



KAPSARC Oil Market Outlook (KOMO)

Q1, 2021

Summary

Total global oil demand is expected to increase year-on-year (YoY) by 4.2 million barrels per day (MMb/d) in 2021 and further grow by 3.5 MMb/d in 2022, returning to 2019 levels by the third quarter (Q3) 2022. The International Monetary Fund (IMF) predicts economic growth of around 5.4% in 2021, compared with a decline in real gross domestic product (GDP) in 2020 of -4.4%. However, KOMO estimates a forecast more in line with the OECD's outlook for growth (4.2%), which presumes that GDP levels will only reach 2019 levels by the end of 2021. This projection for growth in 2021 reflects the assumption of an ongoing recovery in economic activity and that a combination of vaccine availability and coronavirus immunity will allow the recovery to continue without any new waves of the virus occurring. Indeed, oil demand in many emerging economies already started to bounce back in Q3 and Q4 2020. The economic recoveries of many OECD countries, as well as those in the Middle East, Eurasia, Africa and Latin America, are expected to take longer than Asia, while Asia is expected to lead the rebound in oil demand in 2021. China's average demand is expected to be around 13.4 MMb/d in 2020, with 15 MMb/d in Q4 2020 due to the government relaxing its import quota restrictions on teapot refiners and oil traders. We expect Chinese demand to normalize in Q1 2021 at around 14.4 MMb/d, with 1 MMb/d of this going into inventories. Nevertheless, this normalization will remain highly contingent on the success of virus containment measures globally as well as the continuation of economic stimulus packages, and we assume that the pandemic (including the new COVID-19 variant) is largely brought under control by the end of April 2021 without any further waves or variations of the virus. With the Northern Hemisphere in winter and a spike in cases, global demand is expected to decline by 200 thousand barrels per day (Kb/d) in Q1 2021 (YoY), and by 900 Kb/d quarterly. However, the global program of vaccinations is likely to allow the recovery in economic activity (and therefore oil demand) to continue after April.

Our assumption of declining global demand led by a quarterly decline in demand from China is based on the results of our models, which indicated China's demand going from around 15 MMb/d in Q4 2020 to 14.4 MMb/d in Q1 2021. Our fuel consumption model concluded that China's actual consumption for Q1 2021 is at about 13.3 MMb/d. This implies that over 1 MMb/d will go to storage.

Although most countries' oil demand has started to rebound in Q1 2021, others, such as those in the Middle East and OECD Europe, are expected to decline this quarter. For now, KOMO notes that although OECD Europe is expected to rebound during the next eight quarters, it will not reach 2019 levels. It is possible that oil demand in OECD Europe has peaked.

Total global oil supply is expected to grow by 650 Kb/d in 2021 with a stronger recovery of 3.4 MMb/d in 2022. OPEC+ members should account for most of the rebound in supply in 2021 as the gains will likely not be driven by new projects, but by ramping up existing assets. The Joint Ministerial Monitoring Committee (JMMC) meeting held in January agreed that Russia and Kazakhstan would increase production by 75 Kb/d each month in February and March, while Saudi Arabia volunteered to cut an additional 1 MMb in the short term. After this period, there is no official guidance and all decisions will be made on a monthly basis,

Summary continued...

reflecting the market conditions. Bringing production back at full throttle after April risks destabilizing the efforts made in 2020 and regressing prices to May 2020 levels. Hence, we assume a more gradual production increase among all members through 2022. We expect the actual course of OPEC+ production restoration in 2021-2022 to depend on how quickly inventories can be drained. We estimate supply in Q1 2021 will be 7.3 MMb/d less than Q1 2020, though growing by 500 Kb/d from Q4 2020.

This step to balance the market, given the current new lockdown provisions worldwide, will ensure that prices remain stable, strengthening to pre-COVID-19 levels by late 2022. As a result, there is the potential for additional production to come online. Shale is a wildcard when it comes to a potential recovery over this period and adds significant uncertainty to the supply forecast. United States (U.S.) shale production is expected to continue to decline by 600 Kb/d YoY in 2021, and the outlook for 2022 is entirely dependent on the resumption of drilling operations to combat the declines. We forecast shale growth of 750 Kb/d in 2022, which will offset the loss of production in 2021.

These supply/demand trends suggest that there will be an average global withdrawal from global inventories of 1.1 MMb/d in 2021 and 1.3 MMb/d in 2022. We expect the declines in supply for the next eight quarters to range between 0.4 MMb/d-1.8 MMb/d. We again note that the current 2021 balance outlook assumes that OPEC+ members will increase production at a gradual rate, the vaccination programs will bring back further economic recovery, AND the recent spread of the new COVID-19 variant is controlled by the end of Q1 2021, with no further new waves of the virus. Compliance rates could vary if pricing improves and fiscal circumstances test the resolve of some OPEC+ members. However, based on the projected imbalances in 2021 and the estimated deficit of 1.9 MMb/d in the third quarter, OPEC+ members could begin to ease their remaining cuts as soon as the second half (2H) of 2021 if inventory withdrawals accelerate. As such, we assume that the remainder of Saudi Arabia's voluntary cuts are relieved by Q3 2021, and the group as a whole increases its production by 500 Kb/d. Beyond this point, there is room for a consistent increase in production of 500 Kb/d without exceeding the growing demand, while inventory levels decline.

Under these assumptions, we expect target inventory levels for the OECD to decline by 56 MMb, reach 4,579 MMb in 2021 and increase by 36 MMb in 2022. We expect actual inventory levels to reach 4,697 MMb in 2021 and further decline by 180 MMb in 2022, falling below target levels by Q1 2022 and creating a conducive different from rest of word environment for prices to rise gradually.

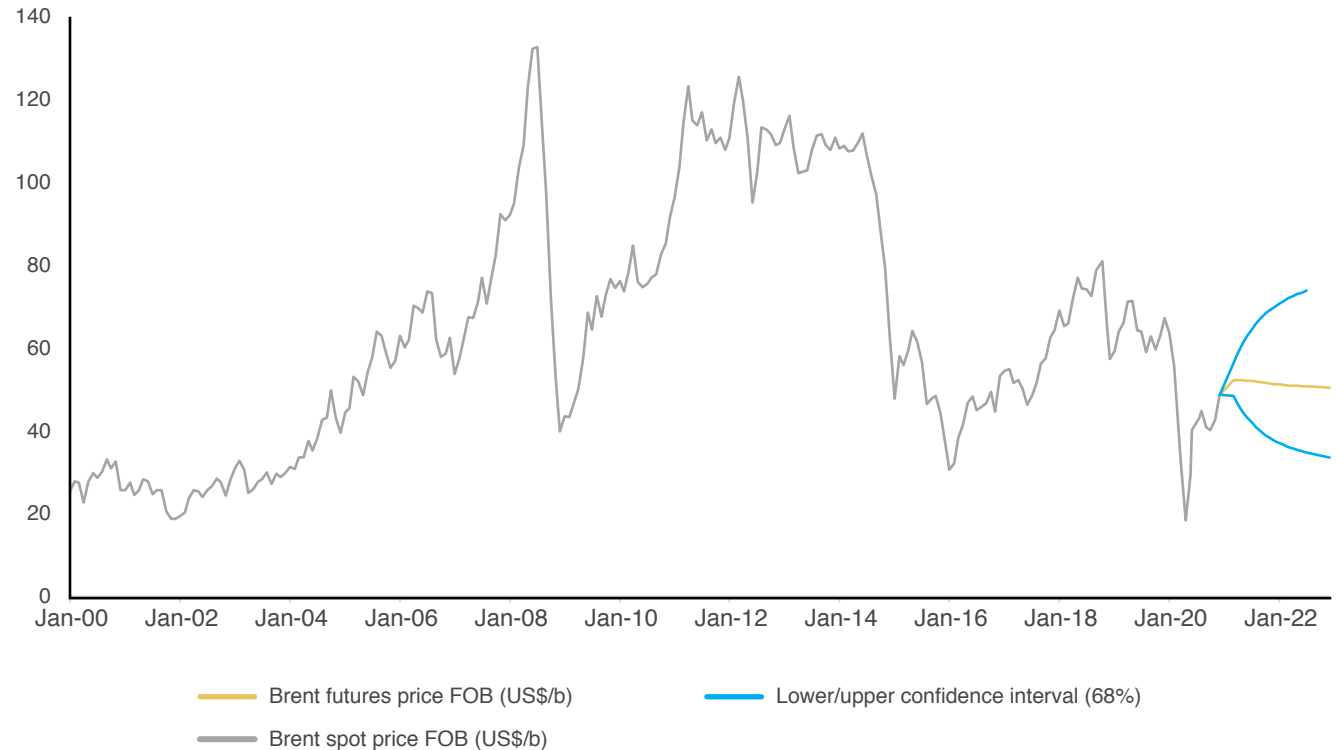
	2019	2020	Δ	2021	Δ	2022	Δ
Demand	99.3	91.8	-7.4	96.0	4.2	99.6	3.5
Supply	100.6	94.2	-6.3	94.9	0.6	98.3	3.4
Δ	1.3	2.4		-1.1		-1.3	

Summary (prices)

The confidence interval is derived from options market prices and the futures curve, which represent the views of a wide array of market participants, such as producers, refiners, airlines, speculators and others.

KOMO expects prices to rise in Q1 2021, given the assumptions provided in the summary. Moreover, while comparing this edition's confidence intervals with previous publications, we notice that the spreads grew closer, hinting at expectations of reduced volatility.

Brent crude oil price and 68% confidence intervals US\$/b



US\$/b	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022
Futures	\$ 52.26	\$ 52.20	\$ 51.89	\$ 51.46	\$ 50.84	\$ 50.73	\$ 50.50	\$ 50.44
50% CI	\$49 - \$54	\$47 - \$58	\$44 - \$61	\$42 - \$63	\$41 - \$64	\$40 - \$65	\$39 - \$65	\$38 - \$66
68% CI	\$48 - \$56	\$45 - \$59	\$40 - \$66	\$38 - \$69	\$37 - \$71	\$35 - \$73	\$35 - \$74	\$34 - \$76
95% CI	\$45 - \$61	\$39 - \$71	\$33 - \$82	\$29 - \$92	\$26 - \$98	\$25 - \$103	\$24 - \$106	\$22 - \$112

Source: KAPSARC calculations based on NYMEX data, CME Group, FINCAD, December 2020.

Note: CI= confidence interval

Key issues for the oil market in 2021 and 2022

For a better understanding on what to expect in 2021, KOMO requested the IMF's permission to publish the following maps taken on December 20, 2020 from The IMF [DataMapper](#). The DataMapper is a tool that allows users to visualize, compare, and download data from a collection of IMF datasets, including a wide selection of regional and national economic indicators.

Figures 1 and 2 represent real GDP growth for 2020 and 2021, respectively. The red and green shades represent degrees of contraction and expansion, respectively. The IMF DataMapper estimated that the world would see a decline in real GDP of -4.4% in 2020 and a rebound of 5.2% in 2021. Unlike the IMF's projections and more in line with KOMO's own estimations, the OECD's forecast does not project the

2021 recovery in real GDP to outpace the 2020 decline, but rather to rise by 4.2% in 2021, thus offsetting the decline in 2020. Moreover, the recovery will be gradual and will differ for each country.

While the economies of countries such as China are expected to grow by 1.9% this year, others may not reach their 2019 growth levels in 2021 or 2022, particularly hydrocarbon and service-oriented economies. Indeed, while a recovery in travel is expected to be slow and thus lead to reduced oil demand, some countries may lose on oil revenues while others may lose on service revenues. Even with the current global easing of fiscal and monetary policies, the dichotomies between countries emphasizes that countries will recover at different speeds.

Some may argue that this expected recovery in the global economy is the result of early vaccine distributions. However, indicators show that the recovery started in early October, only to be halted again in the wake of a second wave of quarantine measures in several countries as a renewed wave of infections spread. Nevertheless, the early distribution of vaccines in December and the consensus on the continuation of fiscal and monetary packages have given more confidence to the market. Together with the easing of geopolitical concerns, including expectations of a more moderate approach by the new President of the United States, Joe Biden, commodity prices could rise.

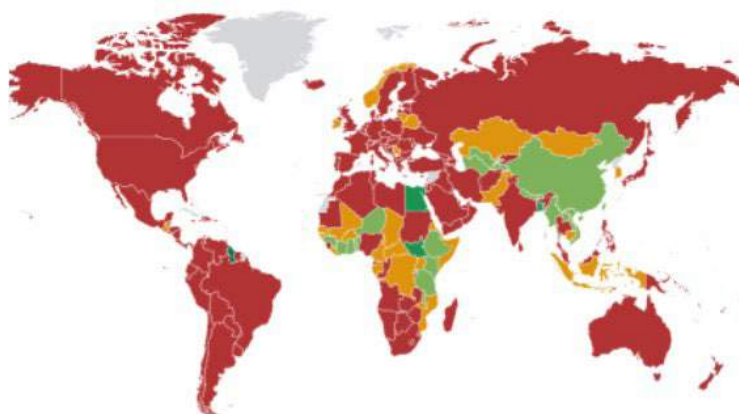


Figure 1. IMF's real GDP growth forecast 2020.

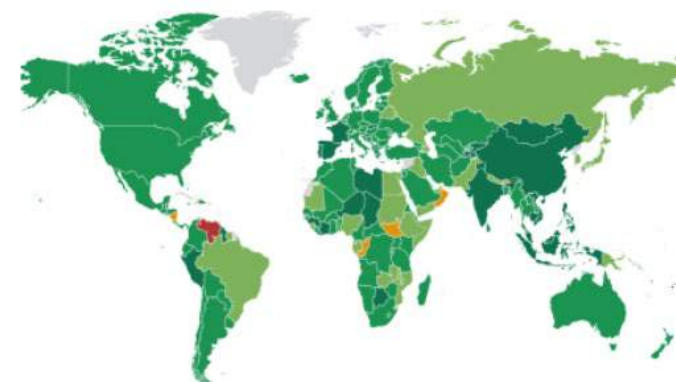


Figure 2. IMF's real GDP growth forecast 2021.

Key issues for the oil market in 2021 and 2022...

The real GDP growth of OECD and non-OECD countries for 2020 and 2021 remains around 9% (by swinging from negative to positive growth). But surprisingly, oil demand recovery in 2021 for OECD countries is expected to be at the same level (in b/d) as non-OECD countries. This is due to several reasons:

- Major non-OECD economies such as China, India and Brazil returned to YoY growth in Q3 and Q4 of 2020, so the recovery in demand is already underway (unlike our OECD expectations).
- Vaccine distribution is expected to reach OECD member countries earlier than the remaining non-OECD members.

Our forecast may see further changes as a new COVID-19 variant with a stronger capability to spread halts economic activity in the United Kingdom (U.K.) and continues to spread in other countries. Although, as of December, the three approved vaccines are still equipped to prevent this new variant, further viral evolution may render the current vaccines less potent. If this scenario occurs, we will face another wave of quarantine measures and OPEC+ may need to maintain production cuts for a longer period. However, for now, and based on the available information, this is less likely to happen as the world remains hopeful that governments and citizens will maintain safety precautions during this period.

Whether or not a third wave occurs, demand is not expected to reach its 2019 levels this year. In fact, KOMO projects a slight decline in demand for Q1 2021 compared with Q4 2020. Even as economic activity recovers, travel and spending behavior changes are expected to lead to a durable demand loss and a slow demand recovery. Although domestic aviation has been rising since the summer, it generally remains well below pre-pandemic levels, and international travel remains very subdued. However, when looking at KOMO's long-term vehicle model, we notice that vehicle sales have remained somewhat healthy for 2020. Couple this fact with some behavioral changes such as increasing mileage in Brazil, and we do see overall global growth for oil in 2021.

While some may argue that most assets have not been compromised and that there should be a strong rebound after the crisis passes, this may be offset by the number of jobs and investments lost. Unemployment levels in some countries have very likely surpassed those of the 2007-2008 Global Financial Crisis, which took over two years to recover from. Indeed, sectors like tourism, air travel and mass transit face the risk of durable changes in consumer preferences, with potential implications for future oil demand.

KOMO's assumptions in the past two quarters were more optimistic and expected air travel to resume by Q4 2020. However, this has not been the case to date, with a slower recovery, particularly in the services sector,

including discretionary consumer spending and travel. The forecast for the aviation sector will be affected by recent innovations in the airline industry, including rapid COVID-19 testing for crew and passengers and the speed of vaccine certification.

- The IMF forecasts that global gross domestic product (GDP) for 2020 will decline by 4.4%, compared with growth of 2.8% in 2019. It also states that

“Global growth is projected at 5.2 percent in 2021, a little lower than in the June 2020 WEO Update, reflecting the more moderate downturn projected for 2020 and consistent with expectations of persistent social distancing. Following the contraction in 2020 and recovery in 2021, the level of global GDP in 2021 is expected to be a modest 0.6 percent above that of 2019. The growth projections imply wide negative output gaps and elevated unemployment rates this year and in 2021 across both advanced and emerging market economies.”

As mentioned earlier, we have a less optimistic assumption for global economic growth for 2021, closer to the OECD's view.

- Fiscal stimulus package distributions are expected to play the most important role as they support consumers, businesses and the banking system

Key issues for the oil market in 2021 and 2022...

against the economic impact of COVID-19. Couple this with the uncertainty surrounding the potential for low, or negative short-term interest rates in many OECD countries, and there could be a modest recovery if the stimulus measures are kept in place.

- Geopolitical tensions are expected to subside on many fronts, with U.S. sanctions on Iran expected to ease, China and the U.S. resuming talks, and more diplomacy among all countries, as many shift their attention toward the pandemic and economic recovery.

Global supply in Q1 2021 is expected to increase by around 500 Kb/d, a more modest pace than in the previous quarter. This will be largely driven by Saudi Arabia's recently announced additional cuts of 1 MMb/d. Despite a recent uptake in drilling activity, U.S. shale production will continue to decline in the short term. Indeed, current drilling activity and investments indicate that the U.S. shale industry will continue to struggle.

In accordance with both Rystad and the International Energy Forum's (IEF) forecasts, drilling capital expenditure (capex) is expected to decline by 30%. Furthermore, Boston Consulting Group (BCG) forecasts further 20% declines for 2021 in their recent publication "Oil and Gas Investment in the New Risk Environment."

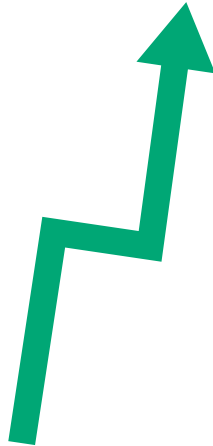
On the other hand, OPEC+ cuts and compliance levels have improved, and the market, while still shaky, is much less volatile now than earlier in 2020. The much-hoped-for 'V-shaped' recovery has not occurred, and shale continues to feel the pinch, with the industry facing accelerating financial difficulties. The overall decline in investment and drilling will result in flat-to-declining North American shale production for 2021, with a recovery expected in early 2022 at the earliest. While improved pricing may allow for a recovery of drilling activity, the industry will need to overcome the production declines of 2020.

Recent political and economic developments have made forecasting supply somewhat difficult. Iran announced that it may double production if sanctions are lifted, Libya saw substantial economic growth in Q4 2020, and Iraq recently devalued its currency by around 20%. These factors have put OPEC compliance levels and the exemption status of countries such as Iran and Libya under the spotlight. Furthermore, the delayed development of production in Guyana, Brazil and Norway during the pandemic are expected to come onstream in 2021.

The currently high inventory levels as well as spare capacity levels, which will persist well into 2021, should be sufficient to mitigate any short-term negative supply shocks and result in gradual price movements with less volatility. Prices could see additional downward pressure if the current spread of COVID-19 is not controlled. As always, inventories have the potential to cushion volatility if they remain below capacity, but if storage again threatens to reach historic capacity levels, as it did earlier in 2020, price volatility can be expected. Although this scenario appears unlikely with global inventories now receding, it could occur if OPEC+ members fail to honor their agreement and/or demand weakens.

KOMO's supply/demand forecast is an average for each quarter and does not take into account short-term volatility. Actual changes to supply and demand will, of course, remain volatile in light of the responses to and the duration of the COVID-19 pandemic. Other challenges may include unexpected oil supply cuts due to hurricanes, OPEC+ compliance, and upheavals in developing countries, among others.

Factors influencing price



- Effective containment of COVID-19 with accelerated vaccine distribution
- Maintaining fiscal stimulus and more liquidity for emerging markets
- Faster OECD recovery
- Weaker non-OPEC rebound/growth supply
- Opening international borders for travel
- Sharper than expected decline in U.S. shale production

Future catalysts (+/-) for price strength

- Rate of OPEC+ easing production post-April
- Speed of U.S. measures to reduce sanctions
- Magnitude of recession recovery and restoration of market confidence
- Resilience of non-OPEC production
- Further multilateral cooperation and national action and policies



- Extended global recession
- Renewed quarantine measures for COVID-19 or a third wave
- Global inventory stockpile overhang
- Stronger non-OPEC supply (shale and conventional)
- Rapid return of OPEC-exempted member production



Demand forecast

Global oil demand is projected to grow by 4.2 MMb/d in 2021 year-on-year and further increase by 3.5 MMb/d in 2022. However, global demand in Q1 2021 is expected to decline by around 900 Kb/d from Q4 2020, and then start to rise gradually. The expected decline comes as a result of increased measures to address rising caseloads, the new COVID-19 strains emerging in Europe and Africa, and easing demand from countries like China that increased their oil imports above normal levels in Q4 2020 to take advantage of lower prices.

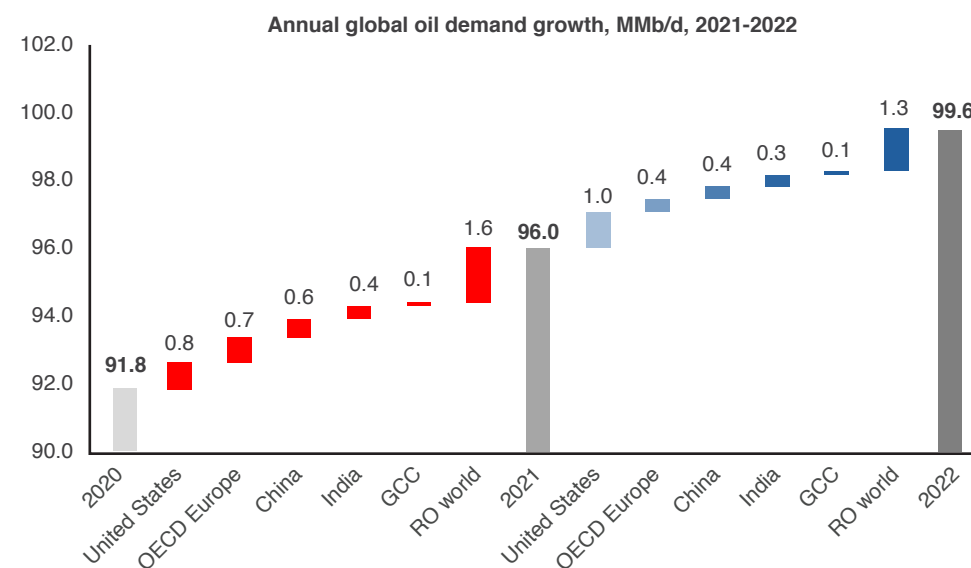
Surprisingly, OECD nations are expected to have the same amount of oil demand growth as non-OECD countries this year, at around 2.12 MMb/d. The United States is estimated to be responsible for most of the OECD growth, representing 91% of the Americas OECD growth and 40% of total OECD growth. It was the most affected by the 2020 crisis, and should therefore see the strongest rebound in demand. We estimate demand to grow by around 890 Kb/d for OECD Americas, followed by OECD Europe at 740 Kb/d then OECD Asia-Oceania at roughly 440 Kb/d.

Non-OECD countries are expected to witness growth of 2.14 MMb/d in 2021. Asia will represent most of the growth for 2021 followed by Latin America, with Asia's demand growing by around 1.73 MMb/d, followed by Latin America at around 460 Kb/d, and Africa at around 80 Kb/d. Both the Middle East and Eurasia are expected to see demand declines in 2021 of 74 Kb/d and 45 Kb/d, respectively.

As discussed earlier, and in accordance with the IMF's recent outlook, hydrocarbon exporting countries are estimated to have the slowest recovery as economic growth remains proportional to their hydrocarbon exports. Although countries like Saudi Arabia and Russia are expected to drive oil demand growth for these regions, at above 105 Kb/d each, the remaining Eurasian countries are expected to see declines. The Middle East countries, particularly Iran and Lebanon, will face economic slowdowns, impeding demand growth throughout the region. Other exporting countries such as Oman and the United Arab Emirates (UAE) are expected, according to the IMF, to have slow recoveries (Oman -10% and -0.5% for 2020 and 2021, respectively; UAE -6.6% and 1.3% for 2020 and 2021, respectively)

In 2022, all OECD countries are expected to see oil demand growth, except for Japan, which will fall by -120 Kb/d after having growth in 2021 of 300 Kb/d. Japan's expected 2021 increase is partly a short-term expansion led by preparation efforts for the 2021 Olympics. OECD Americas are presumed to reach 2019 oil demand levels by the end of 2022, with OECD Asia Oceania reaching these levels by the end of 2021. Although OECD Europe is expected to have growth of 1.1 MMb/d throughout 2021 and 2022, it is not expected to reach its 2019 levels of demand. Indeed, the continued European oil demand declines are due to European countries continuing to diversify away from fossil fuels and enhance their energy efficiency standards.

Non-OECD oil demand in 2022 is expected to grow at a slower pace than OECD demand. This is because demand from most non-OECD countries is expected to reach 2019 levels by the end of 2021, before returning to their historical growth trajectories. Asia is expected to represent over 60% of that growth.



Source: KAPSARC, January 2021.

Note that, according to the BP Statistical Review, the largest YoY oil demand growth recorded was at 4.1 MMb/d in 1973. The projected growth for this year is 4.2 MMb/d. However, global oil demand will remain below 2019 levels.

Demand levels

2020	Q1	Q2	Q3	Q4	2020
OECD	46.2	40.2	43.8	43.5	43.4
Non-OECD	47.9	45.9	48.7	51.2	48.4
Global demand	94.1	86.1	92.5	94.7	91.8

2021	Q1	Q2	Q3	Q4	2021
OECD	44.0	44.8	46.4	46.7	45.5
Non-OECD	49.8	50.9	51.1	50.4	50.5
Global demand	93.8	95.7	97.6	97.1	96.0

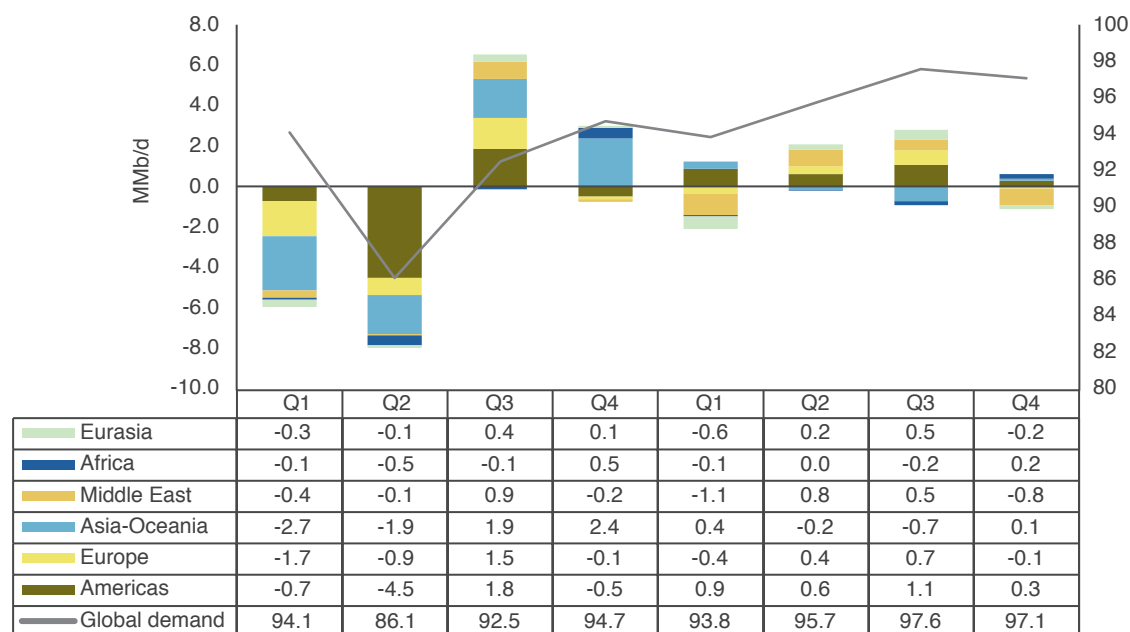
2022	Q1	Q2	Q3	Q4	2022
OECD	47.2	46.4	47.3	48.0	47.2
Non-OECD	51.1	52.4	53.1	52.7	52.3
Global demand	98.3	98.9	100.4	100.7	99.6

Non-OECD is expected to retain its 53% share of global oil demand and will account for 51% of demand growth in 2021 and 2022.

Regionally, Asia-Oceania will face the largest quarterly fluctuation in oil demand growth between 2021 and 2022, driven by China.

Current demand assumptions are susceptible to significant changes, depending on the impact of COVID-19 vaccinations and the speed of distribution on the recovery of economic activity and mobility. Further revisions to these assumptions will be needed as we progress through Q1 2021, particularly for non-OECD countries.

Regional oil demand growth, MMb/d, Q4 2021-2022



Source: KAPSARC, January 2021.

United States

MMb/d	2020	Q1	Q2	Q3	Q4	2021	Q1	Q2	Q3	Q4	2022
United States	18.6	18.7	19.1	19.7	19.9	19.4	20.1	20.2	20.6	20.7	20.4

2021-2022

U.S. oil demand is expected to grow by around 800 Kb/d in 2021 and continue to grow by 1 MMb/d in 2022, yet remain below its 2019 level. This bearish recovery correlates with a modest GDP growth rate for 2021 and 2022, and continued, elevated, unemployment rates. These assumptions are also dependent on the country's fiscal recovery policies to address the recession, including the \$900 billion stimulus package recently enacted. Just as transportation fuels were hit the hardest in 2020, they are presumed to carry most of the growth for 2021.

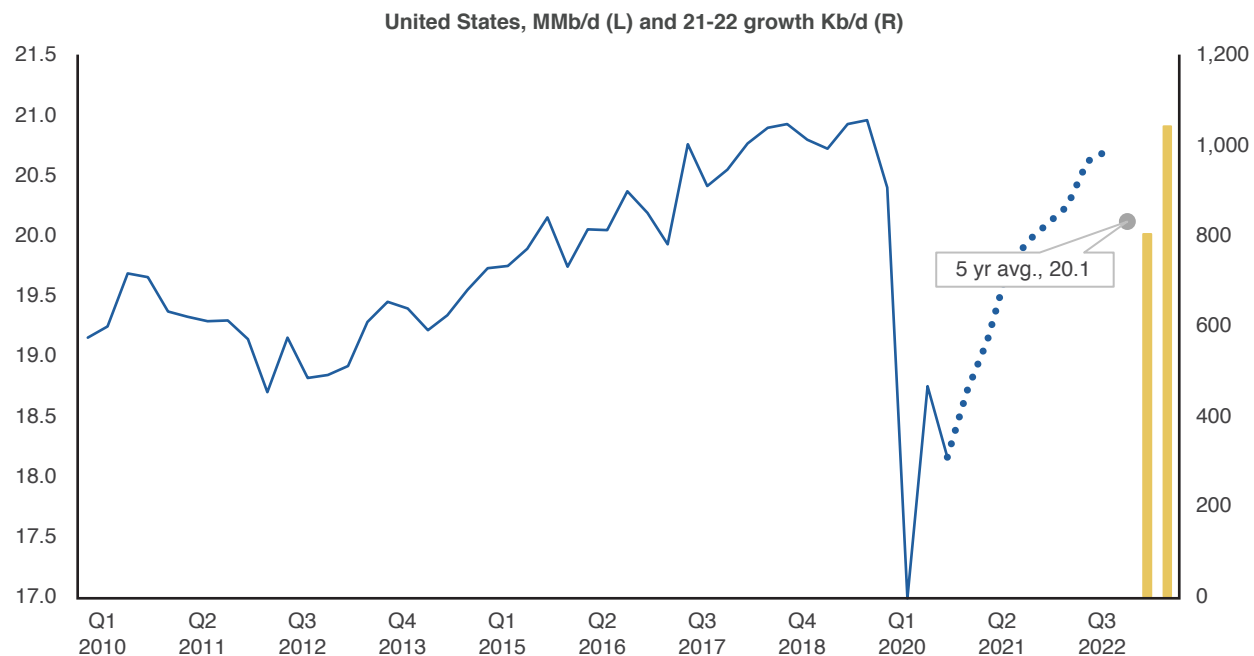
Indeed, in 2021, demand for gasoline in the U.S. is expected to witness strong growth (370 Kb/d), followed by gas oil/diesel (160 Kb/d), liquified petroleum gas (LPG) (100 Kb/d), and other heavy fuels, albeit the latter to a limited extent.

Q1 2021

In contrast to our expectation for a global quarterly decline in Q1 2021 consumption, we project overall growth for the U.S. of around 700 Kb/d. Even with the expectation of high winter demand, gas oil/diesel leads this quarter's growth with an estimated increase of 240 Kb/d, followed by LPG growth of around 230 Kb/d.

Motor gasoline also grows by around 160 Kb/d and all other fuels to a lesser extent, but naphtha in particular is expected to stagnate if not decline by around 50 Kb/d during this quarter. The decline in demand for naphtha can be attributed to the overall high inventory levels of all fuels, hence a lower need to convert naphtha to other fuels, especially during this quarter's global decline in

demand. Reduced U.S. exports and seasonal refinery maintenance will also impact demand for naphtha. A November report by S&P Global stated that "US refiners have a light slate of work scheduled for their refineries in Q4 and into 2021 as they look to conserve cash during a period of weak demand." We will revise our naphtha outlook in the next quarter.



Source: KAPSARC, January 2021.

OECD Europe

MMb/d	2020	Q1	Q2	Q3	Q4	2021	Q1	Q2	Q3	Q4	2022
OECD Europe	12.9	13.2	13.6	14.3	14.2	13.8	14.1	14.1	14.4	14.3	14.2

2021-2022

OECD Europe's oil demand is expected to grow by 950 Kb/d in 2021 and another 420 Kb/d in 2022. Similar to the U.S., the European Union (EU) is expected to recover much – but not all – of its lost demand from 2020. However, unlike its OECD counterparts, demand from this region is presumed to have peaked and KOMO expects a stagnating or declining trend for OECD Europe post-2022.

Nevertheless, when comparing the demand in 2021 with that of 2020, we would expect gas/diesel oil to represent around 45% of demand growth. This would reflect the resumption of transportation, since much of the European vehicle fleet runs on diesel. Gasoline demand is also expected to rise by 130 Kb/d, followed by heavier fuels at around 110 Kb/d.

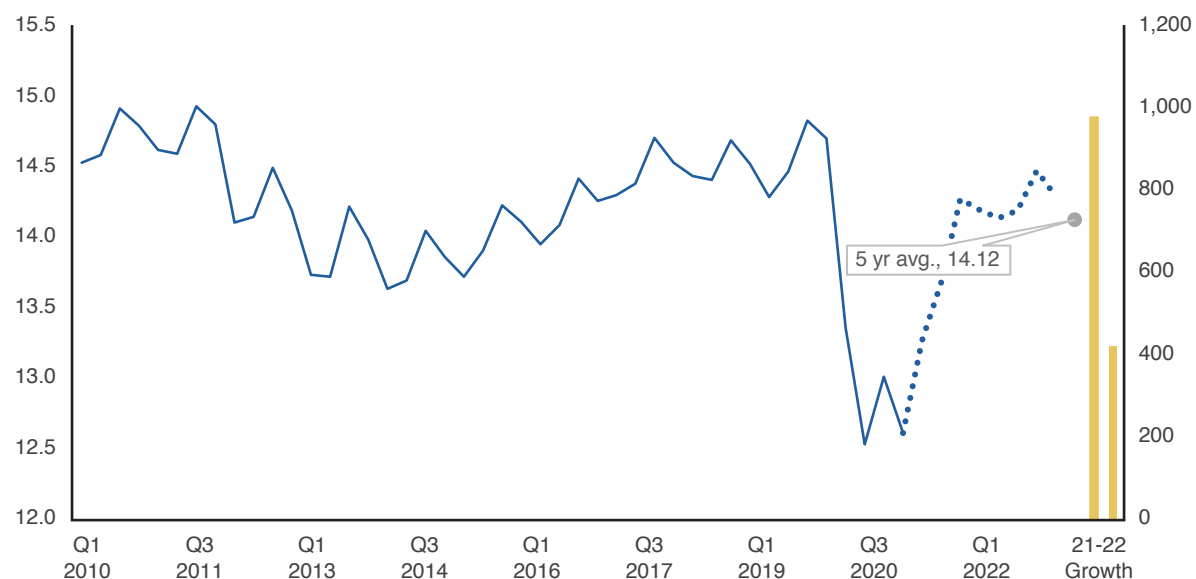
Q1 2021

Demand in the first quarter is expected to increase, driven by lighter fuels such as LPG and gasoline rising by around 200 Kb/d and 100 Kb/d, respectively. Other transportation fuels such as jet fuel and diesel are expected to decline, given the current measures to limit

the spread of the new COVID-19 variant. This quarter's decline in transportation demand should be offset by

the increase in demand for heating fuels. As such, we estimate stagnating European demand for the quarter.

OECD Europe, MMb/d (L) and 21-22 growth Kb/d (R)



Source: KAPSARC, January 2021.

China

MMb/d	2020	Q1	Q2	Q3	Q4	2021	Q1	Q2	Q3	Q4	2022
China	13.4	14.4	14.3	13.7	13.4	13.9	13.8	14.3	14.3	14.7	14.3

2021-2022

China is expected to be the only country to have stable (or even increasing) demand in 2020. Despite an estimated decline in vehicle sales during 2020 of around 38%, the government of China relaxed import restrictions on both teapot refineries and traders, helping support demand for crude into 2020 and early 2021. It is expected that China's growth will be around 650 Kb/d in 2021 and 360 Kb/d in 2022. Furthermore, KOMO expects a strong rebound in vehicle sales of around 25 million for 2021, and we also highlight several refineries expansions with added capacity for 2021 and 2022. Indeed, cities such as Lianyungang, Dalian, and Zhangzhou are expected to lead China's demand growth in 2021. Furthermore, given the large quantities of imports over the past few months, we estimate that China will create additional storage to facilitate a smooth supply chain.

Over 50% of China's demand growth for this year will be for transportation fuels, with diesel demand expected to reach 150 Kb/d and gasoline demand around 130 Kb/d. Demand for national aviation is also expected to continue growing, increasing demand for jet fuel by around 40 Kb/d.

Q1 2021

China's demand and consumption patterns will vary significantly in this quarter. Although fuel consumption is expected to be around 13.3 MMb/d, we anticipate demand of around 14.4 MMb/d. This suggests that, for the coming quarter, we expect China to store around 1 MMb/d. Nevertheless, China's consumption of refined products tends to decline in Q1 (QoQ) by around 200

Kb/d during its festive season, during which time there is a decline in diesel consumption and many companies close. Hence, we expect China's diesel demand to decline by around 500 Kb/d during this period. Chinese LPG demand is also expected to decline by around 100 Kb/d while the consumption of other fuels rises.

China, MMb/d (L) and 21-22 growth Kb/d (R)



Source: KAPSARC, January 2021.

India

MMb/d	2020	Q1	Q2	Q3	Q4	2021	Q1	Q2	Q3	Q4	2022
India	4.6	5.0	5.0	4.7	5.1	5.0	5.3	5.4	5.1	5.4	5.3

2021-2022

India's oil demand is expected to grow by around 380 Kb/d in 2021 and 340 Kb/d in 2022. To understand India's growth for this year, KOMO delved deep into several refinery company reports. Overall, there seems to be a sense of pessimism for 2021. However, by looking at other indicators, we notice that India has had a good year in vehicles sales, although 3-5 million fewer than in 2019. These sales helped support higher demand for vehicle fuels such as gasoline and diesel. KOMO expects vehicle sales to range between 21 and 26 million in 2021, and, as a result, we expect diesel demand to grow by 140 Kb/d and gasoline demand to rise by around 50 Kb/d.

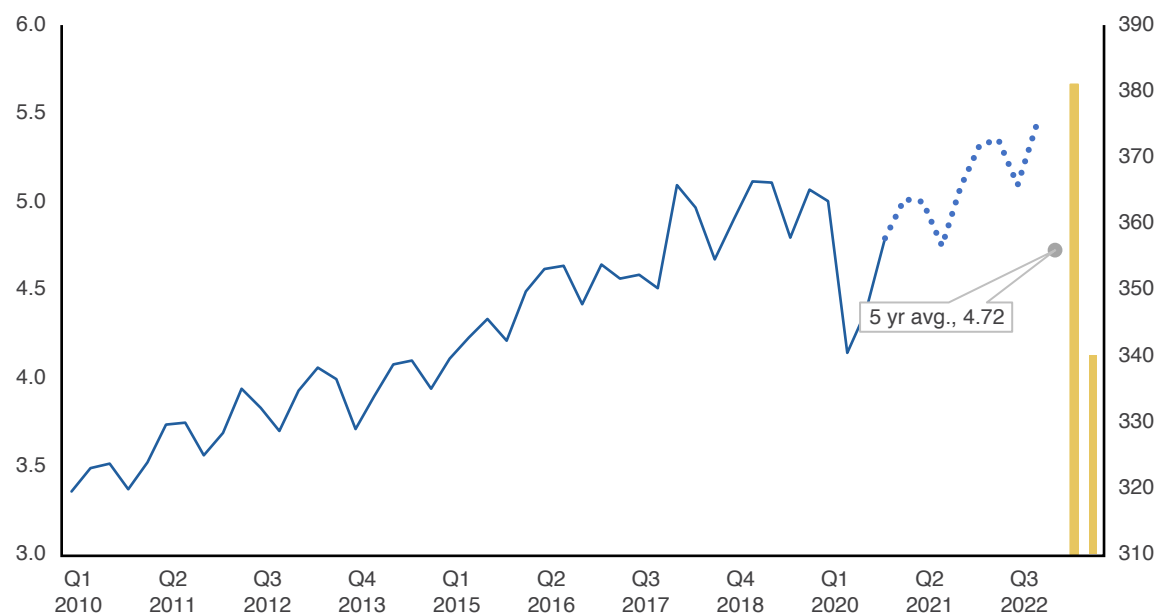
Total fuel demand is expected to grow in 2021, but LPG demand risks stagnating and potentially declining, as the recent policies by the Indian government aimed at deregulating LPG prices support prices rising throughout next year. As such, we estimate LPG demand growing by only 60 Kb/d.

Q1 2021

India is expected to witness a modest growth of 300 Kb/d this quarter. We do not expect any major changes in fuel demand, and the growth in all fuels is estimated to be proportional. However, India continues to build its

infrastructure and, as such, we expect demand growth of 100 Kb/d for heavy products, while the growth of all other fuels should remain below 50 Kb/d.

India, MMb/d (L) and 21-22 growth Kb/d (R)



Source: KAPSARC, January 2021.

Saudi Arabia

MMb/d	2020	Q1	Q2	Q3	Q4	2021	Q1	Q2	Q3	Q4	2022
Saudi Arabia	2.7	2.4	3	3.4	2.8	2.9	2.5	3.1	3.4	2.8	2.9

2021-2022

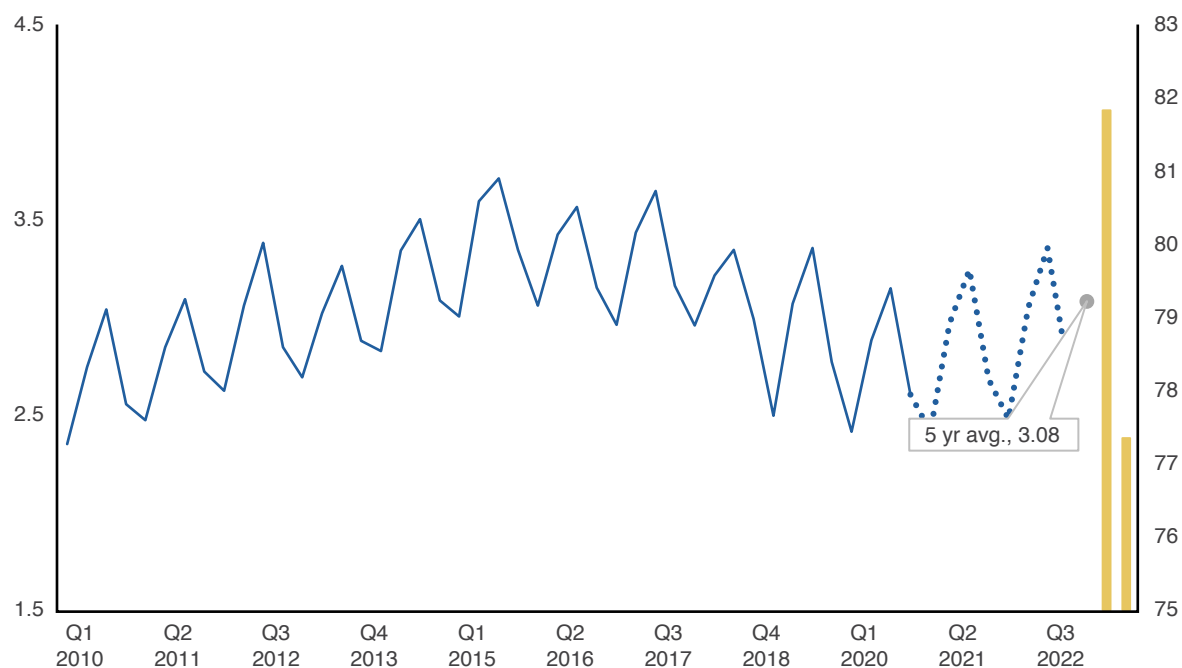
Saudi Arabia's oil demand is expected to rebound by 80 Kb/d in 2021 and to continue rising by a further 77 Kb/d in 2022.

Overall, Saudi Arabia's demand for this year will range between 3 Kb/d-18 Kb/d across all fuels. The current low prices have impacted the country's growth projection, and the IMF's October outlook expected Saudi Arabia's real GDP to decline by 5.4% in 2020 and bounce by 3.1% in 2021. Coupled with the 2020 increase in VAT, it seems that spending may not bounce back until after 2021.

Q1 2021

Total oil demand is expected to decline by around 100 Kb/d this quarter. However, unlike in other regions, this decline is in line with normal seasonal behavior. Although we expect positive growth or a slight stagnation in demand for lighter fuels such as LPG, naphtha and gasoline, most of the decline in overall demand will be from heavier fuels as electricity generation falls during the quarter.

Saudi Arabia, MMb/d (L) and 21-22 growth Kb/d (R)



Source: KAPSARC, January 2021.

Discussion

In 2020, the oil industry had one of its most difficult years on record. The depths of the demand deficit appear to be behind us, with the hope of a continued (if gradual) improvement over the next two years. The supply side of the market performed admirably through intentional (OPEC+) and natural (shale/other) regulation of production, but there will be challenges going forward.

The most pressing challenge is COVID-19 and its impact on demand. Currently, supply can only grow as fast as the market can handle, and demand is limited by the level of economic activity and freedom of movement that people are allowed. While people have adapted to the realities of lockdown, until some level of herd immunity creates confidence among consumers, normal consumption patterns will not resume. More waves of infection may bring about additional lockdowns, such as we are now seeing in the U.K. and other countries. We have assumed that current vaccines will be effective against any mutations that arise, but there is an underlying chance that the virus may evade our best efforts. The challenge for suppliers will be to follow the demand curve while draining the inventory overhang.

The strategy of OPEC+ has changed to one of nimbleness, with monthly meetings to adjust production in smaller increments. This allows the group to more effectively balance the market with finer adjustments, but there are some wildcards to contemplate:

- Libya's supply grew enormously in Q4 2020, but is unlikely to grow significantly beyond current levels.
- Iran wants to double its production, but it will take a while before the U.S. gets around to working on a renewed Joint Comprehensive Plan of Action and possibly lifting sanctions.
- Venezuela is optimistic about improved relations with the U.S., but President Biden has been clear that he will continue the current restrictions and may even strengthen them.
- Iraq's fiscal problems are a growing issue and may be a stress factor for the agreement.

Non-OPEC members are restrained by economics and investment, and will remain under pressure until pricing brings them back into the market. This is especially true for the U.S. shale industry, whose growth will take a while to resume following its steep decline in production and reduced drilling. Shale will only see significant growth from 2022, and there is a debate over how reduced long-term price outlooks and waning investor interest will impact future supply. A longer-term threat, however, is that prospects for weaker investment may leave the market *undersupplied*, creating an opportunity for shale. See our editorial, at the end of this report, for more details.

Supply forecast

Global liquids supply is expected to grow by about 650 Kb/d in 2021 to reach 96 MMb/d – partially recovering some of the losses from 2020, but significantly below the expected increase in global demand, which will allow for substantial withdrawals of surplus global inventories. Demand will be the main driver of any increase beyond this level. The management of the coronavirus and its new more transmissible variants, and the distribution of vaccines, will be the most important drivers of demand. The primary supply challenge will be to balance the market in an orderly and gradual manner, especially given the large overhang of spare production capacity now held by OPEC+ countries.

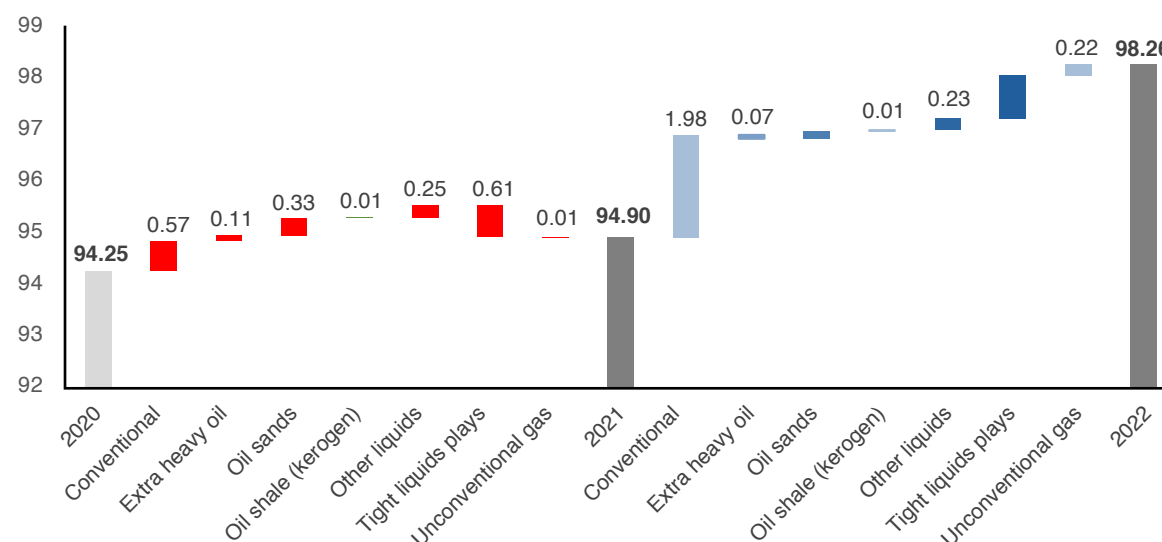
For non-OPEC players, price and economics will likely keep things in check. Oil sands have generally recovered from their lows in 2020, and will see some growth. However, despite having production restraints lifted in December, their supply is limited by transport infrastructure. Shale supply is likely to be flat as companies are only able to maintain, not increase, production and are waiting for pricing to improve before they can increase production. Aside from Canada and the United States, the other standout growth centers are Brazil and Norway, each adding over 200 Kb/d of production in 2021, continuing their pre-COVID paths. Otherwise, the price environment is still not conducive to real growth for these players, especially with the amount of cheap spare capacity waiting to come online from OPEC+.

For OPEC+, the new strategy of fine-tuning the market with monthly meetings and smaller production adjustments is a smart choice that will be less disruptive to the market. It will allow for a more gradual absorption of extra barrels entering the market while increasing producers' flexibility in a very uncertain phase of the recovery. As such, the Kingdom of Saudi Arabia has taken extraordinary measures to voluntarily cut an additional 1 MMb/d, kickstarting a real recovery in prices. Balancing the market in a mindful manner like this brings stability and confidence, factors that were missing in 2020. As long as the group holds together

and follows the plan it has set itself, we should see a better environment for all producers by the end of 2022.

Most supply increases for 2021 and 2022 will be from OPEC+, largely in the form of conventional supply. This growth will be 0.6 and 2 MMb/d for 2021 and 2022, respectively. Other sources have much smaller adjustments. Tight liquids has a wide swing during our forecast period, with a fall of 600 Kb/d in 2021 and a rebound of 830 Kb/d in 2022 driven by declines in the current production base and a slow return to drilling.

Annual global liquid supply, MMb/d, 2021-2022



Source: KAPSARC, January 2021.

OPEC+

OPEC+ behavior is governed by many factors, including the number of members participating, members' compliance levels, the target cut level and market stability. The rollercoaster of 2020 created the conditions for the largest cuts ever made in the group's history and some of the highest compliance levels seen to date. The question going forward is whether this can hold.

Among the exempt members of the group, we have seen a significant increase in production from Libya, but there is likely to be much less growth going forward after their gains from the restart of their shut-in capacity. Iran is optimistic that it could double production in 2021 if U.S.-led sanctions against it are lifted by the Biden administration, but a return to the Joint Comprehensive Plan of Action is likely to take time to negotiate and is not a high policy priority given the many more pressing matters domestically to be handled first. Venezuela is also optimistic about improving relations with the U.S., but it is very unlikely that there will be a change in policy in light of Biden's statements about Maduro. There have been some interesting developments in both Venezuela and Iran, with increased shipments to China and other locations reported despite the sanctions, but we do not think such incremental shipments will be material to the global balance.

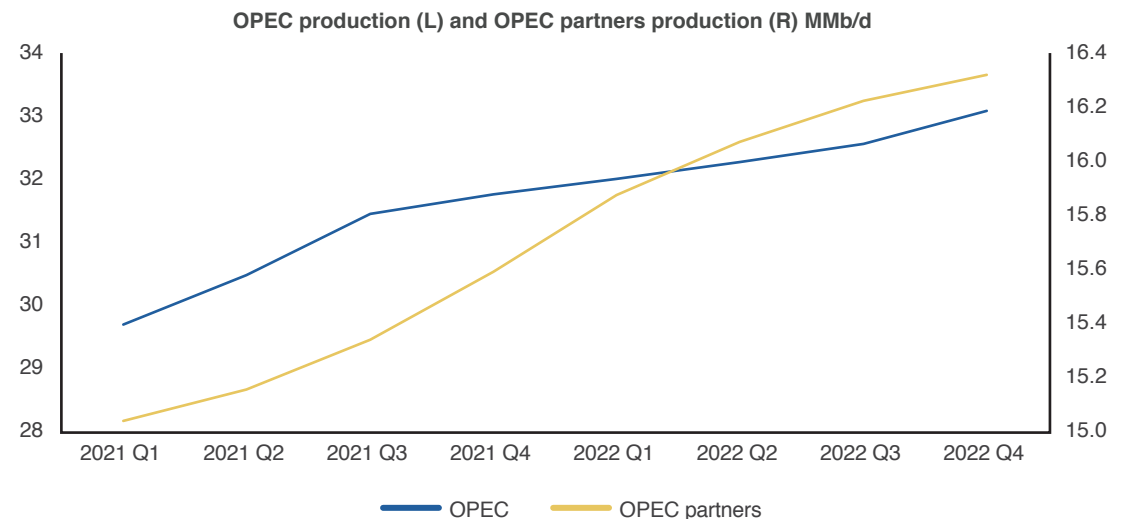
Compliance is another matter. It follows a somewhat inverse bell shape relative to the severity of the oil market imbalance. With small imbalances, the cuts are minimal and there are fewer incentives to cheat. With large imbalances, the need to balance the market is extreme

and there is heightened vigilance over what each country is producing. The middle ground, however, is in a market with imbalances of a few thousand barrels, where non-compliance could be worth the risk. As the market exits its current period of extreme imbalances, the prospect of non-compliance is a growing concern, especially since the new official OPEC+ arrangement has no guidelines post-Q1 2021. Our model assumes that compliance is still high (100%) for Q1, but may drift slowly downwards into the low 80% range over the forecast period as the market recovers its balance and pricing improves. Alternatively, OPEC+ could elect to collectively increase production beyond its current plans as the market tightens.

OPEC+ currently plans to add 500 Kb/d in January with a very modest increase of 75 Kb/d in February

and March, with Saudi Arabia cutting an additional 1 MMb/d during this period. This behavior is coded into our model and helps the market head toward balance in a gradual manner. It is not known how the remainder of the cuts could be relaxed after this period, however. The remainder of Saudi Arabia's voluntary cuts are expected to be eased by Q3 2021, and OPEC+ should increase production by 500 Kb/d. Beyond this point, there is room for a consistent increase in production of 500 Kb/d without exceeding the growing demand curve while maintaining a relatively stable price, which has the potential to reach \$60/b.

As a result, we expect the end of 2022 to be closer to business as usual for OPEC+, with only 4 MMb/d of cuts, subject to changes in inventories.



Source: KAPSARC, January 2021.

OPEC and partners supply changes for 2020 and 2021, Kb/d

	2021	2022
Mexico	-107.57	-33.09
South Sudan	-3.24	9.41
Equatorial Guinea	-19.22	-17.78
Brunei	14.01	5.33
Sudan	12.22	-1.64
Bahrain	4.36	8.36
Gabon	-8.28	-4.61
Oman	44.63	47.75
Congo	-27.09	-17.63
Malaysia	53.79	50.14
Azerbaijan	7.86	26.34
Nigeria	-49.07	-12.79
Kazakhstan	-39.46	63.72
Algeria	-16.54	47.42
Angola	14.28	-116.67
Kuwait	-88.09	126.02
Venezuela	40.78	48.80
Iran	8.46	298.03
UAE	-139.58	142.13
Saudi Arabia	-213.05	868.50
Iraq	-79.05	243.35
Libya	725.04	120.05
Russia	-0.96	569.95
OPEC	148.58	1724.83
OPEC Partners	-14.36	746.26
OPEC+ TOTAL	134.22	2471.09

Source: KAPSARC, January 2021.

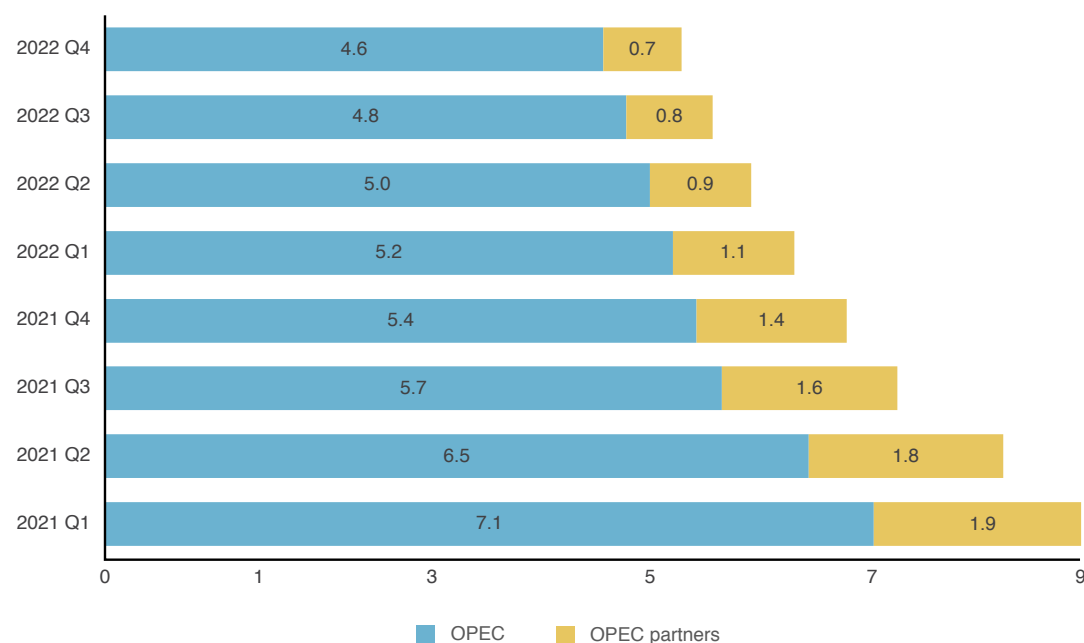
OPEC+ spare capacity

The spare capacity for OPEC+ will follow the assumed reduction in cuts over time. The assumption is that Saudi Arabia's voluntary cuts will be reduced over the next two quarters, while other members will begin reducing their cuts by 500 Kb/d through the end of our forecast period. This should bring spare capacity levels to around 4.6 MMb/d for OPEC and 0.7 MMb/d for its partners.

In practice, however, the new monthly meetings of OPEC+ may allow for more dynamic cuts or increases in production. Changes in demand are the great unknown, and the group is preparing itself for any unexpected shifts. However, in its recent statement on January 5, the group reiterated the need to remove 2 MMb/d of these cuts. Fine adjustments on a regular basis could create a more controlled change in production levels and spare capacity over the next eight quarters if members are able to maintain discipline.

The ideal strategy, which may well occur, is to closely follow the demand curve (up or down) with enough production deficit to ensure a continual draining of the inventory overhang. There are practical limitations to this approach, including lags and measurement, but there is no downside to employing a finer tuning of supply. Anything that can reduce volatility will be greatly welcomed after a dramatic 2020.

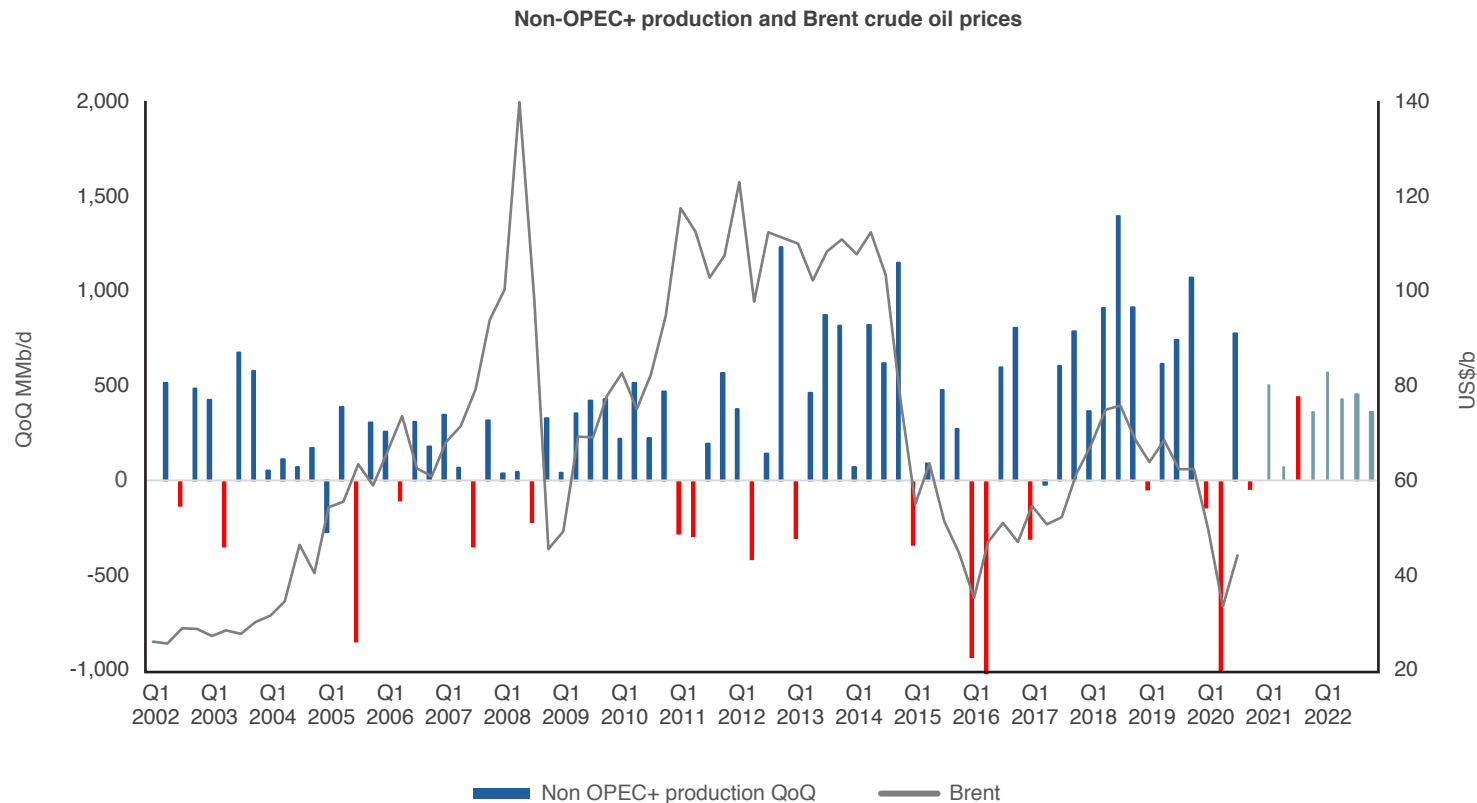
OPEC and partners spare capacity, MMb/d
Technical base



Sources: Rystad; KAPSARC, January 2021.

Note: This updated definition of spare capacity is based on the technical ability of each member to produce at the current price, versus their forecast production under the OPEC+ target cuts, including Saudi Arabia's stated additional spare capacity of 1.5 MMb/d.

Non-OPEC+



Sources: IEA, December 2020; KAPSARC, January 2021.

Non-OPEC+ growth:

- In 2021, the supply of tight oil is expected to fall by 600 Kb/d and unconventional gas liquids will decline by 20 Kb/d, while oil sands will rise by 330 Kb/d.
- In 2022, the outlook for tight oil is a rebound of 830 Kb/d, with unconventional gas liquids growing by 220 Kb/d, and oil sands growing by 150 Kb/d.
- Key features of the non-OPEC+ production story for the next eight quarters are going to be patience and planning. Producers will be controlling costs, executing mergers and acquisitions, and watching OPEC+ and the price signals.

Non-OPEC (tight oil and oil sands)

With the U.S. election behind us, and prices edging toward the tolerable range, shale is in for a period of rather boring healing and austerity. Shut-in capacity is back online, and drilling is slowly coming back, but there was a lot of damage done to the industry in 2020. The usual cost-cutting and mergers are underway, with consolidation and economies of scale the main improvements, but prices remain too low to push the explosive growth seen in recent years. The constant treadmill of drill-produce-invest-repeat has been disrupted, and almost a year without new wells has allowed for the declining rate of shale supply to pull production down rather sharply. We expect production in 2021 to be flat/down and to rebound in 2022.

From a non-technical angle, shale is losing the luster it once had as a high-value commodity with high-tech production methods. Poor returns for investors, growing risks from environmental regulations, in a market awash with spare capacity does not drive near-term confidence in the industry. Beyond our forecast period, however, there are warning signs that the underinvestment in 2020 may have a longer-term impact (see our editorial), exposing the market to the risk of being short. Shale's greatest strength is its speed of production, and if other producers fail to prepare for a future where demand outstrips supply, then shale will be ready to step in – given the proper price/investment incentives.

Monthly U.S. drilling activity (L) vs. global shale production (MMb/d) (R)

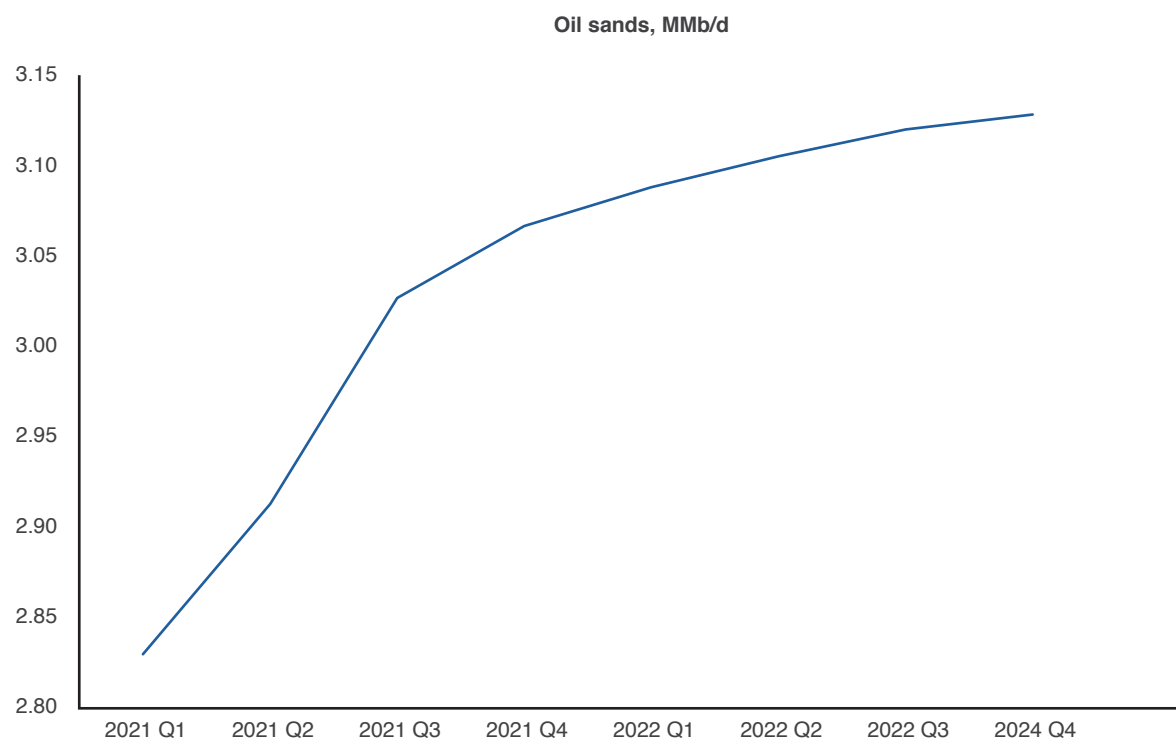


Source: KAPSARC, January 2021.

Non-OPEC (tight oil and oil sands)

Oil sands appear to have almost recovered to their previous levels and look to be pushing beyond those barriers in 2021 and 2022. In the wake of 2020, there has been a lot of restructuring in Canada, with cost cutting and a wave of mergers and acquisitions increasing efficiency and positioning the industry for eventual profitability. While some are worried about the long-term future of oil sands due to increasing environmental concerns, that has not impeded opportunistic investors attracted by the steady returns of oil sands compared with shale.

Toward the end of our forecast period, there is a high likelihood that the Trans Mountain Pipeline Expansion project in British Columbia will be completed. This is an important development that will diversify the market for Canadian producers beyond the U.S. and into the growing Asian market, especially China. The project has had some setbacks, with a recent accident halting construction and some ongoing protests threatening the timeline for its completion. However, it appears that it may be ready in 2022.



Source: KAPSARC, January 2021.

Risk scenarios, December 2020

*The KOMO survey is conducted on a semi-annual basis, and the results from the last quarter are still in effect.

KOMO's risk categories are based on current events impacting the oil industry.

KOMO uses the risk table to estimate potential impacts, taking two components into account: probability and impact.

Probability: A shaded chart at the top right of this table shows the probability of a risk occurring (the darker the shade, the more likely it is to happen).

Impact: This is calculated as a percentage of exports (as domestic supply is often protected), or estimated into the demand model through a multiplier or a change in GDP.

For supply risks, we multiply the probability by the potential impact.

For demand risks, the model either (i) examines historical incidents as multipliers then applies a similar response to future demand, or (ii) estimates the potential impact on GDP and channels it through the model, via changes in the exogenous variables, to determine the implications for future oil demand.

Risk category	Item	Supply/ demand	Impact (Kb/d)	2021	2022	2023
Producer supply risks	OPEC compliance	Supply				
	Libya remains exempt	Supply	↓ 50 - 100			
	Shale rebound	Supply	↓ 0 - 120			
	Lifting Iran sanctions	Supply	↑ 0 - 210			
	Brazil's production growth	Supply	↑ 0 - 100			
	Venezuela's production rebound	Supply	↑ 0 - 160			
	Major conflict	Supply				
Demand risks	Prolonged economic crisis	Demand	↓ 300 - 1500			
	50% global population vaccinated	Demand	↑ 300 - 700			
	Transport behavioral changes	Demand	↓ 400 - 500			
	IMO sulfur regulations	Demand	↓ 0 - 150			
	Air travel resuming 2019 levels in 2021	No	94%			
	Stimulus packages continue through 2021	Yes	94%			
	Strengthening U.S. dollar	No	77%			
	Oil prices averaging \$50/b in 2021-2022	Yes	55%			

The results are based on a survey conducted biannually

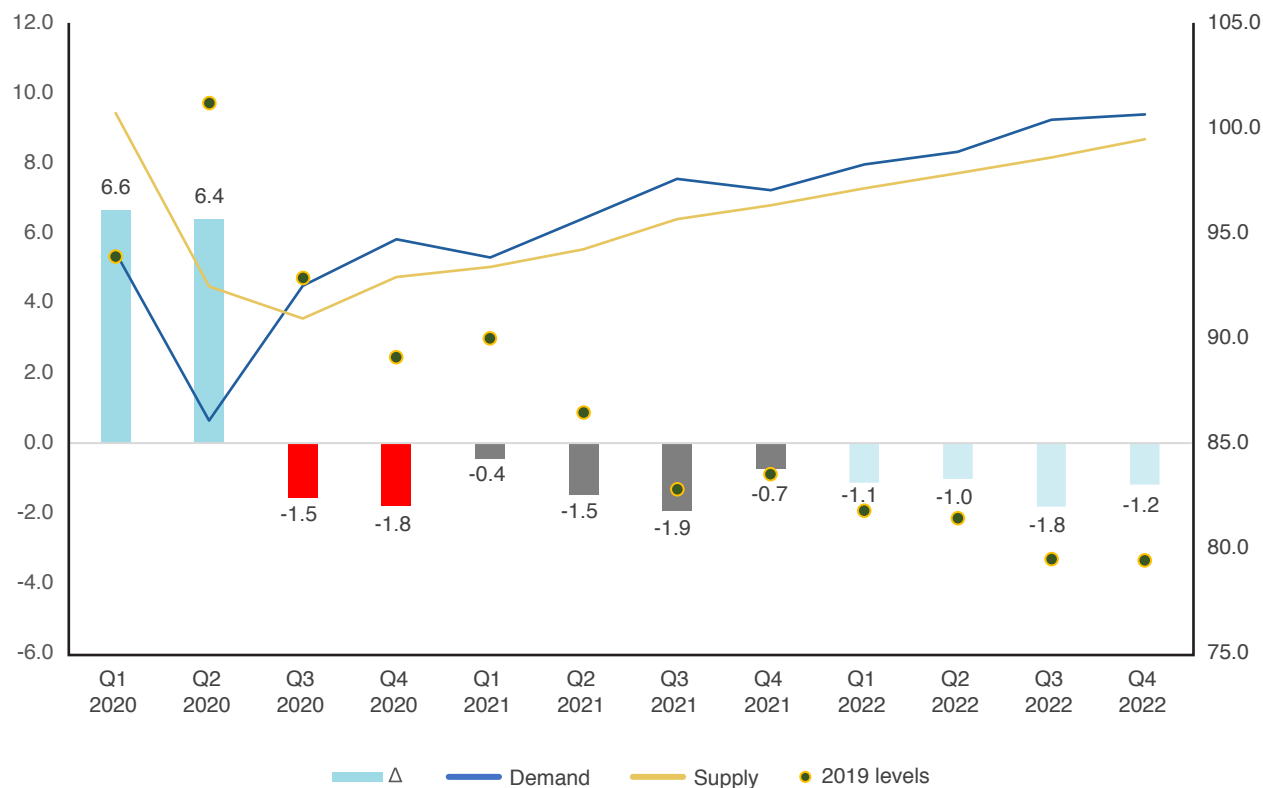
2021 and 2022 balances

Our assessment shows that, over the next eight quarters, the market is likely to remain in deficit, assuming that OPEC+ members comply with their stated cuts, and follow the demand curve in a gradual and controlled manner. This forecast will remain highly contingent on the success of virus containment measures as well as the continuation of economic stimulus packages. As mentioned earlier, we assume that the impact of the new COVID-19 variant is normalized by the end of April 2021 without any further waves or mutations of the virus.

These supply/demand trends suggest that there will be an average global withdrawal from inventories of 1.1 MMb/d in 2021 and 1.3 MMb/d in 2022. However, we expected a short-lived surplus of 800 Kb/d for Q1 2021, with declines for the remaining seven quarters between 0.1 MMb/d-1.8 MMb/d. The recent cuts from OPEC+ has turned this quarter's surplus to a deficit of 400 Kb/d. OPEC+ compliance rates may falter if pricing improves and fiscal realities test the resolve of some members. This may allow for a shift in strategy toward preemptively gaining market share from shale and other producers, but it would limit any upside movement in prices.

We anticipate that the growth in supply will come mostly from OPEC+, as tight oil production will struggle throughout 2021. Current low rig counts indicate a flat-to-declining production profile for now.

Quarterly supply demand balance, MMb/d, 2020-2022



Source: KAPSARC, January 2021.

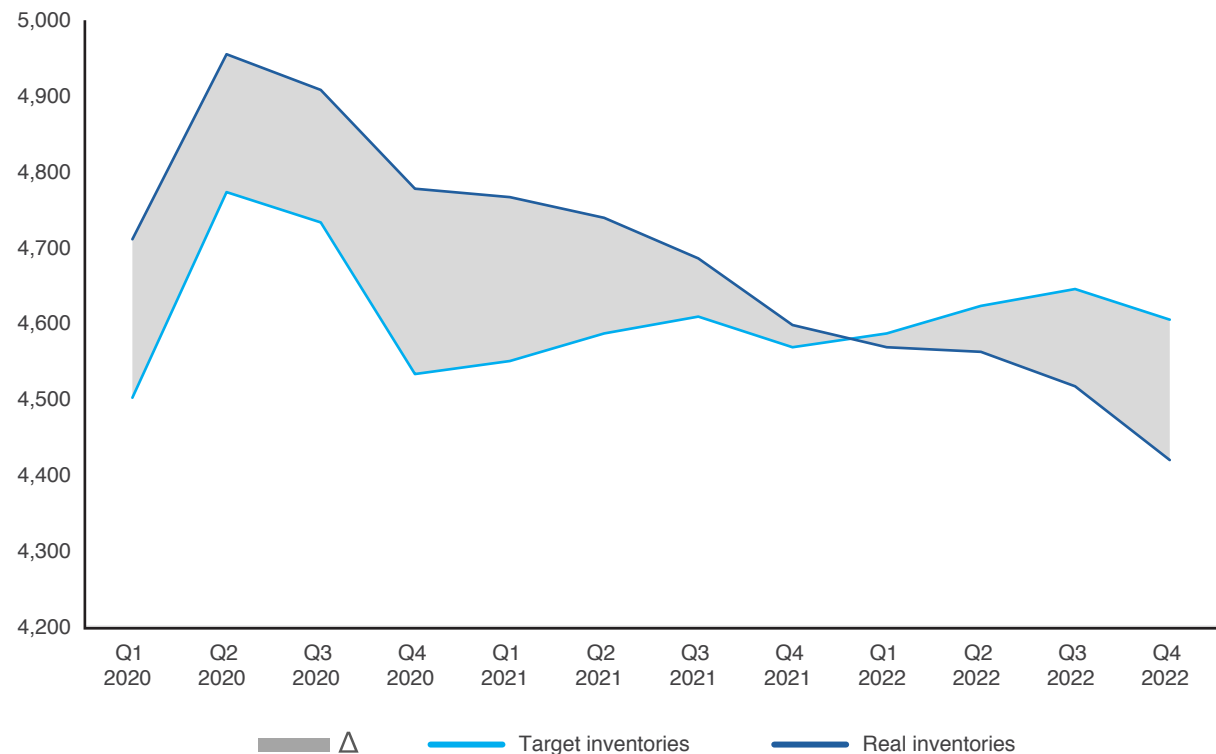
Price fundamentals (inventories)

Price movements will be mainly influenced by inventory levels in the coming quarters. Given the new cuts by OPEC+, we would expect a steady drain on inventories throughout the coming eight quarters. Under these assumptions, continued inventory withdrawals are expected to go below target inventories by the end of 2021.

The KOMO model estimates that target OECD inventories will decline by 56 MMb in 2021 and rise by 36 MMb in 2022 as the market returns to more normal conditions. Real inventories, on the other hand, are expected to decline by 141 MMb in 2021, then decline by a further 180 MMb in 2022 as demand continues to exceed supply.

Given our current assumptions, with demand recovering gradually while OPEC+ maintains their cuts and shale stagnates, a favorable price environment emerges with the possibility of Brent prices significantly exceeding current estimates on the forward curve. Because of the current conditions, inventory withdrawals may exceed the supply buildup of 2020. However, these numbers are highly dependent on compliance as well as the pathway of OPEC+ after April 2021.

Target inventories vs. real inventories (L) and Brent prices (R)



Sources: EIA; KAPSARC, January 2021.

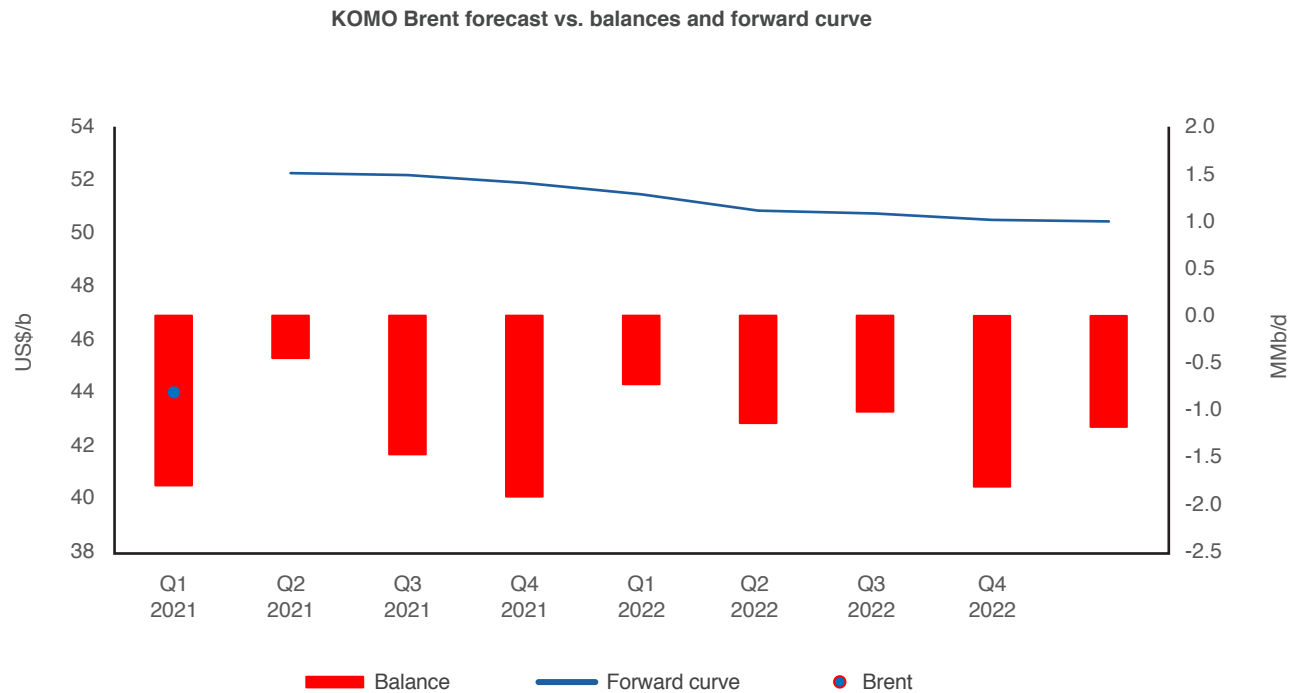
Price fundamentals (Brent)

	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022
Bloomberg	47.78	49.28	50.84	52.39	53.55			
Market sentiment	44.00	49.00	49.00	53.00	53.00	56.00	55.00	53.00

	2021	2022
Bloomberg	49.42	54.55
Market sentiment	52.00	54.00

Source: Bloomberg, December 27, 2020.

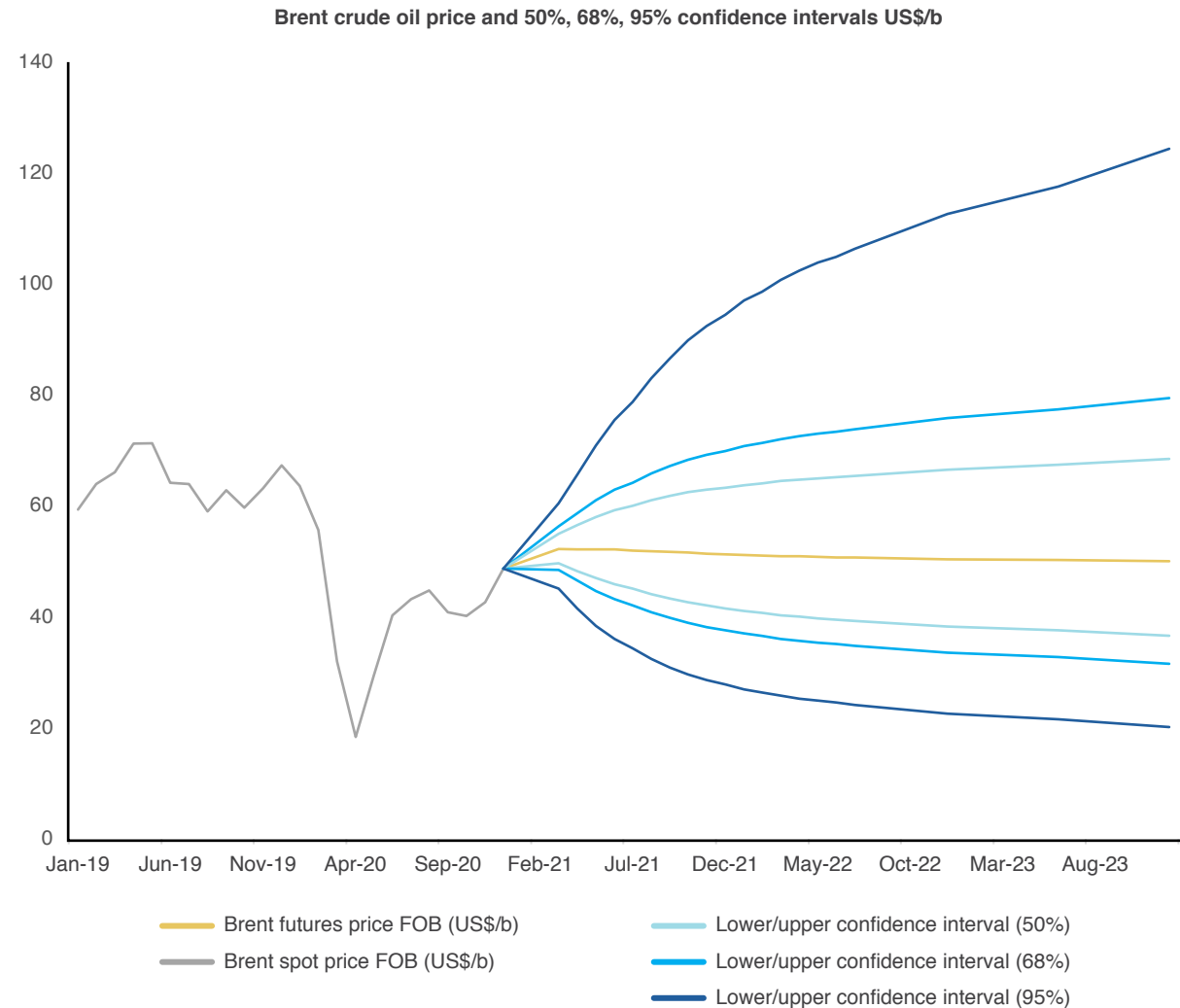
*Market sentiment is based on publicly available forecast data.



Price fundamentals (forward and future curves)

The graph below depicts confidence intervals derived from options market information for at-the-money options contracts.

The graphs represent boundaries calculated at 50%, 68% and 95% confidence intervals.



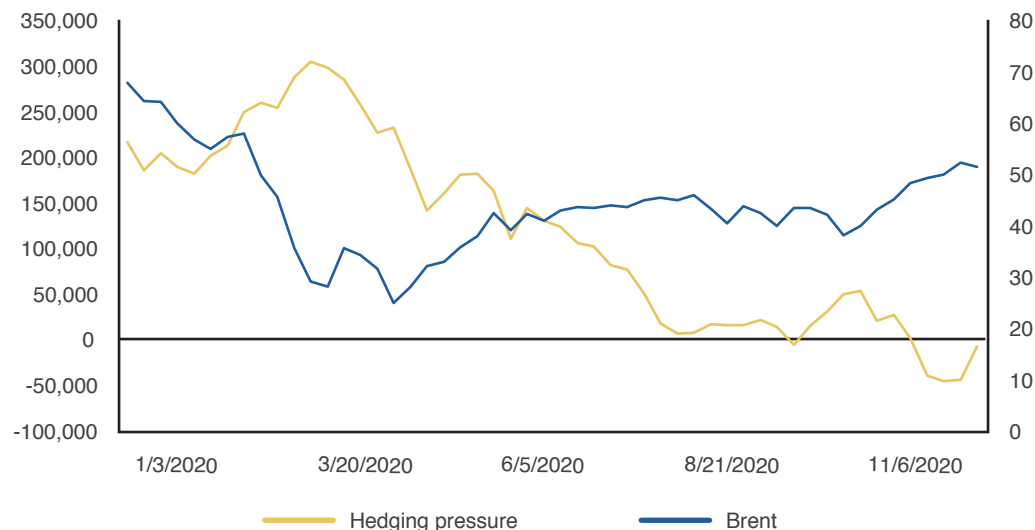
Source: KAPSARC calculations based on NYMEX data, CME Group, FINCAD, December 2020.

Price fundamentals (markets)

Hedging pressure (HP): The graph below shows the settlement price for Brent against hedging pressure. Hedging pressure is a measure of physical commercial (producers/merchants/processors/users) net short positions relative to net managed money long positions. It indicates a negative relationship between Brent prices and market hedgers. The fact that HP continued to decline in early November indicates that the market was more optimistic about prices rising. However, given the recent developments in early December, we notice that HP started to rise, reflecting concerns over the recent news of the new strain of COVID-19 and declining Brent prices.

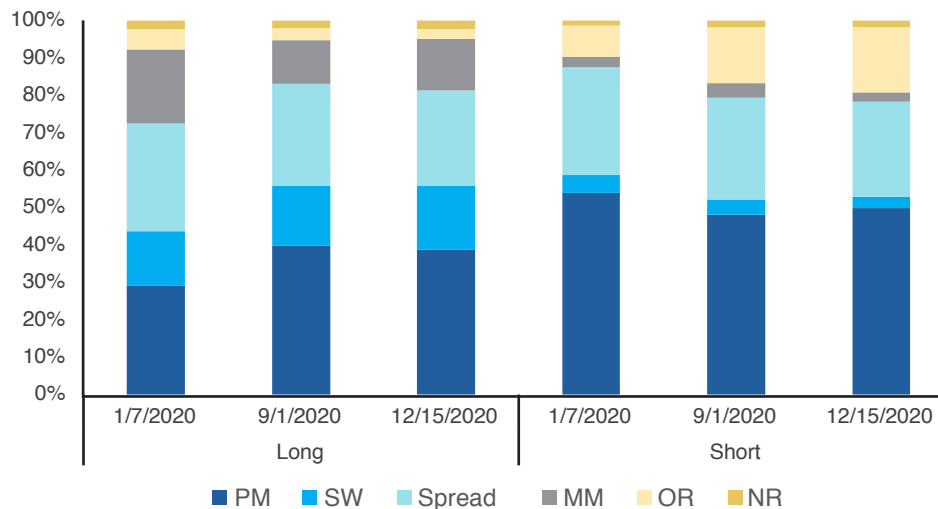
Trader class shares: Since hedger shorts did not appear to shrink in January 2020, the money manager (MM) long traders filled the void created by the reduction in swap dealer (SW) longs. In Q4 2020, there was a stagnation in the short positions relative to Q3 2020, with long positions also stagnating. However, MM and non-reporter (NR) longs have increased, reflecting optimism surrounding rising prices. Furthermore, we expect that MM long positions will increase gradually as prices continue to rise.

Weekly - hedging pressure (L) vs. ICE Brent price (R)



Source: Bloomberg, December 27, 2020.

Traders class shares of longs and shorts



Source: Bloomberg, December 27, 2020.

Price fundamentals (markets)

The U.S. Dollar Index has continued to decline since March 2020, while the price of Brent has kept rising. If the U.S. dollar continues to fall, we estimate higher oil demand as oil continues to be cheaper in U.S. dollar terms relative to other currencies.



Source: Bloomberg, December 27, 2020.

Editorial: Investment, investment, investment – where is it?

The drop in upstream capital investment and expenditures – capex – in the oil and gas sector raises concerns beyond the COVID-19 pandemic. According to Rystad, in 2020, oil and gas companies cut their capex by almost 30%. These are deeper drops than those experienced during the price crisis of 2014. A report by the IEF and BCG assumes that an additional 20% decline in capex is still to come this year.

Capex investment cuts in 2020 were also deeper than the 2004 investment downturn for traditional oil exploration and production. According to Goldman Sachs, in 2004, despite the overall increase in upstream investment (heavy oil and deepwater), oil companies decided to cut their capex in traditional oil fields by more than 50%, with a further drop in 2005. Despite the efforts to bring conventional upstream investment back in 2006, low investment and low prices in 2004 led to substantially higher oil prices in August 2008. However, the situation is different today. In the 2000s, oil prices were supported by fast growth in demand, mostly driven by China's rapid economic development.

Today the market faces different realities. Slower oil demand growth and climate concerns in several regions are dampening the enthusiasm of investors for fossil fuels. The Rockefeller Foundation and other institutional investors are divesting from fossil fuels entirely. The focus of these institutional investors is

shifting to alternative energy investments, while those still interested in oil and gas demand transparency in emissions reporting and companies' preparedness for the energy transition.

The energy transition is pushing big oil companies to address climate change. Experience dictates that during global financial downturns, there is a deceleration of investment in decarbonization and new technologies. However, during the 2020 crisis, the share of renewables as percentage of total capex for big EU oil companies (BP, Equinor, Total, Shell, ENI, Repsol and Galp) almost tripled compared with 2019 levels (Goldman Sachs). This does not necessarily mean that the companies increased their capex in renewables, but it reflects how the oil industry is prioritizing their investments during difficult times, with abrupt oil and gas capex cuts and only some reductions in renewable investments. There is, however, an exception to this: Some national oil companies that are solely focused on oil and gas take downturns as an opportunity to invest, since development costs are cheaper and they have a much longer outlook (e.g., Saudi Arabia, UAE, etc.).

But the current low capex investment in oil and gas is raising new concerns. The IEF's analysis suggests that oil and gas upstream investment needs to rise by over 25% above 2020 levels each year for the next three years to avoid a crisis. Considerably higher

investment is needed by the end of the decade to avoid a longer-term supply deficit. Even under low oil demand scenarios, the current levels of investment would result in a significant market deficit. Moreover, there is also the potential for oil demand to continue growing, as noted in OPEC's recent long-term outlook. The IEF also estimates that "every dollar of capex that is cut today will have twice as powerful an effect in terms of reducing activity than cuts made following the 2014 fall in prices had." In other words, the market recovery from low investment and instability is likely to take longer than in previous crises and be more expensive due to slower growth in demand and a modest oil price recovery. Production levels will recover to those of 2019, but new conventional oil production required to supply potential demand growth needs new investment, which is not currently being considered.

We are not sure how oil companies without plans to expand their capacity will react to an undersupplied market. Conventional upstream investment requires long-term planning, and it cannot be solved instantly; expanding capacity depends on new discoveries today to supply the market tomorrow. Inappropriate investment will result in market instability, high oil and gas prices, and global economic turmoil. Investment should grow starting today, if not for market stability, then at least for improved future returns.



Appendix

World oil demand, 2021-2022 (MMb/d)

		2020	Q1	Q2	Q3	Q4	2021	Q1	Q2	Q3	Q4	2022	
Americas	OECD	United States	18.6	18.7	19.1	19.7	19.9	19.4	20.1	20.2	20.6	20.7	20.4
		Canada	2.5	2.5	2.3	2.4	2.3	2.4	2.5	2.5	2.6	2.6	2.5
		Mexico	1.7	1.7	1.8	1.9	1.9	1.8	1.9	1.9	1.9	1.9	1.9
		Chile	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
		Total	23.1	23.3	23.6	24.4	24.6	24.0	24.9	25.0	25.5	25.6	25.2
	Non-OECD	Argentina	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
		Brazil	2.9	2.9	3.0	3.2	3.3	3.1	3.1	3.1	3.2	3.1	3.1
		Venezuela	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
		RO Latin America	2.0	2.0	2.2	2.2	2.3	2.2	2.2	2.3	2.4	2.3	2.3
		Total	5.8	5.8	6.2	6.4	6.5	6.2	6.3	6.5	6.5	6.5	6.4
Total Americas		28.9	29.1	29.7	30.8	31.1	30.2	31.2	31.4	32.0	32.1	31.7	
Europe	OECD	Germany	2.2	2.2	2.3	2.4	2.4	2.3	2.3	2.4	2.5	2.4	2.4
		France	1.5	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
		United Kingdom	1.3	1.2	1.4	1.5	1.5	1.4	1.5	1.5	1.5	1.5	1.5
		Poland	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
		Turkey	0.9	0.8	0.9	1.1	1.0	1.0	0.9	1.0	1.1	1.0	1.0
		RO OECD Europe	6.5	6.7	6.7	6.8	6.8	6.8	6.9	6.9	6.9	7.0	6.9
	Total OECD Europe	13.1	13.2	13.6	14.3	14.2	13.8	14.1	14.1	14.4	14.3	14.2	
Asia-Oceania	OECD	Australia	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2
		Japan	3.4	3.5	3.7	3.8	3.8	3.7	3.9	3.2	3.3	3.7	3.5
		Republic of Korea	2.4	2.5	2.4	2.4	2.5	2.5	2.7	2.5	2.5	2.7	2.6
		New Zealand	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		Total	7.0	7.3	7.4	7.5	7.6	7.4	8.0	7.1	7.2	7.8	7.5
	Non-OECD	China	13.4	14.4	14.3	13.7	13.4	13.9	13.8	14.3	14.3	14.7	14.3
		India	4.6	5.0	5.0	4.7	5.1	5.0	5.3	5.4	5.1	5.4	5.3
		Indonesia	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.7	1.7
		RO Asia	6.4	7.3	7.1	7.1	7.0	7.1	7.6	7.4	7.4	7.4	7.5
		Total	26.0	28.3	28.0	27.2	27.2	27.7	28.5	28.9	28.6	29.2	28.8
Total Asia		33.0	35.6	35.4	34.7	34.8	35.1	36.5	35.9	35.8	37.1	36.3	
Middle East	OECD	Israel	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2
	Non-OECD	Bahrain	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1
		Iraq*	0.9	0.8	0.9	0.9	0.9	0.9	0.8	0.9	1.0	0.8	0.9
		Kuwait	0.4	0.3	0.4	0.5	0.4	0.4	0.3	0.4	0.5	0.3	0.4
		Oman	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		Saudi Arabia	2.7	2.4	3.0	3.4	2.8	2.9	2.5	3.1	3.4	2.8	2.9
		Qatar	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		UAE	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
		Total GCC	5.2	4.6	5.5	6.0	5.2	5.3	4.9	5.6	6.2	5.2	5.5
		Iran	1.8	1.7	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7
		RO Middle East	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Total	7.4	6.7	7.5	8.0	7.2	7.4	7.0	7.7	8.3	7.2	7.5		
Total Middle East		7.7	6.9	7.7	8.3	7.5	7.6	7.2	7.9	8.5	7.5	7.8	
Africa	Non-OECD	Egypt	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
		South Africa	0.5	0.5	0.5	0.6	0.6	0.5	0.6	0.6	0.6	0.6	
		Other Africa	2.4	2.6	2.5	2.3	2.5	2.5	2.7	2.7	2.4	2.7	
	Total Africa		3.6	3.7	3.7	3.5	3.7	3.6	3.9	3.9	3.6	3.9	
Eurasia	Non-OECD	Russia	3.5	3.5	3.5	3.8	3.7	3.6	3.6	3.5	3.9	3.7	
		RO Eurasia	2.1	1.8	1.9	2.1	2.0	2.0	1.9	2.0	2.2	2.1	
	Total Eurasia		5.6	5.2	5.5	6.0	5.7	5.6	5.4	5.6	6.1	5.9	
Global Demand		91.8	93.8	95.7	97.6	97.1	96.0	98.3	98.9	100.4	100.7	99.6	

World oil supply, 2021-2022 (MMb/d)

	2021 Q1	2021 Q2	2021 Q3	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2024 Q4
Africa	7.71	7.79	7.88	7.89	7.82	7.75	7.69	7.64
Americas	32.57	32.53	32.80	32.96	33.31	33.58	33.89	34.15
Asia	9.15	9.18	9.19	9.18	9.15	9.13	9.11	9.08
Eurasia	13.31	13.40	13.53	13.75	14.00	14.17	14.30	14.39
Europe	4.36	4.39	4.41	4.43	4.44	4.45	4.47	4.51
Middle East	26.28	26.95	27.84	28.13	28.42	28.76	29.13	29.71
Total	93.38	94.23	95.65	96.33	97.14	97.85	98.59	99.47

	2021 Q1	2021 Q2	2021 Q3	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2022 Q4
Conventional	68.00	68.84	70.02	70.39	70.76	71.05	71.40	71.97
Extra heavy oil	3.46	3.49	3.51	3.50	3.49	3.45	3.40	3.36
Oil sands	2.83	2.91	3.03	3.07	3.09	3.11	3.12	3.13
Oil shale (kerogen)	0.03	0.03	0.04	0.04	0.04	0.05	0.05	0.05
Other liquids	6.63	6.71	6.80	6.82	6.89	6.95	7.01	7.05
Tight oil	10.16	9.99	9.98	10.17	10.47	10.79	11.08	11.30
Unconventional gas	2.26	2.26	2.28	2.34	2.41	2.47	2.53	2.61
Total	93.38	94.23	95.65	96.33	97.14	97.85	98.59	99.47

	2021 Q1	2021 Q2	2021 Q3	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2022 Q4
Algeria	0.88	0.88	0.89	0.91	0.92	0.93	0.94	0.96
Angola	1.27	1.27	1.25	1.21	1.17	1.14	1.11	1.10
Congo	0.27	0.26	0.25	0.25	0.25	0.24	0.24	0.23
Equatorial Guinea	0.10	0.10	0.09	0.09	0.08	0.08	0.07	0.07
Gabon	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Iran	1.93	1.93	1.96	2.00	2.05	2.14	2.25	2.57
Iraq	3.87	3.94	4.04	4.10	4.16	4.21	4.26	4.30
Kuwait	2.33	2.34	2.37	2.41	2.44	2.47	2.51	2.54
Libya	0.96	1.05	1.16	1.22	1.21	1.21	1.21	1.22
Nigeria	1.48	1.50	1.51	1.51	1.50	1.49	1.48	1.46
Saudi Arabia	8.14	8.66	9.29	9.42	9.55	9.68	9.81	9.94
UAE	2.63	2.64	2.68	2.71	2.75	2.79	2.83	2.86
Venezuela	0.48	0.54	0.57	0.59	0.60	0.60	0.58	0.59
Oil field production	24.52	25.26	26.23	26.57	26.85	27.16	27.46	28.00
Other production	5.17	5.21	5.22	5.19	5.15	5.12	5.10	5.08
OPEC	29.69	30.47	31.45	31.76	32.00	32.27	32.56	33.08

	2021 Q1	2021 Q2	2021 Q3	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2022 Q4
Call on OPEC	45.18	47.10	48.70	48.08	46.77	48.78	49.06	50.34
OPEC	29.69	30.47	31.45	31.76	32.00	32.27	32.56	33.08
	15.04	15.15	15.34	15.59	15.87	16.07	16.22	16.32
Non-OPEC	48.65	48.61	48.87	48.98	49.27	49.50	49.80	50.07
Total	93.38	94.23	95.65	96.33	97.14	97.85	98.59	99.47

Glossary

MMb/d	Million barrels of oil per day
Kb/d	Thousand barrels of oil per day
Target inventories	A theoretical construct reflecting the aggregated 'normal' level of inventories desired by the oil industry to meet contractual obligations, provide a cushion for the complex supply chain that tends to deliver the product in batches, and buffer unanticipated changes in the supply of and demand for crude oil. It is derived from OECD inventory data using a trend component reflecting long-term economic growth, and a seasonal component reflecting phenomena such as the winter heating season, and summer driving and cooling seasons.
Real inventories	Represents the real inventory levels based on KOMO's forecast of supply/demand and inventory surplus/deficit balances.
Hedging pressure	<p>HP = PMnS – MMnL, where PMnS is producer/merchant/processor/user net short, and MMnL is managed money net long.</p> <p>Note that HP is always positive, meaning that managed money net longs are insufficient to meet all of the desired hedging of the PM traders. Also, a negative relationship between price and HP is expected. This is because as HP increases, there is expected to be downward pressure on price: more shorts seeking counterbalancing longs will put downward pressure on the price. The increased hedging pressure costs the short hedgers more because they have to accept lower prices.</p>
PM	Producers/merchants/processors/users
SW	Swap dealers
MM	Managed money
OR	Other reporters
NR	Non-reporters
OPEC partners	Azerbaijan, Bahrain, Brunei, Kazakhstan, Malaysia, Mexico, Oman, Russia, South Sudan and Sudan

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Information as of January 2021 was used in the preparation of this report.



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