Saudi Arabia's CO2 Emissions Steady in 2019 Ahead of Expected 2020 Fall Due to COVID-19

Nicholas Howarth, Alessandro Lanza, Thamir Al Shehri, Jan Braun

Instant Insight

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.

Legal Notice

What has happened?

The 2019 data on carbon dioxide (CO2) emissions have just been released ahead of an expected large fall in CO2 emissions in 2020 due to the impact of COVID-19.

On June 3, Enerdata released its data for Saudi Arabia's 2019 emissions from fuel consumption, estimating them to remain stable at 526.84 million tonnes of CO2 (MtCO2), slightly down (-0.04%) from 527.05 MtCO2 in 2018 (Figure 1).

Figure 1. Saudi Arabia's CO2 emissions from fuel combustion.
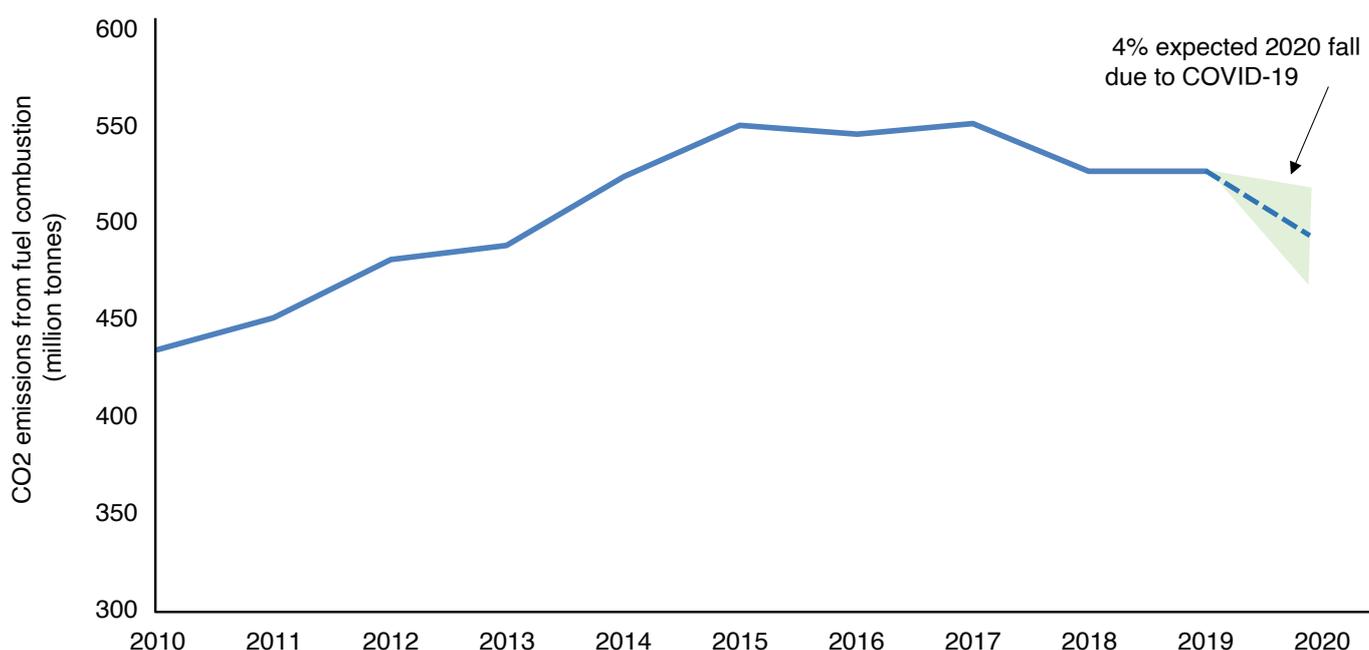
Source: KAPSARC analysis based on Enerdata Global Energy & CO2 Database (2010-2019); 2020 estimate based on Le Quéré et al. (2020), Alatawi et al. (2020) and Soummane and Peerbocus (2020).

The expected impact of COVID-19 on CO2 emissions in 2020 will be significant and will depend on the length and severity of the restrictions imposed to reduce its spread. In the journal *Nature: Climate Change*, Le Quéré et al. (2020) estimated daily global emissions to have fallen by 17% in March and April, 2020 compared with the same period in 2019. Half of this expected fall was attributed to the transport sector as people stayed at home.

If pre-pandemic conditions return by mid-June, the reduction in daily activity in six economic sectors' activity is estimated to produce an average fall in global emissions of 4% for 2020 within a range of -2% to -7%. If restrictions remain in place until the end of 2020, an average fall of 7% is expected within a range of -3% to -13%.

The average global change in activity in the six economic sectors investigated by Le Quéré et al. (2020) under different lockdown scenarios provides a good context for understanding the potential impact

of COVID-19 in Saudi Arabia (Figure 2). The transport sector is expected to be the most impacted by COVID-19, with its daily activity estimated to be down between 10% and 50% for surface transport and between 20% and 75% for aviation, depending on the level of restrictons. Industrial activity and emissions are estimated to fall between 10% and 35%, depending on the severity of the lockdown measures. The power sector is expected to fall between 0% and 15% depending on the severity of the lockdown measures. Emissions from public buildings and commerce are estimated to fall between 5% and 33%, while residential activity is not negatively impacted by the restrictions and is estimated to actually increase by 5% under the most stringent lockdown measures.

Figure 2. Level of confinement and estimated reduction in activity by sector.
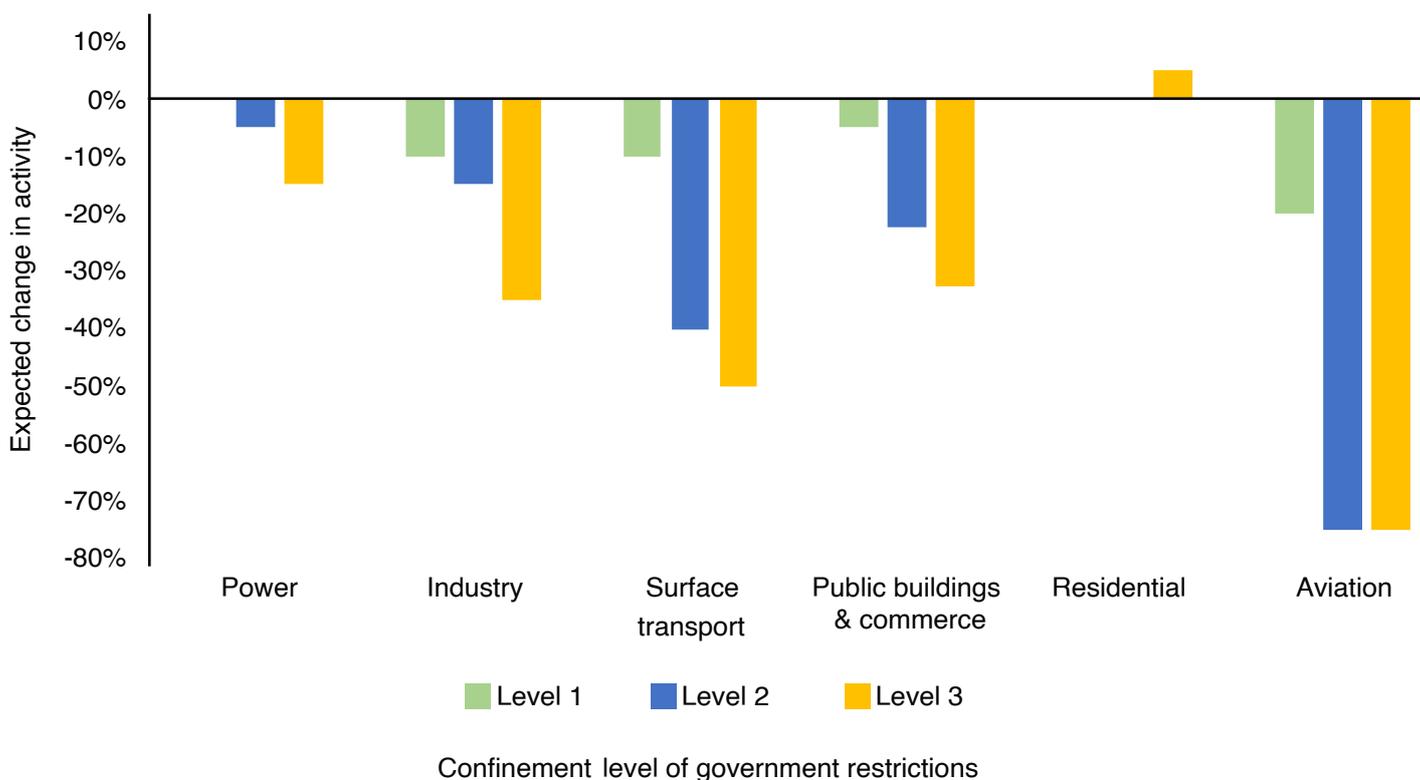
Source: KAPSARC based on Le Quéré et al. (2020).

A clearer picture of these global estimates along with country-specific impacts is expected as more data become available on the impact and duration of the lockdown measures.

For Saudi Arabia and the Middle East, early data suggest gasoline demand was down by around 50% to 58% in March and April, and Saudi Arabia's electricity demand was down by around 5% in late March. It is likely we may see a significant increase in demand for household cooling, as buildings are responsible for around 86% of total final electricity demand, and cooling represents around 70% of total electrical demand from buildings.

How do Saudi Arabia's 2019 emissions compare with those of other G20 countries?

The Kingdom has moved from being the G20's third-fastest reducer of emissions growth in 2018 to matching the G20's 2019 average of no overall growth (Figure 3).

Figure 3. G20 CO2 emissions from fuel combustion (2018-2019 % change).
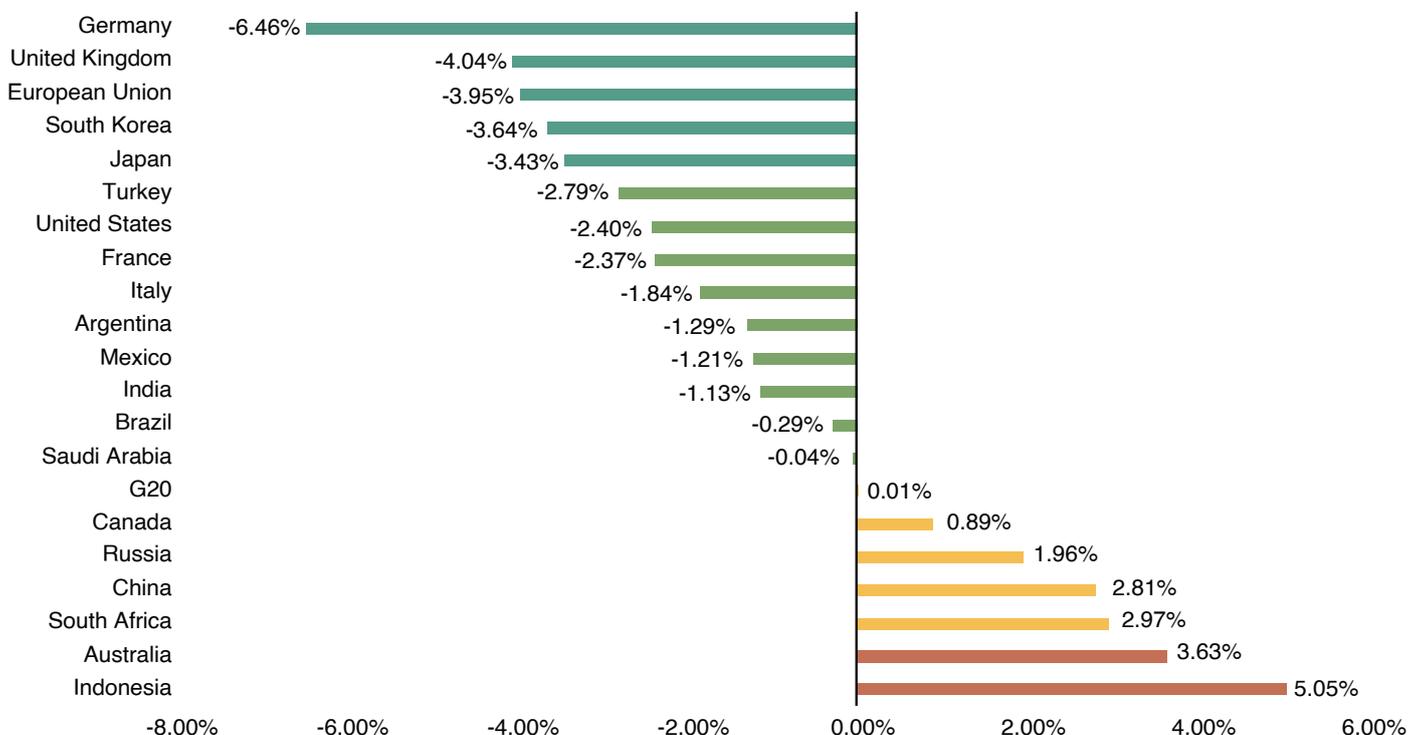
Source: KAPSARC analysis based on Enerdata Global Energy & CO2 Database.

Despite Saudi Arabia's achievement of stabilizing and reducing its historical emissions growth of about 5%-6% each year, and the widespread expectations for higher global emissions in 2019, the G20 as a group is not on track to meet the Paris Agreement's goal of keeping global warming 2-degrees Celsius (°C), and ideally 1.5°C, below pre-industrial levels.

To address this gap, during its 2020 G20 Presidency, Saudi Arabia has put forward the concept of the Circular Carbon Economy (CCE) as a way to help countries shift toward net-zero emissions goals.

Where did emissions change?

While overall emissions were stable, there were significant changes in fuel use and sectoral emissions. Emissions from oil-related fuel consumption fell by 1.80 MtCO2, from 345.45 MtCO2 in 2018 to 343.65 in 2019, or 0.52%, while emissions from gas consumption rose by 1.59 MtCO2, from 181.61 MtCO2 to 183.19 MtCO2, or 0.87% (Figure 4).

Industry, which had the largest share of emissions at 46%, saw its emissions increase back to its 2017 levels, rising by 4.75 MtCO2, or 1.99%, from 238.21 MtCO2 in 2018 to 242.96 in 2019. This reflected the sector's increased fuel combustion from producing petrochemicals, steel and cement (Figures 5 and 6).

Figure 4. Annual change in CO2 emissions from fuel combustion by fuel type.
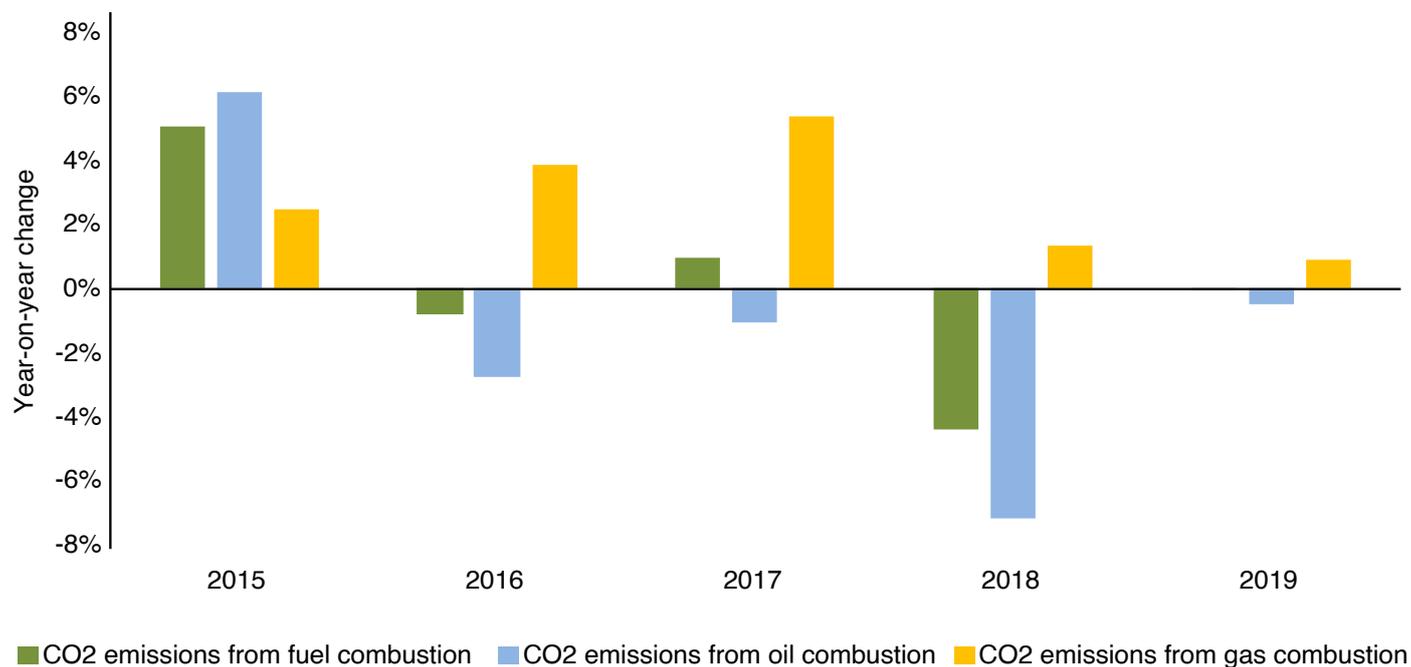
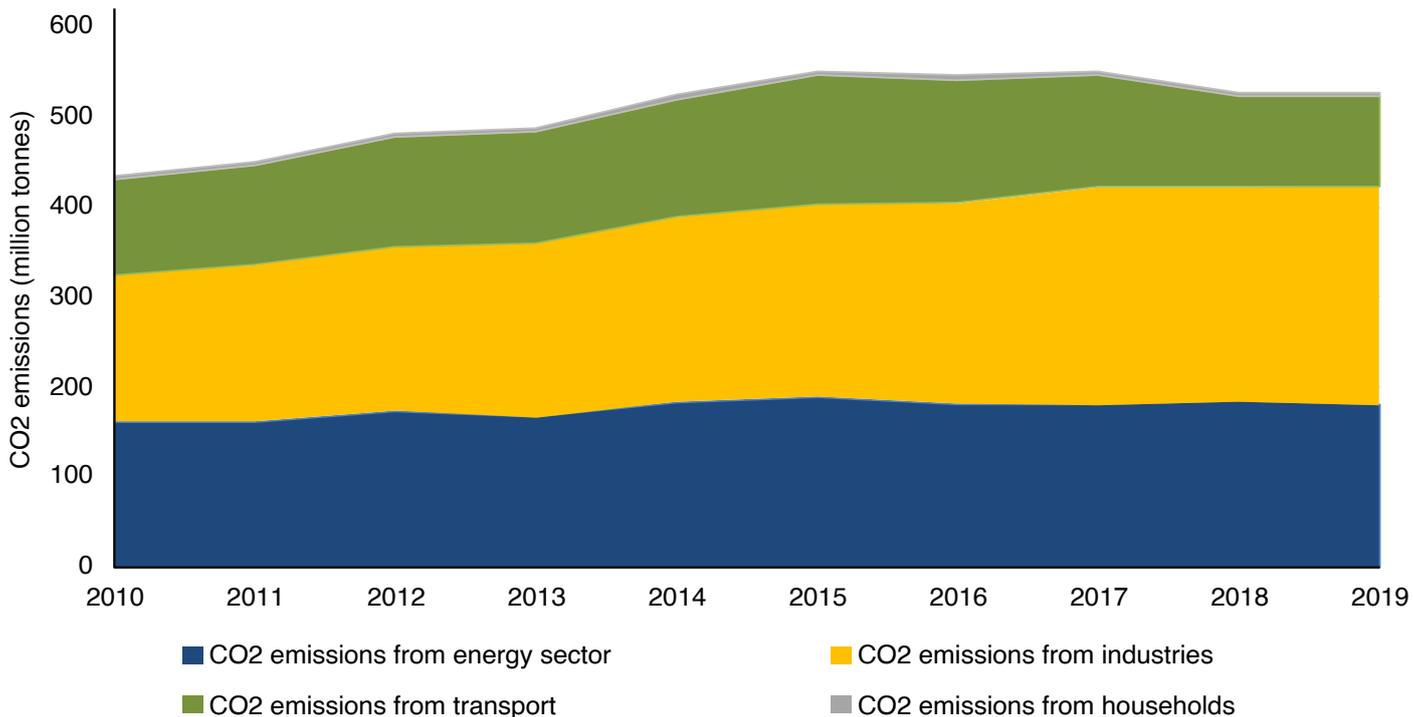Source: KAPSARC analysis based on Enerdata Global Energy & CO2 Database.

CO2 emissions from the energy sector, which includes power generation and refineries, fell by 3.83 MtCO2, from 183.81 MtCO2 to 179.98 MtCO2, or by 2.08%. This was due to a fall in emissions from oil-based electricity generation of 3.61 MtCO2, from 102.37 MtCO2 to 98.76 MtCO2, or 3.52%, and a rise in gas-based electricity-related emissions of 0.43 MtCO2, from 49.69 MtCO2 to 50.12 MtCO2, or 0.87%. This reflects progress toward the Kingdom's policy of phasing down the use of oil for electricity and replacing it with natural gas and renewable energy.

The largest change in emissions came from refining activities, which jumped by 4.67 MtCO2, from 14.15 MtCO2 in 2018 to 18.82 MtCO2 in 2019, or by 32.98%. This is likely to be part of a longer-term trend as energy efficiency and fuel switching to gas divert oil from electricity generation to higher-value uses. This jump in emissions from refining activities reflects Saudi Arabia's efforts to increase downstream productivity by expanding higher-value upstream production. In 2019, Saudi Aramco acquired new refineries aimed at increasing the Kingdom's gross chemical production capacity.
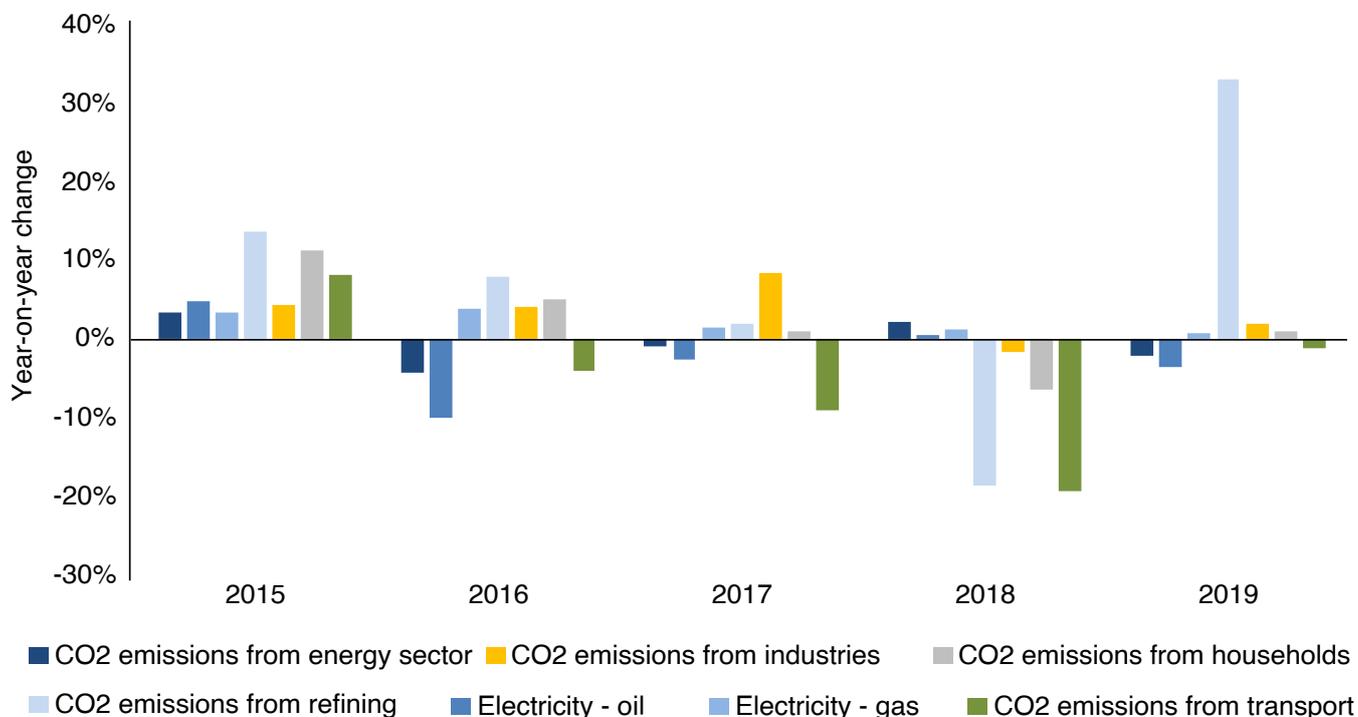
In 2019, transport-related emissions fell by 1.18 MtCO2, from 100.44 MtCO2 to 99.26 MtCO2, or by 1.17%. In 2018, transport-related emissions fell by 19.2% from 124 MtCO2 in 2017 to 100.44 MtCO2. This reduction was responsible for a major shift in the Kingdom's CO2 emissions.

Figure 5. CO2 emissions from fuel combustion by sector.

- CO2 emissions from energy sector
- CO2 emissions from industries
- CO2 emissions from transport
- CO2 emissions from households

Source: KAPSARC analysis based on Enerdata Global Energy & CO2 Database.

Figure 6. Annual change in CO2 emissions from fuel combustion by sector.

- CO2 emissions from energy sector
- CO2 emissions from industries
- CO2 emissions from households
- CO2 emissions from refining
- Electricity - oil
- Electricity - gas
- CO2 emissions from transport

Source: KAPSARC analysis based on Enerdata Global Energy & CO2 Database.

Note: The energy sector includes electricity (oil and gas) and refining. Household emissions excludes electricity and includes fuels used in the home, such as gas.

While the 2019 shift can be explained by improvements in domestic vehicle energy efficiency and reduced demand from drivers for higher-priced gasoline and diesel, it is likely that other factors caused the 2018 fall. Perhaps first among these was a policy shift to discourage the use of private diesel generators for electricity use. This includes commercial sites such as shopping malls, compounds and other remote end-users that fill up their diesel supplies from service stations. Another possible reason is that higher diesel prices reduced the arbitrage incentives for smuggling diesel to sell in nearby countries, including those in Africa.

CO_2 emissions from households constitute only 1% of Saudi Arabia's total CO_2 emissions, as they exclude electricity and only relate to direct fuel use, such as natural gas. In 2019 households' direct fuel-use emissions rose by 0.015 $MtCO_2$, from 4.59 $MtCO_2$ to 4.64 $MtCO_2$, or by 1.17%.

The expected fall in global emissions due to COVID-19 is likely to be temporary as economies eventually bounce back once the virus is controlled and restrictions are lifted. There is an opportunity now to 'build back better' through stimulus measures that operationalize ideas such as the Circular Carbon Economy.

About the data

This Instant Insight draws on data downloaded from the following sources:

• Enerdata Global Energy and CO_2 Database (www.enerdata.net), downloaded June 4, 2020.

Enerdata sources historical information from a range of sources, including the International Energy Agency (IEA), and obtains an estimate for the latest year based on a combination of sources. For example, 2019 data for Saudi Arabia's CO_2 emissions from fuel combustion is based on Enerdata's collation of information from the IEA, the Joint Organisations Data Initiative (JODI), Cedigaz and the Saudi Arabian Monetary Agency (SAMA). Enerdata updates the values for the latest year at least twice yearly. The first update gives preliminary data, while the second and any subsequent updates reflect more concrete energy statistics. The data made available on June 4 is thus a preliminary view.

The estimate of a fall in emissions for 2020 for Saudi Arabia is based on the following studies:

• Le Quéré, Corinne, Robert B. Jackson, Matthew W. Jones, Adam J. P. Smith, Sam Abernethy, Robbie M. Andrew, Anthony J. De-Gol, David R. Willis, Yuli Shan, Joseph G. Canadell, Pierre Friedlingstein, Felix Creutzig, and Glen P. Peters. 2020. "Temporary reduction in daily global CO_2 emissions during the COVID-19 forced confinement." *Nature: Climate Change*. https://doi.org/10.1038/s41558-020-0797-x

• Alatawi, Hatem, Nora Nezamuddin, and Abduelah Darandary. 2020. "The Impact of COVID 19 on Transport and Gasoline Demand." KAPSARC Instant Insight KS—2020—II14.

• Soummane, Salaheddine, and Nawaz Peerbocus. 2020. "Impact of the COVID-19 Lockdown on Electricity Demand: Global insights and implications for Saudi Arabia." KAPSARC Instant Insight KS—2020—II19.