the weak prices experienced in 2020. The surge in prices in 2021 is expected to lift export earnings in 2021–22. Crude and condensate export values are forecast to rise to \$12.6 billion in 2021–22, before decreasing in 2022–23 to \$11.3 billion, as prices decline and stabilise (Figure 8.8).

Figure 8.8: Australian oil and feedstock exports



Notes: Includes crude oil and condensate, but excludes LPG.
Source: Australian Bureau of Statistics (2021); Department of Industry, Science, Energy and Resources (2021).

Domestic refinery production falling with refinery closures

Australian refinery output declined by 15.8% in 2020–21 (noting that source data for Australian production has been revised— see *historical data tables*). Local refiners suffered a challenging year — with low transport demand and fierce international competition weighing on profitability. In the space of four months, half of Australia’s refineries announced they would close in 2021.

BP decommissioned their Kwinana refinery in March 2021 to convert it to an import terminal. Exxon Mobil commenced the shutdown process for their Altona refinery at the end of August 2021. The two remaining refineries —

— continue to operate until at least mid-2027, subject to Government support. As part of the 2021–22 Budget, the Australian Government announced a comprehensive fuel security package. The package includes a variable fuel security services payment to the remaining refineries, where they will receive payment for the production of key transport fuels (jet fuel, petrol and diesel). A minimum stockholding obligation (MSO) is also included in the package, and will require importers and refiners in Australia to maintain minimum stocks of key transport fuels from 1 July 2022.

Total refinery production in September 2021 fell 17% compared to the previous month, as refinery operations wound down at Altona. With only two remaining refineries producing the majority of Australia’s key fuels, refinery throughput will likely continue to decline in 2021–22 and 2022–23.

Australian refined product consumption fell in 2020–21, as COVID-19 containment measures continued to weigh on activity. Aviation fuel consumption decreased by 54% from 2019–20 levels, reflecting the effects of COVID restrictions on both domestic and international travel. However, diesel consumption for 2020–21 was 2% higher than in 2019–20, owing to its broad consumption base. Between June and September 2021, overall consumption steadily declined, due to falls in automotive gasoline and aviation fuel consumption. The fall in demand for refined products reflects lockdowns in NSW, VIC and the ACT during these months. Australia’s

strong vaccination campaign, the re-opening of most state borders, and eased international border restrictions, are expected to strengthen demand for transportation fuels in 2022.

Australian refined product usage is forecast to recover in 2021–22 from 2020–21 levels. However, consumption gains will be constrained by the south east coast state lockdowns of most of the second half of 2021.

Exploration

In the September quarter 2021, Australia’s petroleum exploration expenditure was \$285 million on a seasonally adjusted basis — a quarterly increase of \$32.8 million or 13%. Onshore exploration rose 13% to \$189 million, while offshore increased by 14% to \$96.2 million (Figure 8.9).

Figure 8.9: Australian petroleum exploration



Source: ABS (2021) Mineral and Petroleum Exploration, Australia, 8412.0.

Revisions to forecasts

Since the September 2021 *Resources and Energy Quarterly*, the forecast for Australia’s crude and condensate export earnings has been revised up by around \$1.40 billion in 2021–22, due to higher prices. Export earnings for 2022–23 have been revised up by \$1.37 billion.

Table 8.1: Oil Outlook

World	Unit	2020	2021 ^s	2022 ^f	2023 ^f	Annual percentage change		
						2021 ^s	2022 ^f	2023 ^f
Production ^a	mb/d	93	95	101	103	2.4	5.6	2.4
Consumption ^a	mb/d	91	96	100	102	5.7	3.5	2.6
WTI crude oil price								
– nominal	US\$/bbl	41	68	69	66	67.0	2.4	-4.2
– real ^b	US\$/bbl	42	68	67	63	61.0	-1.0	-6.7
Brent crude oil price								
– nominal	US\$/bbl	42	70	73	69	65.6	3.5	-4.9
– real ^b	US\$/bbl	44	70	70	65	59.7	0.1	-7.4
Australia	Unit	2019–20	2020–21	2021–22 ^f	2022–23 ^f	2020–21	2021–22 ^f	2022–23 ^f
Crude and condensate								
Production ^{ac}	kb/d	372	334	349	339	-10.1	4.5	-2.9
Export volume ^a	kb/d	291	276	306	300	-5.2	10.8	-1.8
– Nominal value	A\$m	9,009	7,434	12,586	11,303	-17.5	69.3	-10.2
– Real value ^h	A\$m	9,377	7,614	12,586	11,064	-18.8	65.3	-12.1
Imports ^a	kb/d	317	247	196	200	-22.2	-20.5	2.1
LPG production^{acd}	kb/d	96	92	108	107	-4.4	17.7	-1.3
Refined products								
– Refinery production ^{ac}	kb/d	445	375	250	236	-15.8	-33.3	-5.5
– Export volume ^{ae}	kb/d	17	13	12	11	-21.4	-9.5	-4.2
– Import volume ^a	kb/d	640	647	725	762	1.1	12.0	5.2
– Consumption ^{acg}	kb/d	981	913	880	910	-7.0	-3.5	3.4

Notes: **a** The number of days in a year is assumed to be 365, and a barrel of oil equals 158.987 litres; **b** In 2021 calendar year US dollars; **c** Historical production data was revised in the December quarter 2021 to align with Australian Petroleum Statistics; **d** Primary products sold as LPG; **e** Excludes LPG; **f** Forecast; **g** Domestic sales of marketable products, including imports; **h** In 2020-21 financial year Australian dollars; **s** estimate.

Source: ABS (2021) International Trade in Goods and Services, Australia, Cat. No. 5368.0; International Energy Agency (2021); EnergyQuest (2021); US Energy Information Administration (2021); Department of Industry, Science, Energy and Resources (2021).