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Short-Term Energy Outlook Supplement: Developments in Global Oil Consumption

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1. Introduction

Responses to the 2019 novel coronavirus disease (COVID-19) caused global demand for petroleum products to fall significantly in 2020. The U.S. Energy Information Administration (EIA) estimates that the world consumed 92.2 million barrels per day (b/d) of petroleum and other liquid fuels in 2020, a decline of 9.0 million b/d (9%) from 2019. The large drop marks the first annual decline in global oil consumption since the recession of 2008–09, and it ends a period of relatively stable growth. In the decade preceding 2020, oil consumption rose at an average annual rate of 1.5 million b/d. The largest annual increase in oil consumption during that period was 2.9 million b/d in 2010 (as the global economy recovered from recession) and the smallest annual growth was 0.7 million b/d in 2011.

Although data on final 2020 oil consumption for much of the world are still preliminary, and might not be confirmed for several years, EIA's initial estimates show that the decline in global oil consumption was the largest since 1980, which is the first year in EIA's records. These estimates also show that consumption in the second quarter was the lowest average level since second-quarter 2006. Global oil consumption has risen since the second quarter of 2020, but it remains lower than pre-pandemic levels because economic activity around the world remains subdued and many people continue to work and attend school from home. Although EIA expects global oil consumption to continue its recovery in 2021 and 2022, the trajectory of that recovery is highly uncertain. This report discusses developments in global oil consumption during the past year, methods for estimating and forecasting global oil consumption, and EIA's expectations for oil consumption in 2021–22.

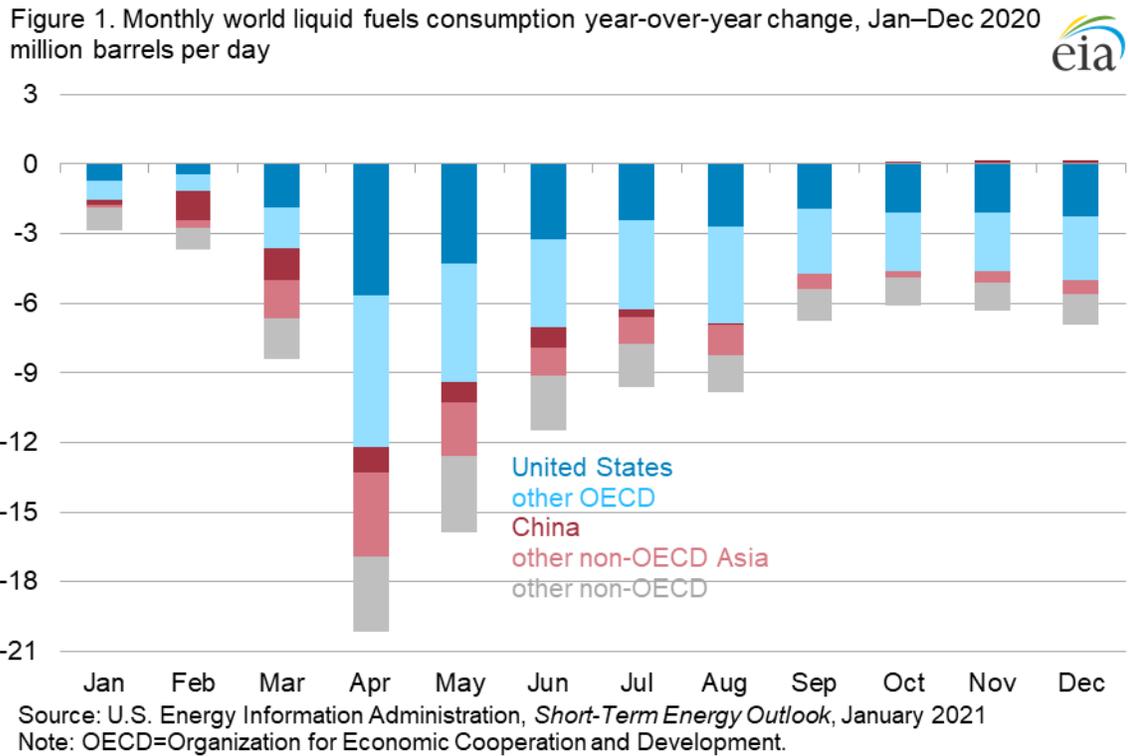
2. Liquid fuels demand in 2020

Heading into 2020, EIA had forecast that global liquid fuels demand would grow for the year more quickly than in 2019, primarily as a result of higher expected global economic growth. Some of the oil market concerns during early 2020 included the transition to using [low-sulfur fuel oil](#) in ocean vessels as well as supply risk amid geopolitical tensions in the [Middle East](#). This combination of expected demand growth and concerns over supply resulted in Brent crude oil spot prices averaging \$67 per barrel (b) during the first 10 trading days of January 2020. By late January, however, easing geopolitical tensions and reduced oil demand as a result of COVID-19 responses, initially in China, began to exert downward pressure on crude oil prices. By February, responses to COVID-19 also began affecting demand in surrounding Asian countries, notably South Korea.

The early COVID-19-related demand declines in Asia largely arose from reduced jet fuel consumption as a result of less air travel for both domestic and international flights to or from China. But gasoline and diesel consumption also began declining in China, and to a lesser extent South Korea, as governments restricted travel and economic activity slowed, according to EIA-derived monthly estimates based on publications by China's National Bureau of Statistics and the International Energy Agency. By the time EIA published the February STEO, the extent of the demand declines were unclear, and EIA had [reduced](#) its 2020 demand forecast by 0.4 million b/d from the January STEO because of the demand declines in Asia.

Responses to COVID-19 began affecting oil consumption in the rest of the world by March. At that point, the United States, countries in Europe, and other regions responded to COVID-19 with mandatory stay-

at-home orders of varying severity and declarations of national emergencies. Travel restrictions as well as significantly reduced economic activity affected all petroleum products. In the United States, consumption of gasoline and jet fuel saw the largest declines as personal and work-related road and air travel fell sharply. Global oil consumption reached its lowest point in April, when EIA estimates show a decline to 80.6 million b/d, a drop of 20.1 million b/d compared with April 2019 (20% year over year), the largest annual decline for any month in EIA data going back to 1990 (Figure 1).



By May and June 2020, stay-at-home orders began to relax in most countries and oil consumption began growing. However, consumption was still affected not only by reduced economic activity but also by voluntary social distancing and reduced travel related to working from home, online education, and online business conferences and events. Despite the mostly upward trajectory of oil consumption over the summer months, global consumption remained much lower than 2019 levels.

EIA estimates that the recovery in global oil consumption leveled off by fourth-quarter 2020. After increasing from 80.6 million b/d in April to 94.7 million b/d in September, EIA estimates that global oil consumption averaged 95.4 million b/d in the fourth quarter of 2020. The flattening oil consumption reflects a similar trend in global economic growth. Based on data from Oxford Economics, EIA assumes that world gross domestic product (GDP) increased by 0.4% in the fourth quarter of 2020 from the third quarter, which is down from the quarter-over-quarter increase of 4.3% in the third quarter from the second quarter. In addition to the flattening economic growth, other indirect indicators of oil consumption, such as mobility indexes and the number of commercial passenger flights, did not significantly change during the final months of 2020, signaling that oil consumption patterns temporarily stabilized at lower levels. However, the recovery in petroleum consumption varied significantly by

country—EIA estimates that China, for example, returned to positive year-over-year growth by September 2020, whereas most other countries' petroleum consumption continues to remain lower than 2019 levels.

3. Methods for estimating and forecasting global oil consumption

Real-time data about oil consumption outside of the United States is lacking. In EIA's *Weekly Petroleum Status Report*, EIA uses product supplied as a proxy for domestic oil demand each week. Other countries in the Organization for Economic Cooperation and Development (OECD) provide monthly consumption data after a two- to three-month lag, and non-OECD countries' data can vary from a two- to three-month lag to a year or more. As a result, EIA will have close to finalized data on about half of world oil consumption for 2020 by the first quarter of 2021, with final numbers from the United States, OECD countries, and some non-OECD countries including India and Brazil. EIA will add finalized data to its published estimates for full-world 2020 as it becomes available throughout 2021 and 2022.

EIA normally forecasts global oil consumption growth in two separate forecasts—a U.S. petroleum consumption forecast and a world oil consumption forecast that excludes the United States (world ex-U.S.). EIA develops the U.S. petroleum consumption forecast on a fuel-by-fuel basis. EIA forecasts changes in U.S. petroleum consumption in response to variables including economic growth, employment growth, vehicle fleet fuel efficiency, oil prices, and other variables.

EIA's forecast of world ex-U.S. oil consumption growth relies on fewer variables. The forecast uses a combination of available real-time data and models based on the relationship between GDP and oil consumption. EIA uses an average of two individual models:

- A regression model that uses forecast GDP growth (from Oxford Economics) and oil price as the two main variables
- An energy intensity of GDP model that forecasts oil consumption based on a continuation of recent trends in oil consumption per unit of economic output

EIA runs the models for 24 countries and regional groups. As a starting point for its forecast, EIA averages the results of these two models and then applies other oil market-specific factors to modify a country or region's consumption forecast. Typically, the factors specific to oil consumption are limited and include things such as new petrochemical plant construction that would increase petroleum consumption beyond the explanatory effects of the modeled results alone.

As a result of the unique situation in 2020, EIA relied on a wide set of other indirect indicators to assess oil demand, including third-party indexes that tracked mobility, flights, and government stay-at-home orders and their stringency across countries. EIA used this method because the declines in petroleum consumption during 2020 stemmed from two major sources. The first was a result of the slowdown in economic activity as countries entered recession. Similar to past recessions, a decline in GDP affects many economic sectors. Cross-sector declines in economic activity typically reduce diesel fuel demand more than demand for other fuels because of reduced shipping, while gasoline consumption is more closely tied to employment than overall economic activity.

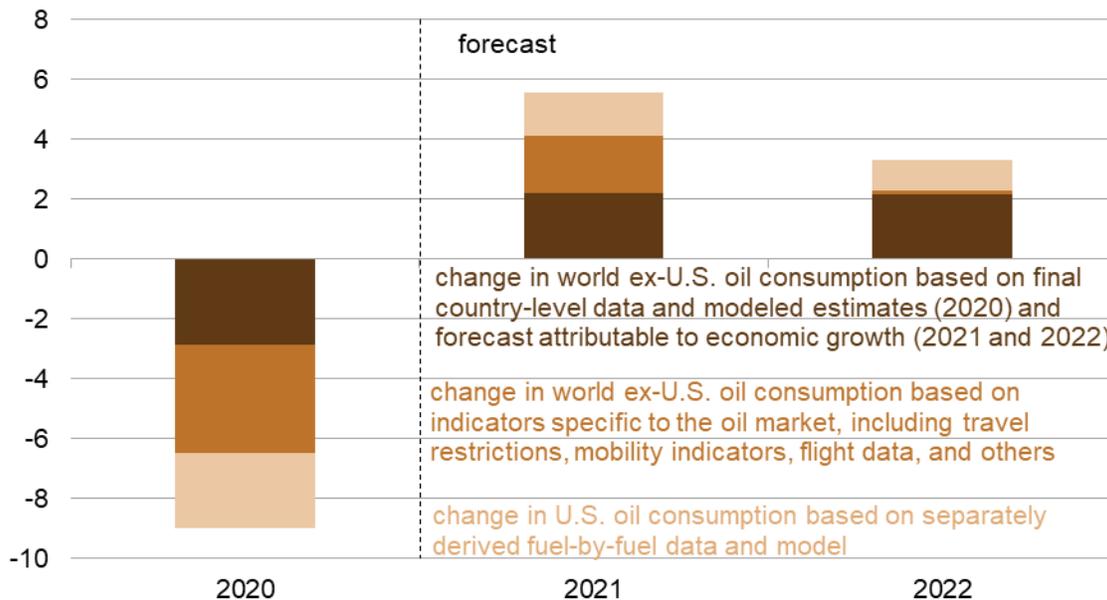
In 2020, however, the effects of restricted travel on overall oil consumption surpassed what may have occurred during an otherwise normal business cycle recession that would have only reduced economic activity. In the [United States](#), gasoline consumption fell as a result of employees and students working or studying from home. In addition, diesel consumption initially declined by less than gasoline and jet fuel consumption because an increase in online retail sales resulted in increased shipping activity that may have offset declines in other uses of diesel. Data from the International Energy Agency show similar trends in other OECD countries.

The effects on oil consumption beyond an economic recession's implications alone increased the challenges in estimating petroleum consumption. As a result, even in May and June, the extent of consumption declines in April were unknown, and to some extent, are still unknown. EIA initially forecast larger declines in oil consumption than actually occurred—in the May STEO, EIA estimated April 2020 world oil consumption declined to 76.3 million b/d, which EIA subsequently revised to 80.6 million b/d as OECD countries and some non-OECD countries released oil consumption data.

4. The forecast for 2021 and 2022

EIA forecasts that some mandatory and voluntary travel restrictions will still be in place in the first half of 2021 amid a resurgence in COVID-19 cases as of late-2020, although the level of restrictions and their duration is highly uncertain. EIA forecasts that a return to more normal consumer behavior and a continued recovery in GDP will contribute to rising oil consumption in 2021 as the year progresses, growing by 5.6 million b/d (6%) in 2021. EIA forecasts that the United States will account for 1.4 million b/d of that growth and that the rest of the world will account for 4.1 million b/d. Oil consumption will grow in 2021 because of both economic growth and a return to more normal travel patterns by the middle of the year, which will also have a small effect on oil consumption growth in 2022 (Figure 2). Despite the forecast increases in global oil consumption in 2021, EIA still expects it to average 97.8 million b/d, which is 3% less than the 2019 level.

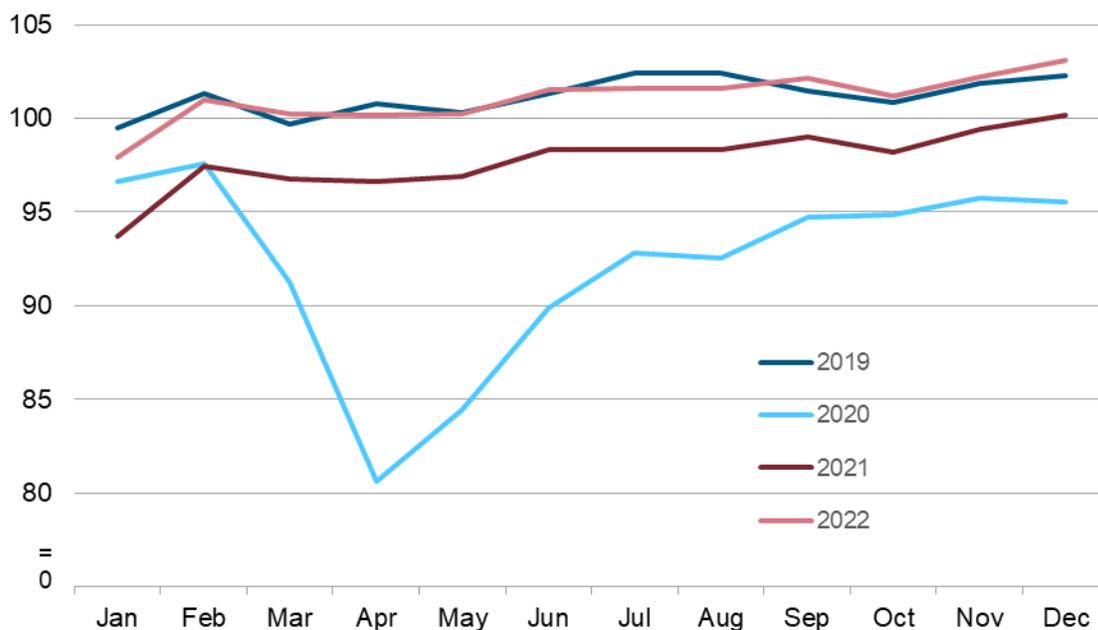
Figure 2. World liquid fuels consumption year-over-year change million barrels per day



Source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, January 2021
 Note: World ex-U.S. means world minus the United States.

For 2022, EIA forecasts global consumption of petroleum and other liquids will grow by 3.3 million b/d (3.4%). EIA forecasts that the United States will account for 1.0 million b/d of that growth and the rest of the world will account for 2.3 million b/d. The 2022 world ex-U.S. forecast is mostly the result of EIA's model output as the effects of travel restrictions and other behavioral changes lessen. The model results are highly dependent on the level of economic activity. EIA's consumption-weighted world GDP growth for 2022 is 4.3%, which EIA derives from forecasts from Oxford Economics. Despite the many uncertainties ahead, EIA expects that global oil consumption will generally return to its same-quarter 2019 levels by the second quarter of 2022. For 2022 as a whole, EIA forecasts consumption will average 101.1 million b/d, only 0.1 million b/d less than in 2019 (Figure 3). Although EIA does not publish a forecast of world oil demand by fuel, EIA expects that jet fuel consumption will continue to be lower than 2019 levels through 2022 because EIA assumes international air travel will not fully recover by then. Other fuels, such as hydrocarbon gas liquids (HGLs) (for example, ethane and propane), will be much higher than 2019 levels. HGLs are used intensively in petrochemical processes, such as plastics production, and EIA expects global demand for plastics will continue to spur demand for HGLs.

Figure 3. Monthly world liquid fuels consumption, 2019–22
million barrels per day



Source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, January 2021

5. Uncertainties

The global petroleum and liquid fuels consumption forecast remains subject to significant uncertainty because responses to COVID-19 continue to evolve. Reduced economic activity related to the COVID-19 pandemic has caused changes in energy demand in 2020 and might have lasting structural changes that are highly uncertain.

The pandemic has likely been the most uncertain environment for forecasting oil demand in at least a decade. Government and individual responses to the pandemic significantly altered historical relationships between GDP and demand, which are normally highly correlated. Developing historical estimates of demand in many cases relied on using new datasets not typically used to assess oil demand, none of which gave a complete picture of the extent of lost oil consumption.

Several factors will continue to cause uncertainties that, depending on realized outcomes, will cause oil demand to be higher or lower than EIA’s forecast. The uncertainties are divided between the near term (the period when vaccination efforts ramp up globally amid the current increase in COVID-19 cases) and the long term (the period that will come after a critical share of the population is vaccinated). In the near term:

- Governments have re-imposed some restrictions as of first-quarter 2021 as a result of the continued spread of COVID-19. Although these may be less stringent than those in second-quarter 2020, these measures have the potential to lower oil demand by more than expected, depending on how long they last and if they become stricter than expected.

- The pace of development, production, and distribution of vaccines could deviate from current expectations. If critical threshold shares of the population receive vaccines either more quickly or more slowly than expected, oil demand will likely respond accordingly.
- Individuals could alter plans or behaviors with knowledge of the vaccine on the horizon. One example of this variable could be a delay in leisure travel plans until after the population is widely vaccinated. Although these effects are likely to be minor, they could affect oil consumption and timing.

Once the pandemic ends, whether pre-pandemic oil demand patterns will return or whether new oil demand patterns will emerge is not yet clear.

- Individuals might choose to continue to work from home or pursue online education, even if the health or transmission risk of COVID-19 is minimized. A related, but slightly different, uncertainty is that employers will increase work-from-home opportunities (or maintain expanded work-from-home options) for employees.
- The composition of leisure travel could change. During 2020, leisure travelers substituted driving for air travel. The extent to which those habits continue in the coming years or whether forgone air travel in 2020 causes a higher demand for air travel in the coming years is unknown.
- Some commuters who used public transportation before the pandemic could decide to drive to work.
- In addition to the factors listed above, how the pandemic will change a broad set of behaviors and preferences and how those changes might affect petroleum consumption after the pandemic is unclear. These wide-ranging issues include where people choose to live, their shopping patterns, and the type of leisure activities they engage in.