

# COVID-19 and Mobility in Riyadh: An Analysis of Changes in Motorized Trips and Possible Emission Loss

**Abu Toasin Oakil**

## Instant Insight

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In this insight, we investigate the implications of COVID-19 on mobility in Riyadh. COVID-19 has impacted our world, leading to a 'new norm' for our standard of living. Countries have restricted personal mobility significantly, among other measures, to control the spread of the virus.

Countries have also shut down industries, transport networks and businesses. As a result, at the beginning of this year the level of pollution fell by 50% in New York and by 25% in China. In Europe, nitrogen dioxide (NO<sub>2</sub>) emissions are declining (BBC 2020). The Kingdom of Saudi Arabia also responded in the same way, suspending all flights, trains, buses, and taxis to stop the spread of the virus (Arab News 2020). Hence, we expect these measures to have similar impacts across economies.

To estimate the environmental impact of these measures in Riyadh, we analyzed Google's mobility report and the traffic model data of the Royal Commission for Riyadh City (RCRC). The Google mobility report (Google 2020; KAPSARC 2020) was published recently to show changes in the frequency of visits to different locations during COVID-19, whereas the RCRC data represents the total number of trips for different purposes within Riyadh. Unfortunately, the latest traffic data available is for 2016. Therefore, we consider 2016 as the base year when estimating changes in mobility during the COVID-19 lockdown. The base year in the Google report is just before COVID-19. The traffic flow in Riyadh has been increasing since 2016. This would mean we will see less of an impact of COVID-19 on traffic flow based on the 2016 data. In addition, we formed an equivalence between the RCRC traffic model data and Google's data (as shown in Table 1) based on travel purposes, since travel purposes between two sources are not identical, and calculated the estimated reduction in trips and travel distances in Riyadh.

**Table 1.** Definition of RCRC's and Google's purposes.

RCRC purposes <sup>a</sup>	Redefining ADA travel purposes	Redefining Google report percentages	Google report percentages	Google travel purposes <sup>b</sup>
Saudi HB work	Work	-45%	-45%	Workplaces
Saudi HB school sec	School	-100%	n.a.	n.a.
Saudi HB school post sec			n.a.	n.a.
Saudi HB shopping	Shopping	- 24%	-24%	Grocery and pharmacy
Saudi HB other	Other	-59% <sup>c</sup>	-49%	Parks
Saudi non-HB			-75%	Transit stations
Non-Saudi male			-54%	Retail and recreation
Non-Saudi female				

Note: HB = home-based; ADA = Arriyadh Development Authority; sec = secondary.

<sup>a</sup> RCRC developed the traffic model for eight groups, six of which include Saudis (home-based work, home-based secondary school, home-based post-secondary school, home-based shopping, home-based other and non-home-based), and two of which are for non-Saudis (male and female). Here, home-based means that a trip either originated or ended at home (an example of non-home-based is going shopping from work).

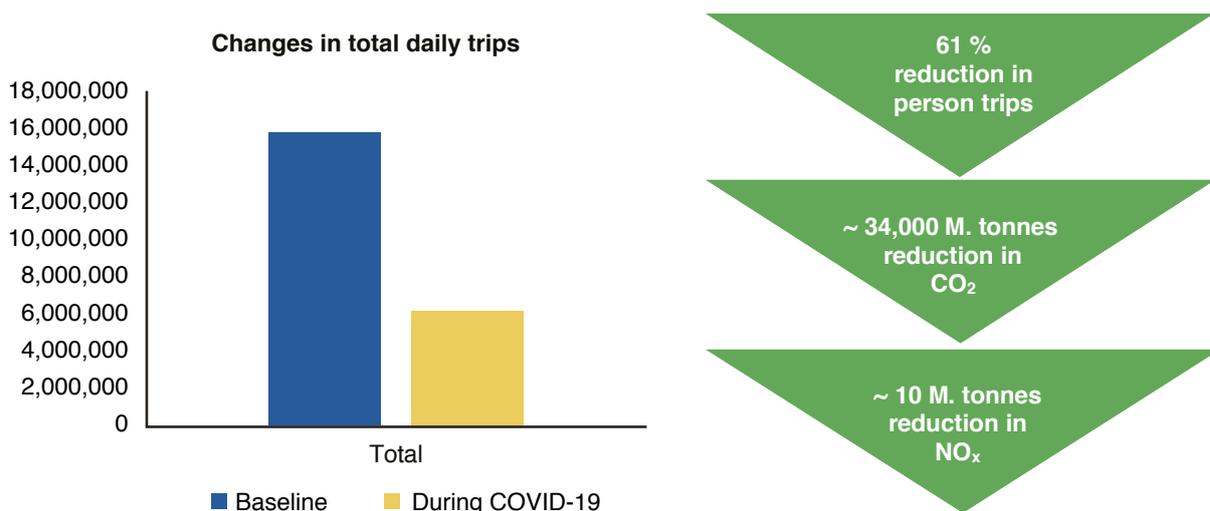
<sup>b</sup> There is one additional travel purpose in Google (residential at + 23%).

<sup>c</sup> Percentage based on the average of multiple travel purposes (parks, transit and retail and recreation).

Based on this method, we calculated the impact of COVID-19 on transport and mobility in Riyadh. Our focus is on the changes in road traffic emissions in Riyadh. We did not consider indirect impacts on emissions due to mobility reductions. The reduction in mobility might have a significant indirect impact on emissions in other sectors, such as changes in household electricity consumption, changes in emissions from power and other industries.

We present the results in Figures 1 and 2. The Google report represents a sample that is not meant to be representative of Riyadh as a whole. It represents the segment of the population that use smart phones and Google apps. In general, it represents a segment of the population with a certain level of income, which would also mean that these people are likely to have jobs. Therefore, we might expect a sample bias where work and shopping trips are overrepresented. However, Google users represent a diversity of income groups, and any deviation in the data they produce from the reality on the ground is expected to be less than from other sources.

**Figure 1.** Changes in total daily trips and their implications.



Sources: Author’s analysis based on RCRC data, KAPSARC (2020); Google (2020).

In Riyadh, most government offices were closed, school attendance was suspended, and other necessities, including medical necessities and grocery shopping, were restricted to emergencies. In turn, mobility was significantly reduced.

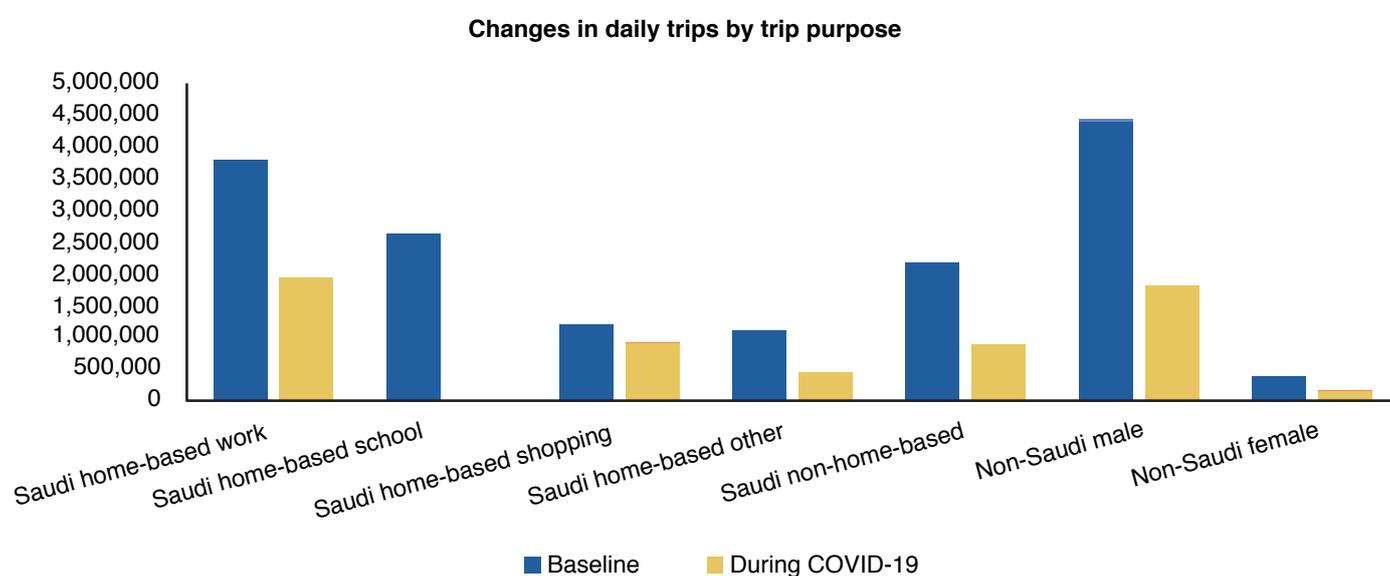
- We estimate that about 61% of trips were reduced compared with the 2016 baseline.

This closure and restriction of activities affected economic growth and mobility in Riyadh. This will, in turn, have caused a substantial reduction in fuel demand, with a substantial environmental impact.

The transport sector accounts for more than 20% of global carbon emissions. These emissions are likely to have fallen as governments implemented cautionary measures, including social distancing, curfews, and remote engagements via video conferencing, among other technologies.

- Based on this analysis, we estimate a global reduction of 34,000 metric tonnes of carbon dioxide (CO<sub>2</sub>) (EPA 2020).
- We may also expect a reduction of 100 metric tonnes of nitrogen oxide (NO<sub>x</sub>) (Transport and Environment 2015).

**Figure 2.** Changes in daily trips by trip purpose.



Sources: Author’s analysis based on RCRC data, KAPSARC (2020); Google (2020).

One positive outcome of the restrictions has been that remote work has transformed the efficiency of the working environment. People have become more accustomed to remote work and may appreciate spending more time with their families. Based on this analysis, if 20% of the working population in Riyadh starts working from home one day per week, it would mean a 4% reduction in car journeys from home to work. This would also mean an equivalent reduction of

- 635 metric tonnes of CO<sub>2</sub> (EPA 2020) and
- 0.2 metric tonnes of NO<sub>x</sub> (Transport and Environment 2015).

Although restrictions on movement can be positive from an environmental perspective, it is not desirable economically. Furthermore, a lockdown may affect the physical and mental well-being of people, restricting exercise, social gatherings, etc. Nonetheless, the crisis placed global cities in a challenging situation and demanded a sustainable and efficient solution to urban mobility. To cope with the pandemic, cities must be

able to perform and adapt during lockdown. For this, we need e-commerce to provide a substantial amount of commercial activities, and neighborhoods where people can access their daily necessities within walking distance.

People need to go shopping for groceries and basic supplies even during lockdowns. However, a sparse distribution of such trips would mean traveling longer distances, which would not only require car travel but also a violation of lockdown, since people would need to move between zones/neighborhoods. A high-density urban development can help reduce car journeys and confine movement to within a limited area. This would help to achieve environmental benefits and enable communities to be prepared for future pandemics without restricting the necessary movement of people but maintaining social distancing measures.

In the crisis, we became more reliant on e-commerce, home deliveries, teleworking, online schooling, and social media. Sound infrastructure is needed to support such increased demand for digital platforms. Although e-commerce is well established in Saudi Arabia, the option of working from home is the exception rather than the norm. Obviously many jobs require workers to be physically present, but working from home would reduce unnecessary gatherings of people at certain places.

COVID-19 is an unprecedented event, and life after is likely to change. We are looking at a new normal. In Riyadh, we often see a sparse distribution of services with large shopping malls and big hospitals serving the city rather than diversified services within neighborhoods. The COVID-19 crisis presents an opportunity to think about these options and to capitalize on the advantages they could confer.

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