KAPSARC
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King Abdullah Petroleum Studies and Research Center

# Revisiting the Impact of COVID-19 on the Demand for Transport and Gasoline

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## About KAPSARC

The King Abdullah Petroleum Studies and Research Center (KAPSARC) is a non-profit global institution dedicated to independent research into energy economics, policy, technology and the environment across all types of energy. KAPSARC's mandate is to advance the understanding of energy challenges and opportunities facing the world today and tomorrow, through unbiased, independent, and high-caliber research for the benefit of society. KAPSARC is located in Riyadh, Saudi Arabia.

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The global outbreak of COVID-19 began in March 2020. As of April 2021, the global caseload has reached over 150 million. Governments globally have introduced various measures in an attempt to contain the virus's spread. These measures have varied in type and stringency in different parts of the world. Some nations have applied extensive containment measures, whereas others have implemented basic guidelines. Governments have also introduced various vaccines to combat the pandemic; around 1.4 billion vaccine doses had been administered as of May 2021 (WHO 2020).

As part of their containment measures, many governments initially restricted movement. These restrictions, which included social distancing measures, remote work, online schooling and physical boundaries, have had severe global economic implications. They brought typical daily activities in all sectors to a halt, with many workers in non-essential sectors forced to work from home. Given the key role that mobility plays in economic flows and human activity, these restrictions have severely impacted the demand for transport. Specifically, global urban road and transit ridership declined by at least 50% in the first two quarters of 2020.

Given these major impacts, this analysis aims to understand the status of the pandemic and the effects of policy measures restricting movement. Using data on cumulative cases and deaths since January 2020 from the World Health Organization's (WHO's) COVID-19 Dashboard, we illustrate the worldwide development of the pandemic. We also use the Oxford COVID-19 Government Response Tracker to understand the development of policy responses to the pandemic.

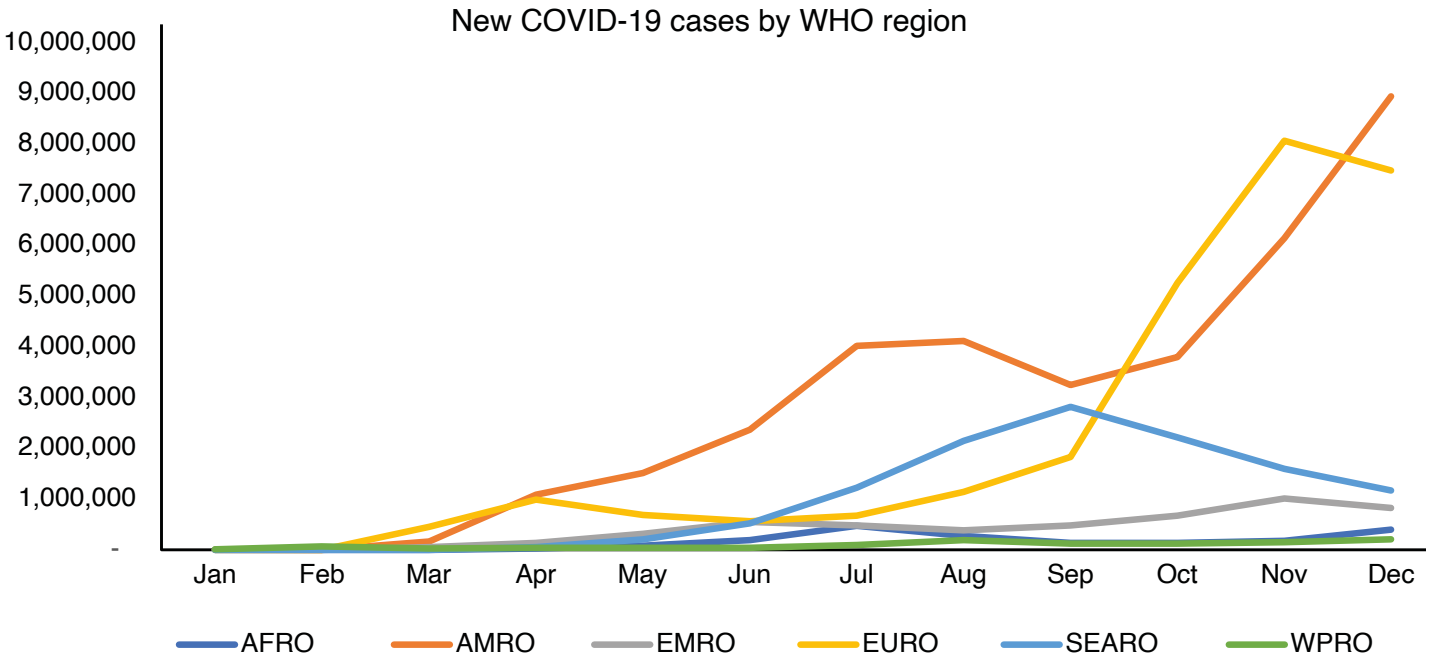
Additionally, this analysis aims to better understand mobility trends during the pandemic. For this purpose, we use data from Apple Maps Mobility Trends Reports. Specifically, we use data on changes in requests for Apple Maps directions via public transit (metro, bus, etc.) and cars since January 13, 2020. These data are representative of Apple Maps users rather than the entire population, and China is not included. However, the data are sufficiently indicative of overall global mobility trends in terms of public transit and driving for the purpose of this analysis.

Finally, we link the demand for fuel and mobility restrictions due to policy measures to contain the spread of COVID-19. For this analysis, we use the United States (U.S.) Energy Information Administration's (EIA's) report on weekly motor fuel production in the U.S.

# Policy responses to COVID-19

The global spread of COVID-19 has put pressure on healthcare systems worldwide. As many as 2.6 million recorded deaths have been attributed to the virus. Figure 1 shows new COVID-19 cases reported each month according to the WHO's COVID-19 Dashboard. Although the virus continues to spread globally, certain regions, such as the Americas Region (AMRO), have seen more cases. Specifically, AMRO recorded more than 2.9 million new cases in December 2020.

**Figure 1.** Monthly new COVID-19 cases by WHO region.




Source: KAPSARC analysis, based on WHO COVID-19 Dashboard data.

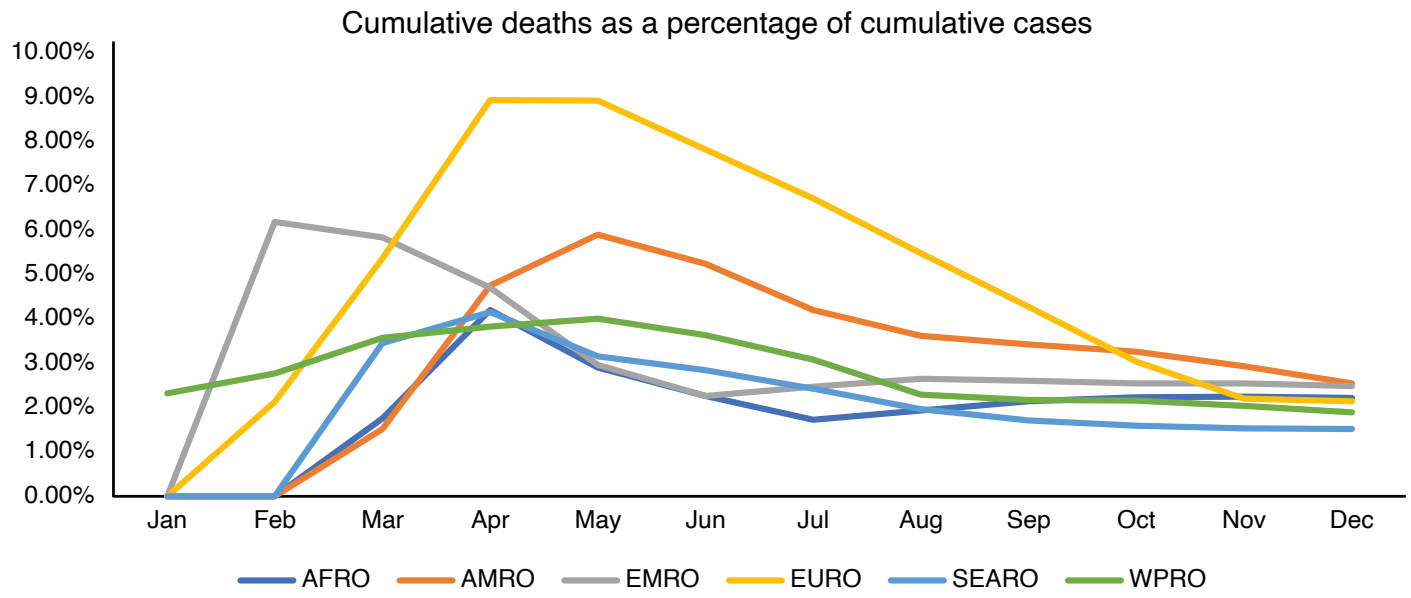
Note: AFRO = African Region; AMRO = Americas Region; EMRO = Eastern Mediterranean Region; EURO = European Region; SEARO = Southeast Asian Region; WPRO = Western Pacific Region.

Other regions have fared better. Southeast Asian Region (SEARO) initially recorded more cases and peaked at 2.8 million new cases in September 2020. However, its caseload fell to 1.19 million new cases in December 2020. The Eastern Mediterranean Region (EMRO) recorded fewer cases in general, with new cases peaking in November 2020. It had 1 million new cases in November 2020, with a decline to 832,000 in December 2020. These declines can be partially attributed to the stringent containment protocols in these countries and regions that allowed them to slow the virus's spread.

A representative example is Saudi Arabia. In March 2020, it registered 1,563 initial COVID-19 cases. Its caseload peaked in June 2020, with an estimated 103,000 new cases, before dropping to 5,473 in December 2020. Saudi Arabia's government implemented stringent measures limiting movement to minimize the spread of the virus. These measures also aimed to reduce the overflow of patients in hospital emergency rooms around the country.

Figure 2 depicts cumulative deaths as a percentage of cumulative cases by WHO region since January 2020. Clearly, many regions have been able to reduce the virus's spread by applying stringent policy measures after the initial chaos. SEARO and Western Pacific Region (WPRO) have successfully controlled deaths per cumulative case, as cumulative deaths in both regions are 2.1% of their cumulative cases on average. Europe initially struggled to control the spread of the outbreak, with cumulative death rates averaging 5.2% of cumulative cases from January to October 2020. Italy, Spain and the United Kingdom (U.K.) were among the hardest hit countries.

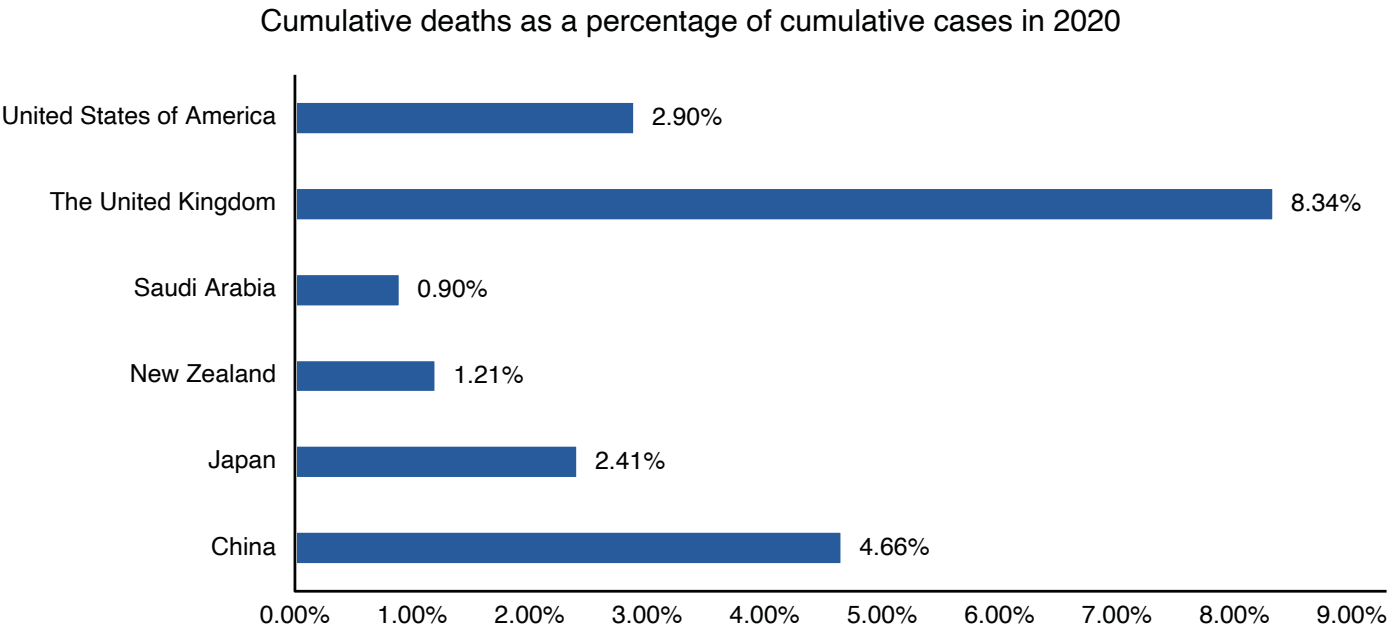
**Figure 2.** Cumulative deaths as a percentage of cumulative cases by WHO region.




Source: KAPSARC analysis, based on WHO COVID-19 Dashboard data.

Note: AFRO = African Region; AMRO = Americas Region; EMRO = Eastern Mediterranean Region; EURO = European Region; SEARO = Southeast Asian Region; WPRO = Western Pacific Region.

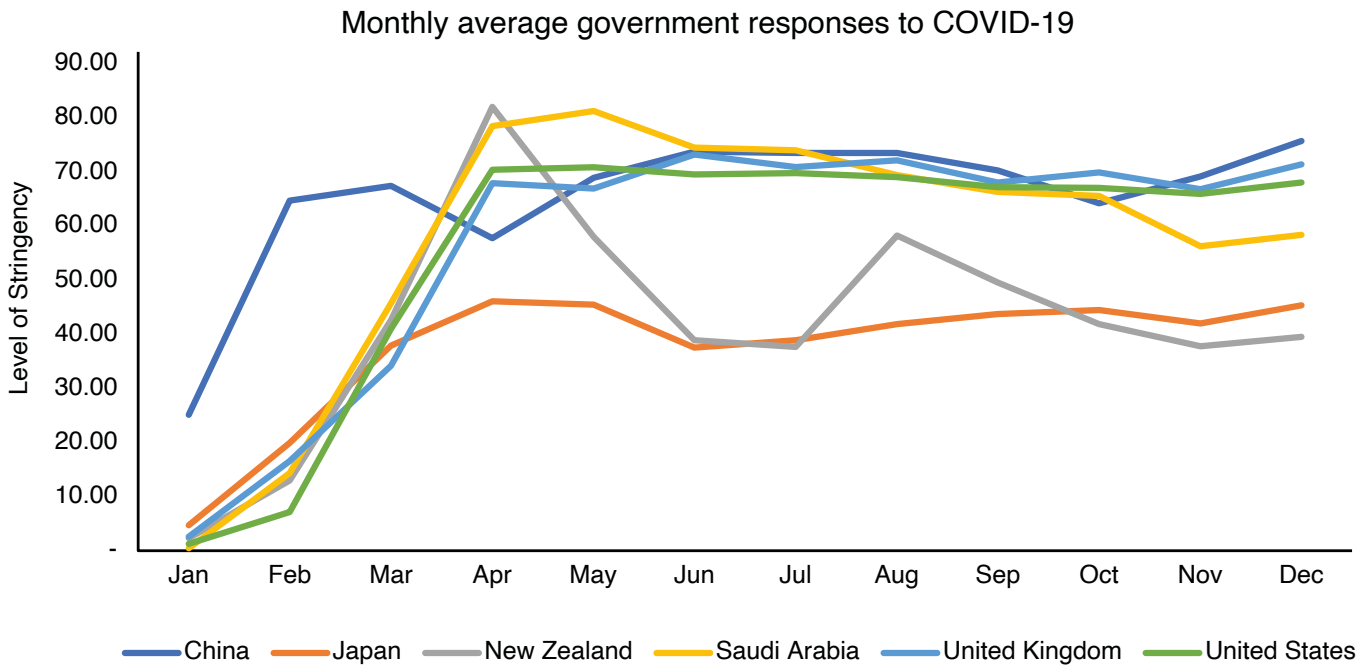
**Figure 3.** Cumulative deaths as a percentage of cumulative cases in 2020.




Source: KAPSARC analysis, based on WHO COVID-19 Dashboard data.

Figure 3 shows cumulative deaths as a percentage of cumulative cases for specific countries in 2020. We take data for Saudi Arabia, the U.S., the U.K., New Zealand, Japan and China from the WHO's COVID-19 Dashboard. In Saudi Arabia, cumulative deaths were 0.90% of cumulative cases in 2020. This result can again be attributed to the response of the government, which applied relatively stringent policies.

**Figure 4.** Monthly average government responses to COVID-19.




Source: Oxford COVID-19 Government Response Tracker.

Governments worldwide have applied containment measures in some form to stop the spread of COVID-19. Figure 4 depicts the monthly average stringency of government responses to the pandemic according to the Oxford COVID-19 Government Response Tracker. This resource evaluates and tracks the stringency level of different response measures to COVID-19 over time. Governments' responses are measured using an index of various indicators, such as closures, containment measures, economic measures and health measures. The stringency scores range from 0 to 100, with 0 being the least stringent and 100 being the most stringent.

Several patterns emerge from Figure 4 that allude to the types of measures applied by different countries. New Zealand and China have alternated between applying strict measures and relaxing them once they have proven effective. Although Japan has opted for weaker measures, it had, on average, a relatively low number of reported cases in 2020. Its cumulative deaths were 2.68% of the cumulative cases on average. At the end of 2020, several countries started to experience second waves of the pandemic. Some countries were exposed to variants of the COVID-19 virus that are more easily transmitted. As a result, many countries reinstated more stringent measures. An important observation is that applying more stringent measures does not necessarily imply that a country's citizens actively follow those measures. This

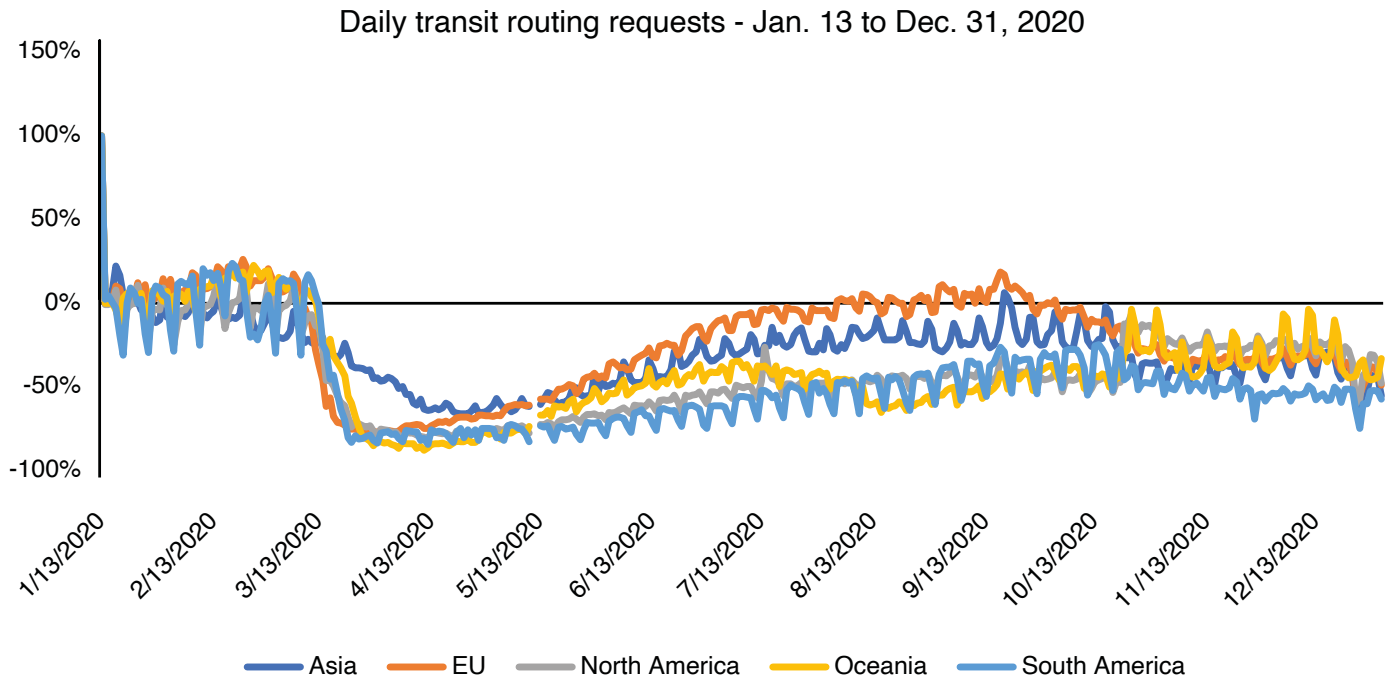
distinction is especially important if the measures are not associated with monetary disincentives. In other words, people's behavior in response to government measures is also critical to their success.

In Saudi Arabia, more stringent measures were initially applied, with a level 80 government response in March 2020. The stringency of its response gradually declined to 60 in December 2020 (Figure 4). Saudi Arabia's measures included the closure of all non-necessary activities, a curfew on movement, and nationwide remote work and study in non-essential sectors. Saudi Arabia also established social distancing guidelines and limitations on gatherings, strictly enforced mask-wearing policies and utilized a contact tracing application to ensure adherence to guidelines.

## Is the impact on public transit demand permanent?

The spread of COVID-19 has severely impacted the transportation sector. Globally, the demand for mobility via public transit declined by an estimated 75% to 80% in the first two quarters of 2020. Figure 5 depicts changes in routing requests since January 13, 2020 according to the Apple Maps Mobility Trends Report. A routing request refers to when an individual user requests directions to a destination on Apple Maps. The data cover 63 countries grouped by region.

**Figure 5.** Change in public transit routing requests since Jan. 13, 2020.



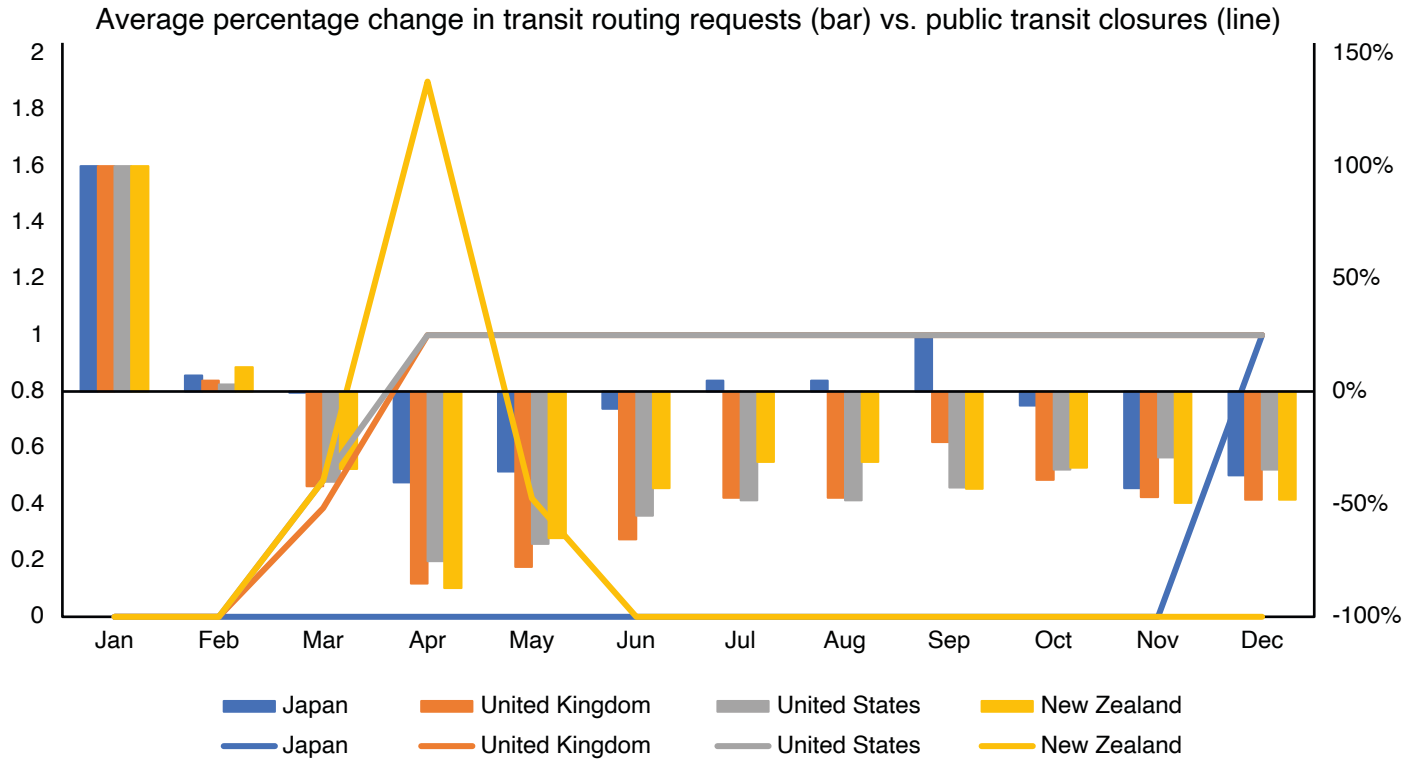

Source: Apple Mobility Trends Reports.

Note: EU = European Union.

The continued government measures to reduce the spread of COVID-19 have greatly impacted the public transit sector. Many public transit service providers are required to apply safety measures to allow for social distancing. These measures may be direct or indirect. Some examples include caps on the number of passengers, fewer timing options to reduce congestion, installing separation glass, mandatory mask wearing, temperature checks and the suspension of services. Some countries took more extreme measures, such as shutting down public transit entirely.

Some countries resumed economic activities after a reduction in the number of new cases to allow their recession-bound economies to recuperate. Nevertheless, transit ridership remains at record low levels. In some countries, public transit ridership has not recovered. In others, it has improved slightly but has not returned to January 2020 levels (Figure 5).

**Figure 6.** Average percentage change in transit routing requests (bar) vs. public transport closures (line).




Source: Apple Mobility Trends Reports (bar graph); Oxford COVID-19 Government Response Tracker (line graph).

Figure 6 compares the average percentage change in transit routing requests and public transport closures. The former data, shown in the bar graph, are taken from the Apple Mobility Trends Report. The latter data, shown in the line graph, are taken from the Oxford COVID-19 Government Response Tracker. Public transport closures are defined as in Hale et al. (2020), who use the measure as an individual closure and containment indicator. The indicator is defined on an ordinal scale in which a value of zero means that no measures were applied. A value of one means that closures were recommended, significantly reducing the volume and means of available transport. Finally, a value of two means that public transit closures were required.

In all of the countries in Figure 6 except for Japan, public transit closures were among the first measures applied. In contrast, Japan applied no measures limiting or closing public transit. It is evident that public transit measures are not the reason that public transit routing requests have not recovered since the beginning of the pandemic. The continued lack of public transit ridership can be partially attributed to people's behavior and the perception of public transit as a space where the coronavirus spreads. Together, these factors have caused public transit revenues to plummet, which has affected the sustainability of these services.

Overall, these measures and the general shift in behavior related to public transit have disproportionately affected vulnerable communities. These communities include people in lower socioeconomic brackets and those who typically work in lower-income essential services, such as convenience store and sanitation workers. These communities continue to rely heavily on public transit. In contrast, people in higher socioeconomic groups tend to use public transit less. They tend to have access to different modal choices, including private transport, and have the luxury of working remotely. As ridership remains low, many governments will need to address the issue of maintaining public transit as a public service.

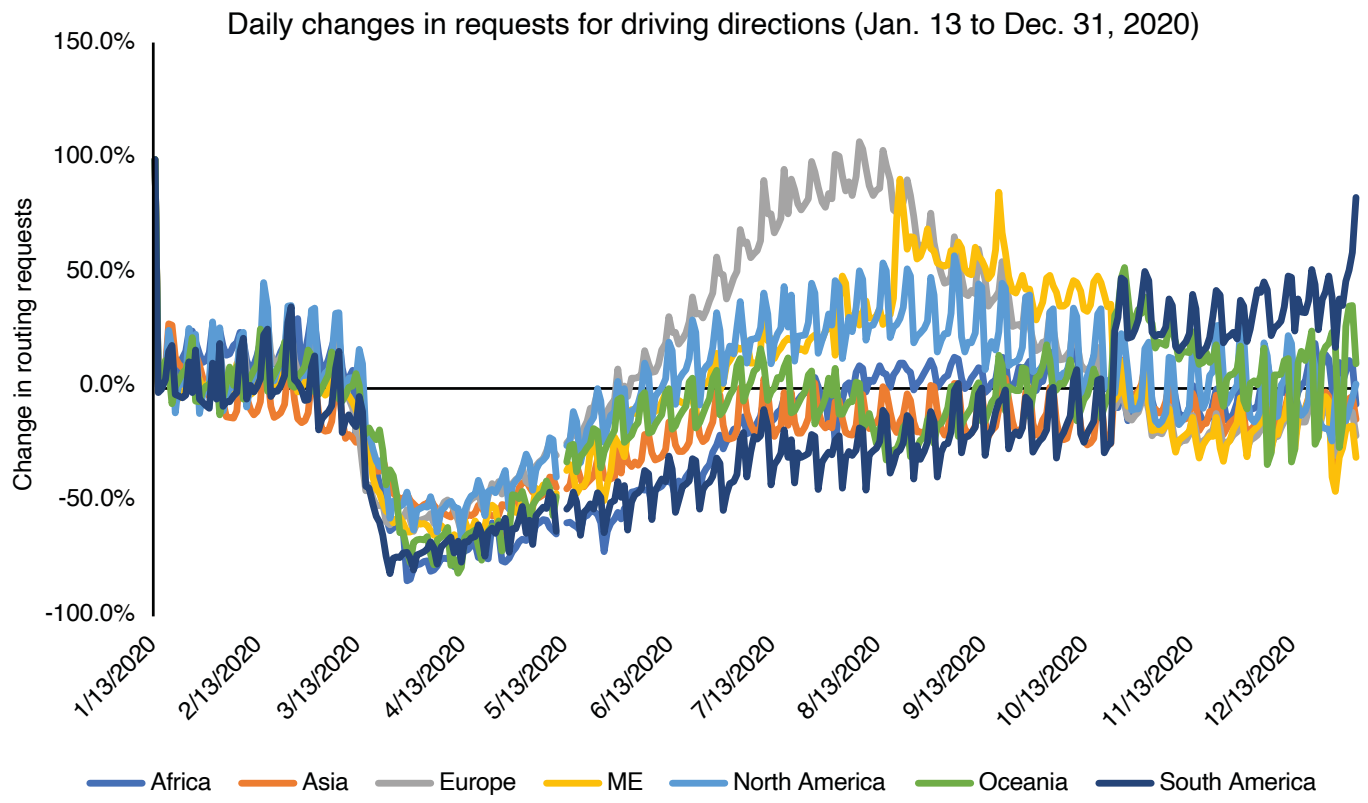
Saudi Arabia is not included in Figure 6 because it currently has no active public transit system. However, it is in the final stages of launching its first public transit metro system in Riyadh, its capital. The current global decline in public transit ridership may provide a platform for innovative thinking on resilient transit systems. As Saudi Arabia is about to launch its first public transit system, this potential for innovation provides it with a unique opportunity.

## Impact on road transport and gasoline demand

Like the demand for public transit, demand for road transport has also declined as a result of the pandemic. Unlike public transit, however, road transport has been more resilient, as routing behavior in some parts of the world has returned to pre-pandemic numbers. Figure 7 depicts the daily changes in routing requests via car from Apple Maps Mobility Trends Reports since January 13, 2020. Again, we show data for 63 countries grouped by continent or region. These routing requests initially declined by between 54% and 83% in the first two quarters of 2020, taking January 13, 2020 as a baseline. In the third quarter, the number of road transport routing requests increased in many countries. This improvement was mainly due to lower reported cases resulting from government measures to combat the virus's spread.

In Figure 8, we use Apple Maps Mobility Trends Reports to illustrate the changes in routing requests via car since January 13, 2020 for individual countries, with January representing the baseline of 100% of requests. Specifically, we show the trends for Saudi Arabia, Japan, the U.K., the U.S., Hong Kong and New Zealand. Saudi Arabia's trend mirrors that of the Middle East in Figure 7. Requests for driving directions have cycled according to the changes in the stringency of government measures throughout 2020. In Saudi Arabia, routing requests via car fell to -27% in April 2020 owing to the stringent government response to the spread of the virus. By July 2020, these requests had almost returned to their original levels, reaching 86% of the original demand for driving directions. However, the discovery of new virus strains and the increase in cases caused the government to reapply stringent measures at the end of 2020. As a result, the demand for driving requests declined to 36% of its original level.

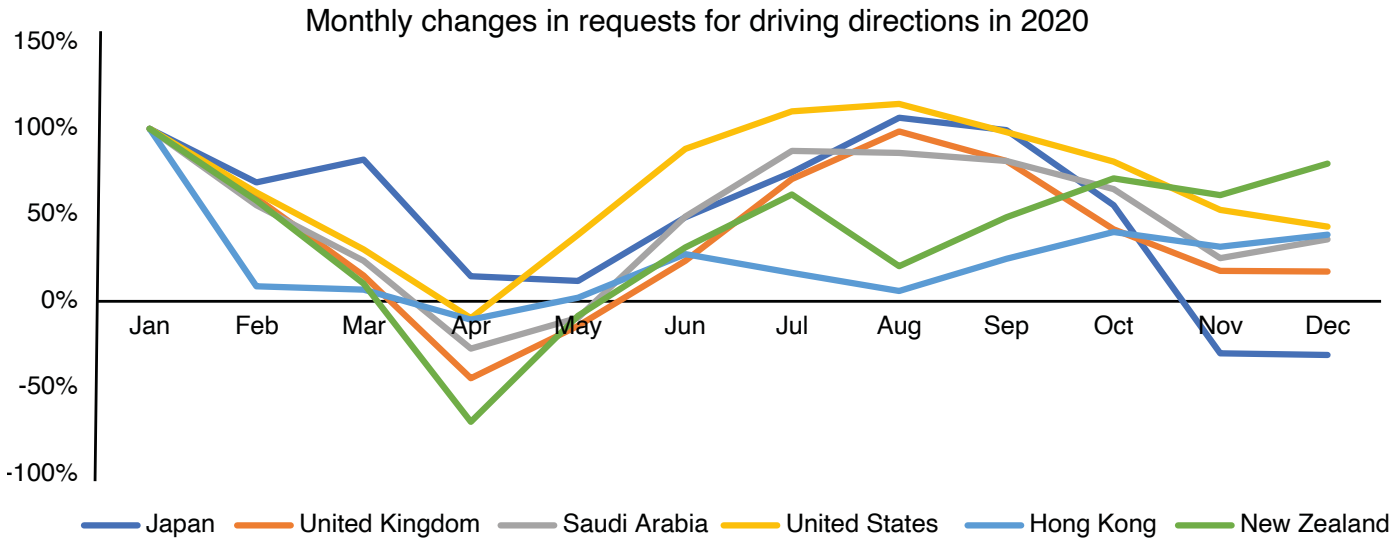
**Figure 7.** Daily changes in requests for driving directions since Jan. 13, 2020.




Source: Apple Mobility Trends Reports.

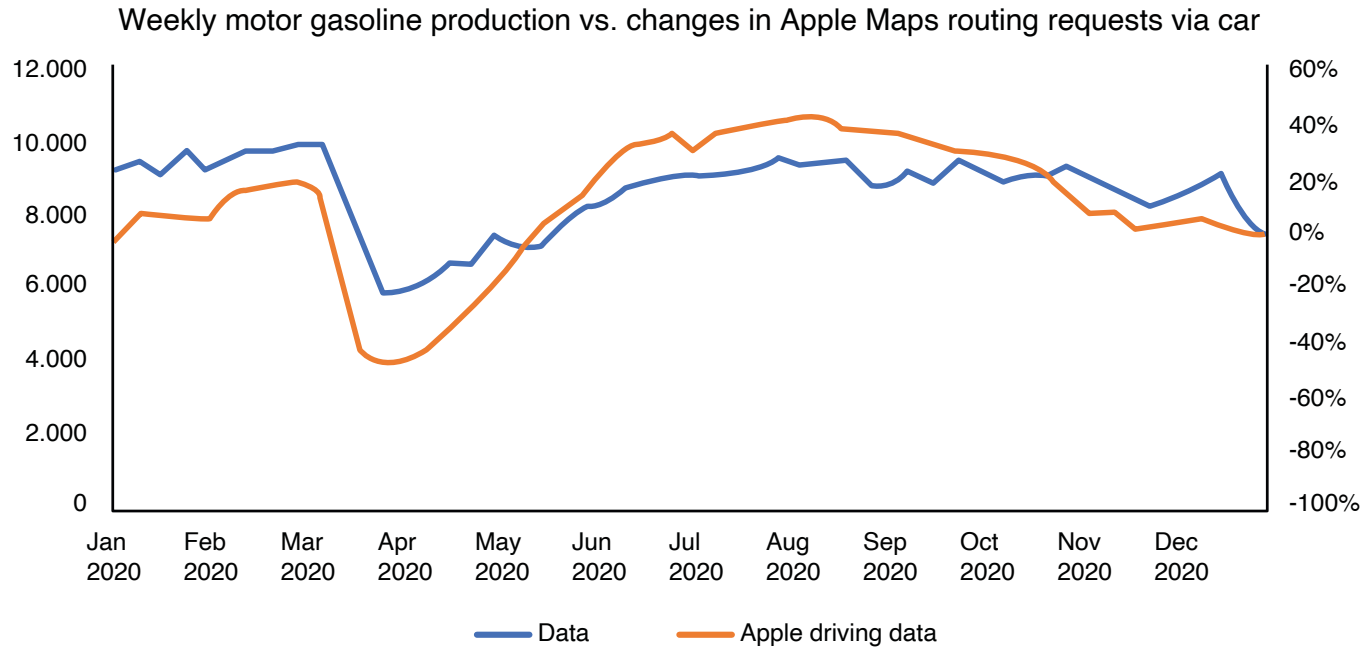
Note: ME = Middle East.

**Figure 8.** Monthly changes in requests for driving directions in 2020.




Source: Apple Mobility Trends Reports.

**Figure 9.** Weekly motor gasoline production vs. changes in Apple Maps routing requests via car.



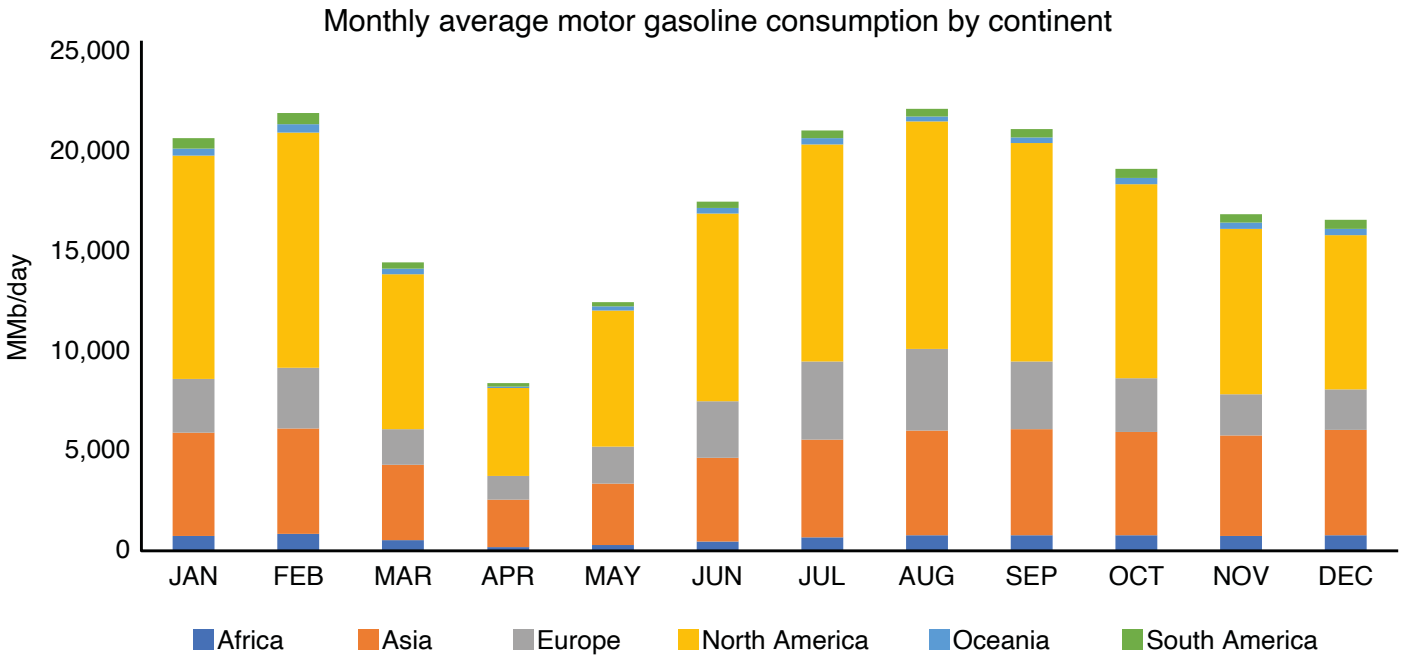

Source: EIA weekly report on U.S. motor fuel production and Apple Maps Mobility Trends Reports.

In this analysis, we try to quantify the decline in the demand for motor gasoline using data on requests for driving directions from Apple Maps. We assume that the change in routing requests via car on Apple Maps translates to a change in the overall use of road transport. A decline in road transport use, in turn, directly affects motor gasoline consumption. We illustrate this assumption in Figure 9 by plotting weekly U.S. motor gasoline production against Apple Maps requests for driving directions.

Figure 10 shows the monthly average consumption of motor gasoline by continent according to our calculations. Specifically, we apply the change in Apple Maps' daily routing requests via car to the EIA's most recent data on annual daily average motor gasoline consumption for each continent. Gasoline consumption declined the most in April 2020. Specifically, demand was approximately 60% lower than in January because of worldwide mobility restrictions. Combined with storage build-up in the first and second quarters of 2020, the reduced demand for gasoline put downward pressure on oil prices.

After the first wave of the COVID-19 pandemic, mobility increased until August. Then, most countries faced a second wave of COVID-19. As of December 2020, gasoline consumption was down 20% overall compared with January of that year. In Asia, however, gasoline demand returned to its January 2020 level in December 2020. This result can be partly linked to the overall easing of government mobility restrictions as the virus's spread was controlled and, in some cases, reduced.

**Figure 10.** EIA 2020 monthly average motor gasoline consumption.




Source: KAPSARC analysis, based on EIA 2020 data.

Note: MMb/d = million barrels per day.

## New realities for the transport sector in a post-pandemic world

The global race for vaccination is now underway. For example, Saudi Arabia and the U.S. have administered more than 12.24 million and 264.35 million vaccine doses, respectively (WHO 2020). Nevertheless, the path to a post-COVID-19 future in the transport sector remains uncertain.

Both public transit and road transport have suffered greatly during the pandemic, but road transport has proven more resilient. Demand for road transport has almost returned to January 2020 levels in some regions that have effectively controlled the virus's spread. In these regions, stringent pandemic measures have been eased, and the movement of people is allowed. Conversely, public transit demand continues to suffer in many regions, mainly owing to changes in people's behavior and perceptions of public transit. Many people view public transit as a space for the virus's spread. Public perception, coupled with stringent public transit measures, has led to a slow rebound in public transit ridership.

Innovative and resilient government policies are needed to prepare for the next wave of the COVID-19 pandemic or for another pandemic. In addition, it is necessary to reignite public confidence to boost public transit utilization. Public transit plays a crucial role in connecting communities to economic activity centers. However, its future is uncertain and will require active government intervention. In countries where public transit is a public good, its current structure should be evaluated. It is necessary to improve its resilience to events, such as pandemics, that can bring entire economies to a halt.

For Saudi Arabia in particular, the pandemic has presented challenges on several fronts. The first is the economic slowdown due to the stringent local response to prevent the spread of the virus, which limited people's mobility. The second is the economic toll of the global decrease in the demand for oil. This decrease in oil demand is partly due to governments worldwide applying measures to slow the virus's spread.

In Saudi Arabia, the utilization of road transport has already rebounded as mobility restrictions have been eased. However, its public transit faces a unique challenge. The country is aiming to launch its first public transit project with the Riyadh metro, while consumers remain hesitant about shared spaces and close proximity to others. Saudi Arabia already faces challenges in attracting its citizens, who depend on road transport, to its new public transit system once it is launched. However, the pandemic may present a unique opportunity for it to address the challenges facing public transit globally. It has a chance to develop resilient policies that will allow its fledgling public transit sector to flourish in a post-pandemic world.

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