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# **The Impact of COVID-19 on the Transportation Ecosystem:** **An International Perspective on Mobility Trends**

Since the World Health Organization formally declared the coronavirus pandemic on March 11, 2020, nations, regions and localities responded with a variety of government-ordered measures to “stop the spread” of COVID-19. As a result, there has been an unprecedented economic slowdown that has traced the path of the COVID-19 cases across the globe, which now stands at 8.6 million cases reported in 213 countries and territories, and 461,000 deaths recorded worldwide as of June 19, 2020. The transportation industry – with very few exceptions – has experienced unparalleled effects as a result of the work-from-home orders, cancellation of events, closure of schools, and restrictions on travel. In this article, I will review the government actions taken and the impact of the COVID-19 pandemic on the transportation network ridership for all modes. As we follow the easing of the government restrictions, there are new policies being implemented to allow for the “new normal” of reopening with continued concerns about the spread of COVID-19. Some of these changes may be temporary, but there are clear indicators I will address of what the future holds for transportation providers for the remainder of 2020 and beyond.

## **The Mobility Impacts of Pandemic Related Policies**

### ***Travel Bans, Stay-at-Home Order & Social Distancing***

Beginning with President Trump’s order to limit travel from China on January 31, 2020, and the subsequent orders to restrict travel to the United States from new “hot spots” in Europe (on March 13, 2020) and Brazil (on May 26, 2020), government officials have taken unprecedented steps in 2020 to address the new threat from COVID-19 and to minimize the spread of the coronavirus – especially as public health officials were issuing predictions of the numbers of potential fatalities if preventative steps were not taken. After the initial lockdown of Wuhan in China, similar measures were followed in late February and early March 2020 in Italy, South Korea, and Iran as the international spread of the coronavirus was tracked. The government mandates include the shutdown of commerce and schools with travel restrictions and stay-at-home orders. By early March, the documented cases in Washington State and California led to public officials ordering similar measures. With President Trump’s national declaration of an emergency on March 13, 2020, all states acted over the following weeks to lockdown their populations and to enact some version of a “pause” on economic and social activities. The vast majority of the 213 nations and territories with COVID-19 cases have instituted some form of lockdown.

With the concept of “social distancing” added to the vocabulary of billions of people across the globe, government officials then enacted steps to best ensure the minimization of social contact. Orders to “stay-at-home” became “work-from-home” for office workers; schools were closed; sports and large events were canceled, and tourism instantly evaporated. In the United States, many governors exempted taxis and for-hire vehicles from the lockdowns because their work was deemed “essential” as a service. Louisiana was a notable exception. Although for-hire service continued in New York City, Mayor Bill de Blasio ordered the cessation of shared rides to promote social distancing. The NYC Taxi and Limousine Commission and other regulators took steps to encourage the use of partitions, including relaxing restrictions on the partition

requirements. Even though public transit continued to operate and for hire ground transportation was technically still operating, the effects on the various modes of transportation were swift and remarkable.

### ***Mobility Trends: Ridership Reductions & Modal Shift***

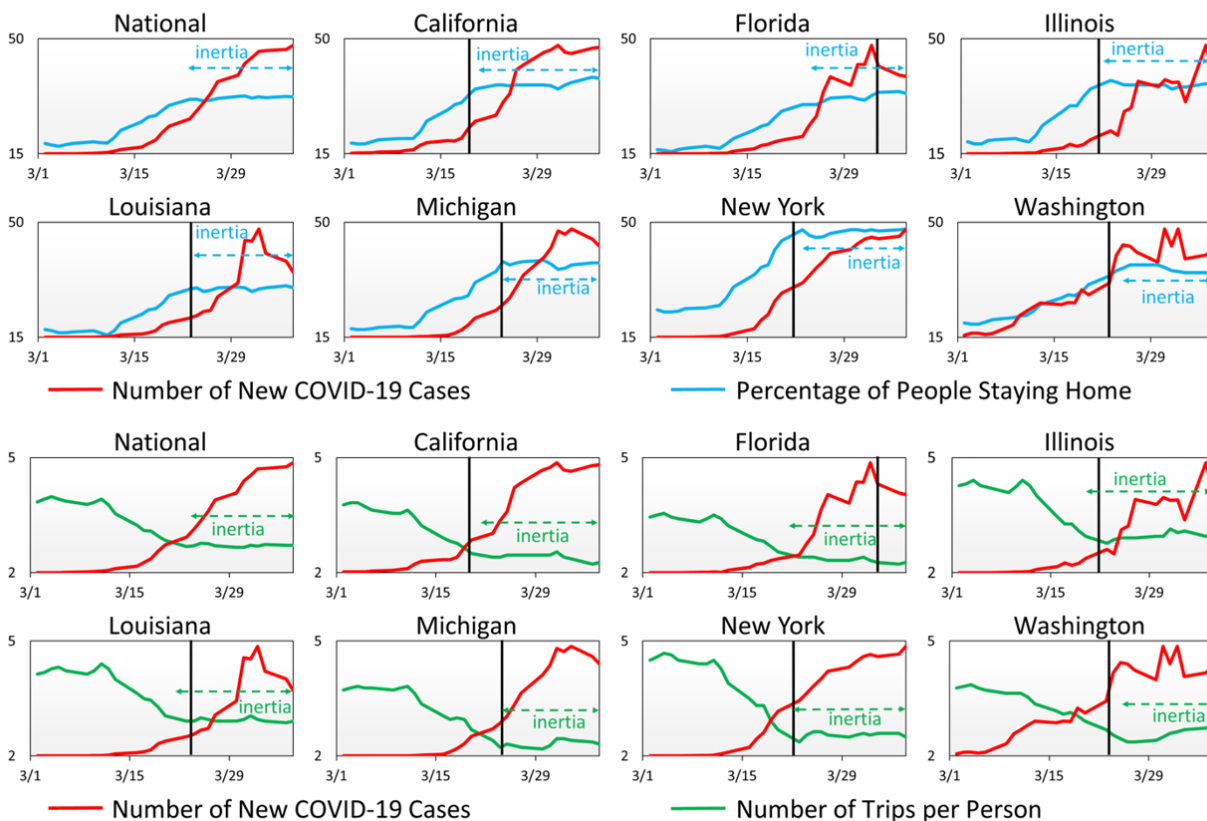
As soon as COVID-19 cases first began to appear in significant numbers in a state or county (i.e., early to mid-March), social distancing measures were quickly adopted without mandatory government orders. According to data from the Maryland Transportation Institute, at the onset of COVID-19, the percentage of people staying home nationwide rapidly increased from 20% to 35% in the week of March 15, but then stagnated at 35% for three weeks as of April 10 (see diagram below). But did transportation behaviors change during this period?



### **Impact of Stay-at-Home Orders on Mobility Behavior**

March 1~April 9 data from: [data.covid.umd.edu](https://data.covid.umd.edu)

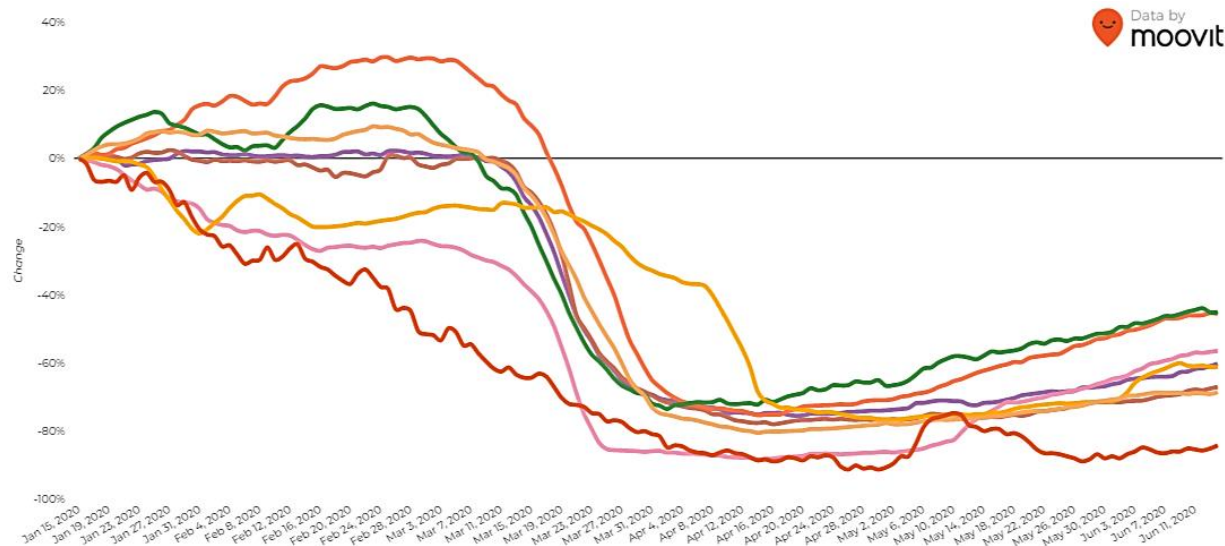
Black lines indicate dates of statewide stay-at-home orders. Vertical axes on the left show ranges of %staying home (15~50) and #trips/person (2~5). #COVID-19 cases across states have different ranges.



**Public Transit.** Around the world, public transit systems experienced a near-collapse in ridership since the outbreak of the pandemic. This is only logical, in light of fear over the risk of infection on crowded trains and buses. A study conducted by MIT concluded that New York City subways and buses were a “major disseminator” of the coronavirus.<sup>1</sup> By April 15, ridership in major cities around the world were down by 70-90% from pre-crisis levels (see the chart below). The

<sup>1</sup> [https://web.mit.edu/jeffrey/harris/HarrisJE\\_WP2\\_COVID19\\_NYC\\_13-Apr-2020.pdf](https://web.mit.edu/jeffrey/harris/HarrisJE_WP2_COVID19_NYC_13-Apr-2020.pdf)

precipitous drop in fare revenue is further exacerbated by the lack of funding streams and the fact that mass transit will not rebound nearly as fast as other modes of transportation.



Apr 15, 2020

- NYC, New York - New Jersey: **-74.8%**
- Toronto, ON: **-77.5%**
- Sydney & NSW: **-75.3%**
- Paris: **-88.3%**
- Berlin/Brandenburg: **-70.9%**
- Singapore: **-71.1%**
- London and South East: **-80.3%**
- Tokyo: **-88.4%**

**Driving.** With at least one-half of the world population under some form of lockdown by early March, traffic congestion and collisions plummeted in most cities. The vehicle miles traveled (“VMT”) in most coastal cities by March 2020 were reduced significantly compared to the average VMT of January 2020.<sup>2</sup> New York City reported drastic reductions in traffic crashes by the end of March 2020.<sup>3</sup>

**Taxicabs.** In New York City, ridership plunged by 94% from the first week of March to the week of May 4.<sup>4</sup> Afraid of contracting the virus (sadly, at least 50 drivers have died from the virus), roughly 83% of drivers have stopped working altogether. In the UK, some taxi drivers said they

<sup>2</sup> <https://www.streetlightdata.com/VMT-monitor-by-county/#emergency-map-response>

<sup>3</sup> <http://c2smart.engineering.nyu.edu/covid-19-dashboard/>

<sup>4</sup> <https://time.com/5836223/nyc-taxi-drivers-coronavirus/?eid=EAAAAApABkHLF5DmYHhW1gVx2FL%2BUoV%2Bzm7TxjBV8fC9QReFis8o8eVrPFJUG6aSgY4leg%3D%3D&ecf34Msi=1171&emi8s9Kj=608>

had cut their working hours by more than half while others had given up work altogether.<sup>5</sup> In Sydney, Australia more than half of the city's 5,572 cabs deregistered.<sup>6</sup>

**For-Hire and Executive Sedans:** Similar to taxis, ride-hailing services (Uber, Didi, Ola etc.), ridesharing (Via) were also affected adversely. Uber's ridership was down 70%,<sup>7</sup> along with other app-based services such as Bolt, Careem,<sup>8</sup> Ola and Grab.<sup>9</sup> As movement becomes restricted, ride-hailing services were asked to pause pooling for social distancing reasons. With work-from home restrictions and business travel and tourism eviscerated, the reductions in ridership for the traditional for-hire industry neared 90% or more.<sup>10</sup>

**Bus and Motorcoach:** Due to school closures, school bus transportation providers effectively stopped working. Most charter and tour companies closed their doors, commuter operations mostly stopped running, and scheduled service operations were operating at approximately 15% of capacity. The industry experienced a fallout between 80% to 90% of cancelled trips and very few future bookings.<sup>11</sup>

**Rentals:** As a result of the rapid decline in air travel and tourism, car rental companies reported immediate reductions in business upon the lockdowns being initiated. The major companies reported business operations immediately reduced by more than one-third in mid-March, and that loss deepened depending on the extent of the lockdown.<sup>12</sup>

**Micromobility:** In the early part of April 2020, e-scooters such as Bird, JUMP, and Lime were suspended in numerous jurisdictions across the globe as the fight against the novel coronavirus spread.<sup>13</sup> In Atlanta, for example, the dockless vehicle industry was not deemed as an essential business.<sup>14</sup>

**Biking.** In New York City, Citi Bike saw a 67% surge in demand in early March compared to last year.<sup>15</sup> Around the world, London, Milan, Berlin, and many other major cities have seen ridership

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<sup>5</sup> <https://www.bbc.com/news/uk-england-52490083>

<sup>6</sup>

[https://www.theaustralian.com.au/subscribe/news/1/?sourceCode=TAWEB\\_WRE170\\_a&dest=https%3A%2F%2Fwww.theaustralian.com.au%2Fnation%2Fcoronavirus-no-idle-threat-as-cabbies-in-decimated-taxi-industry-return-plates%2Fnews-story%2F5e359d5e047674789d09de2b4bc507c5&memtype=anonymous&mode=premium&nk=be62ad28a6e2b7330644ac804f1a1a13-1592253611](https://www.theaustralian.com.au/subscribe/news/1/?sourceCode=TAWEB_WRE170_a&dest=https%3A%2F%2Fwww.theaustralian.com.au%2Fnation%2Fcoronavirus-no-idle-threat-as-cabbies-in-decimated-taxi-industry-return-plates%2Fnews-story%2F5e359d5e047674789d09de2b4bc507c5&memtype=anonymous&mode=premium&nk=be62ad28a6e2b7330644ac804f1a1a13-1592253611)

<sup>7</sup> <https://www.theverge.com/2020/3/19/21186865/uber-rides-decline-coronavirus-seattle-sf-la-nyc>

<sup>8</sup> <https://www.bloomberg.com/news/articles/2020-06-09/uber-s-middle-east-unit-careem-sees-recovery-after-80-slump>

<sup>9</sup> <https://www.newsmax.com/us/electricscooters-coronavirus/2020/03/20/id/959307/>

<sup>10</sup>

<https://wydaily.com/local-news/2020/04/28/these-limo-businesses-have-been-hit-hard-by-the-coronavirus-heres-how-theyre-adapting/>

<sup>11</sup>

<https://www.metro-magazine.com/10112747/as-covid-19-lingers-motorcoach-industry-seeing-devastating-losses-report>

<sup>12</sup> <https://www.forbes.com/sites/michaelgoldstein/2020/04/24/covid-19-creates-massive-layoffs-stock-drop-for-hertz-car-rental/#1e768695148c>

<sup>13</sup> <https://atlanta.curbed.com/2020/4/7/21210071/coronavirus-atlanta-e-scooter-dockless-covid-19-mobility>

<sup>14</sup> <https://www.govtech.com/fs/transportation/Companies-Pull-Scooters-from-Atlanta-After-City-Order.html>

<sup>15</sup> <https://www.nytimes.com/2020/03/14/nyregion/coronavirus-nyc-bike-commute.html>

increases.<sup>16</sup> According to data reported for March 2020 – the period of time that the economic and travel shutdown was announced and then took effect – sales of basic adult bikes were up 121% in the U.S.<sup>17</sup>

## **The Reopening: Policy & Mobility Impacts**

### ***What New Policies and Requirements Have Been Put in Place?***

As of early June, all 50 states and the District of Columbia have entered into some phase of reopening. This had already begun to happen in those parts of the globe that “flattened the curve” like Europe, Asia, and Australia. The reopening has resulted in government regulators issuing guidance and requirements that provide a keen idea of what the “new normal” will be now and in the short-term. For public and private transportation providers, social distancing is critical. Even though New York City enters Phase 2 of its reopening on Monday, June 22, shared rides remain prohibited. As another example, the U.S. Centers for Disease Control and Prevention (the CDC) issued a set of recommendations that detailed a plan for reopening America, and recommended that schools create distance between children on school buses (e.g., seat children one child per row, skip rows) when possible.

The Equal Employment Opportunity Commission (the “EEOC”) recently expanded guidance and is recommending that employers have a “Return to Work Safety Plan” (the “Plan”) to address a whole host of issues related to COVID-19 which includes policies and procedures to ensure social distancing, promote hygiene, mandate the availability, distribution and use of personal protective equipment (“PPE”), provide for employee screening before leaving for work and upon arriving at the workplace, and ensure contact tracing. CDC has also recommended the use of approved cleaning products from “List N” of the U.S. Environmental Protection Agency. The U.S. Department of Labor’s Occupational Safety and Health Administration (“OSHA”) has also issued guidance for rideshare, taxi and for-hire workers, which includes recommendations that there should be limits on the number of passengers transported at a single time, and the installation of plexiglass partitions between driver and passenger compartments when possible.

Failing to implement such a Plan and enforcing OSHA and public health requirements can lead to administrative actions and litigation. On May 19, 2020, OSHA announced it is increasing in-person inspections at all types of workplaces, and that OSHA staff will continue to prioritize COVID-19 inspections, and will utilize all enforcement tools.

### ***Re-Opening Mobility Trends***

As cities around the world are easing lockdown measures, traffic on roads and highways has begun to return to normal. Mobility data from Apple Maps, based on requests for directions/routes from several OECD countries, supports this conclusion. As shown in the charts below, the recovery of public transit is trailing behind driving, particularly in North America and

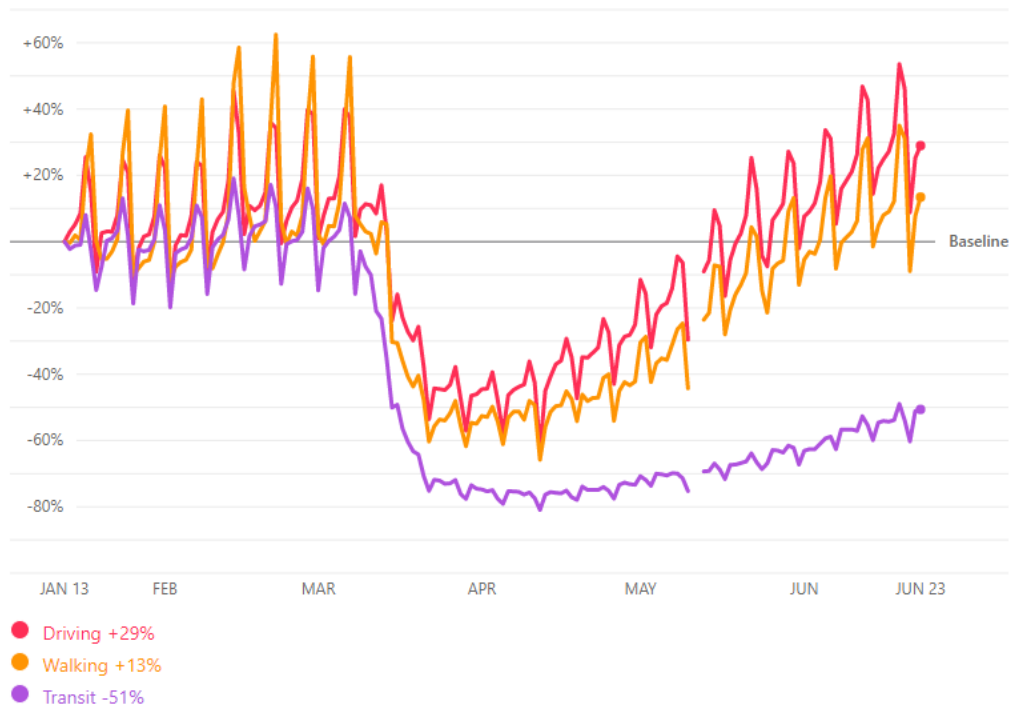
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<sup>16</sup> <https://www.forbes.com/sites/billroberston/2020/05/29/bike-sales-get-a-big-boost-in-perfect-storm-of-demand-covid-19-recovery-and-ebike-maturity/#b464ab4f9195>

<sup>17</sup> <https://www.npd.com/wps/portal/npd/us/news/press-releases/2020/sporting-goods-home-fitness-and-cycling-sales-surge-in-the-us-reports-the-npd-group/>

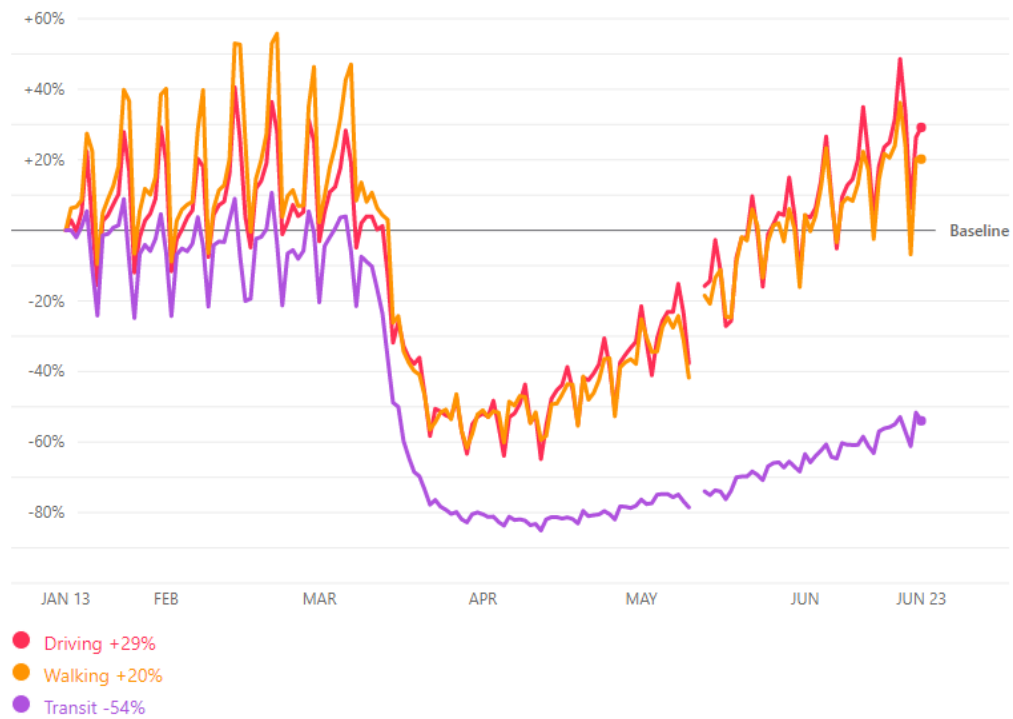
the UK. In Sweden, the amount of driving seems to have surpassed pre-pandemic level by leaps and bounds. All told, in early June, daily global emissions were only 5% below 2019 levels, compared to a reduction of 17% in April.<sup>18</sup>

#### Mobility Trends in United States

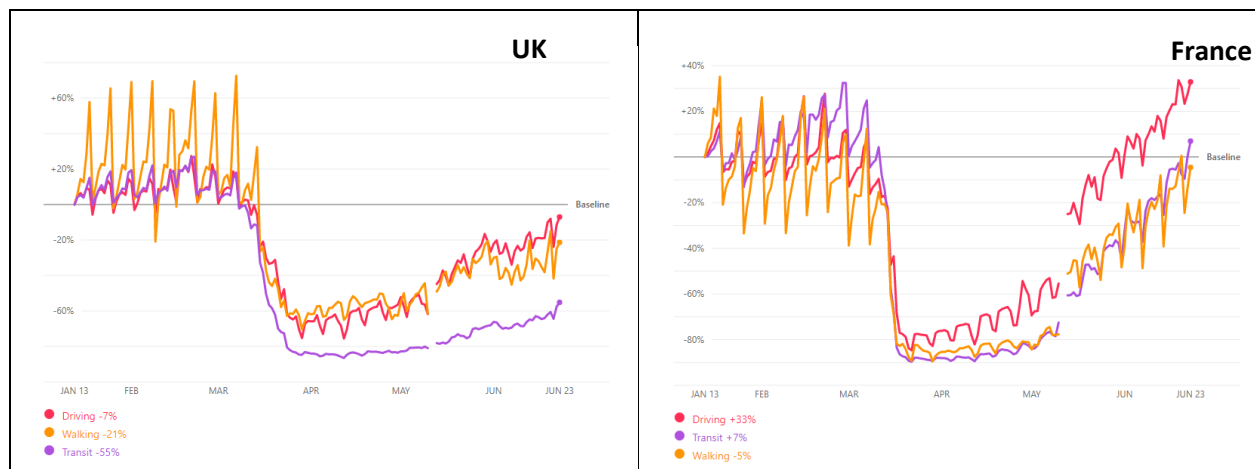


#### Mobility Trends in Canada

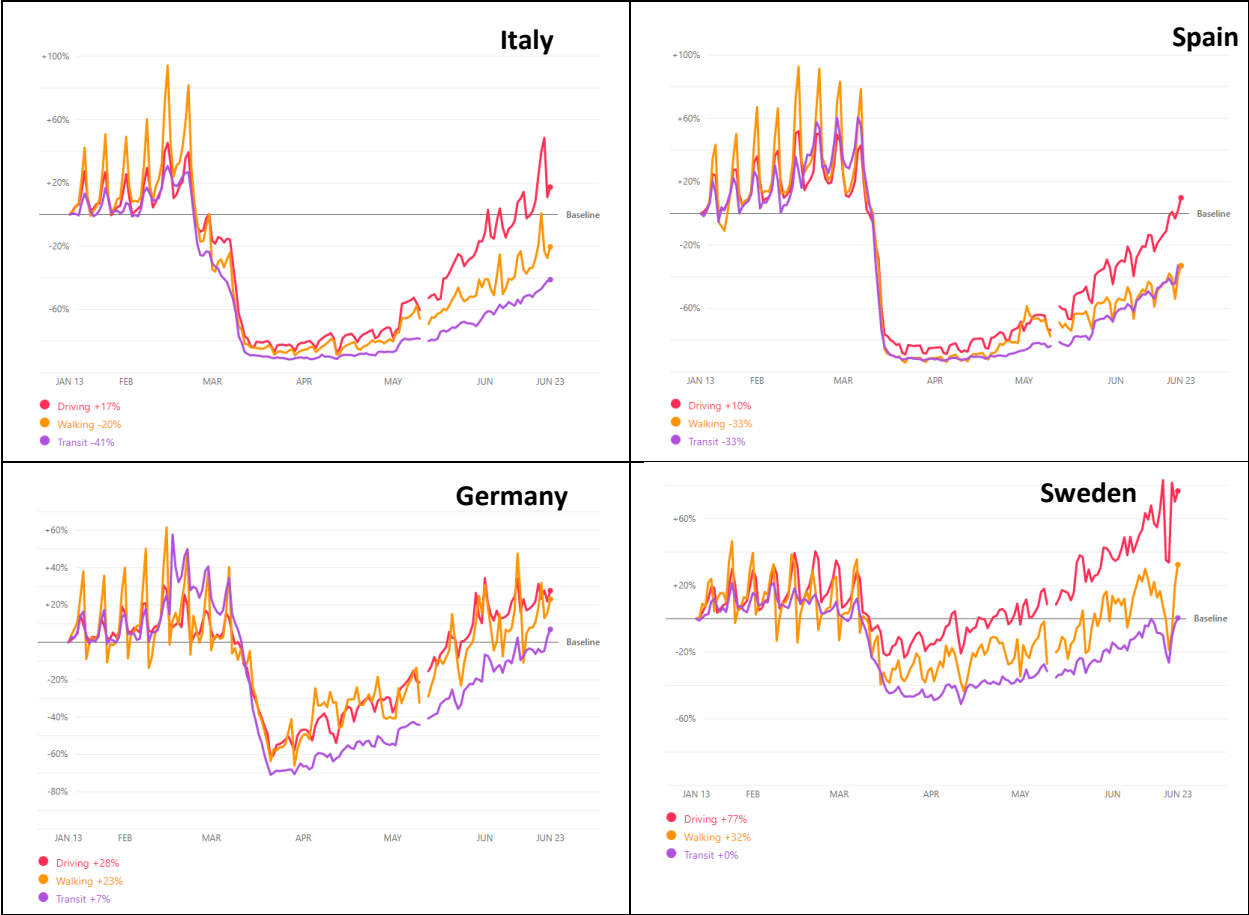
<sup>18</sup> <https://www.scientificamerican.com/article/carbon-levels-surge-again-as-countries-emerge-from-lockdown/>



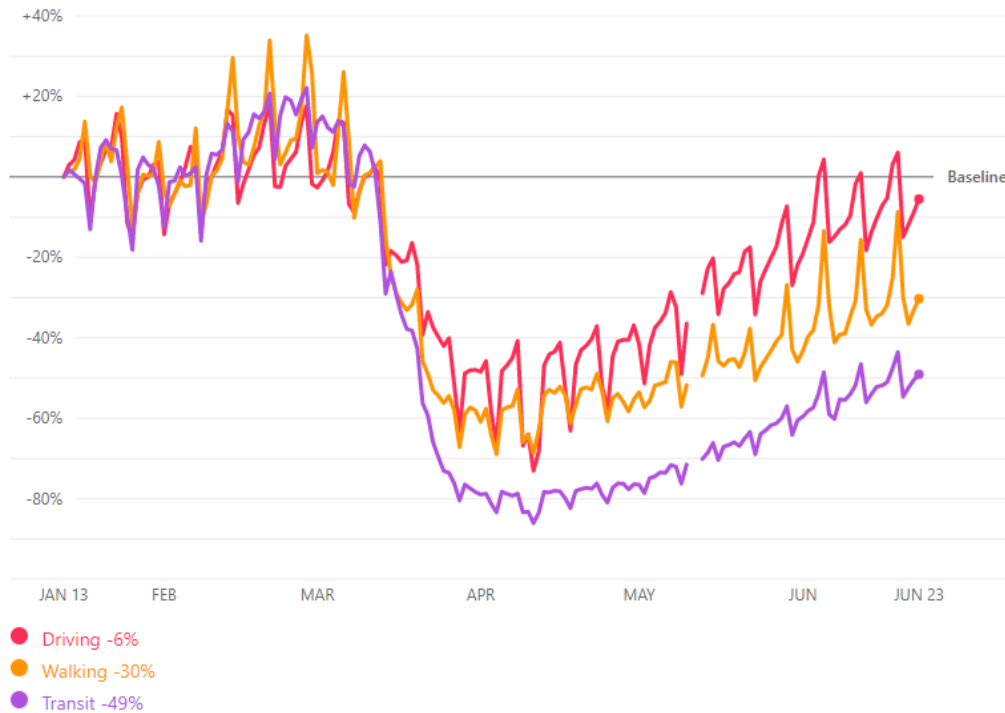
## Mobility Trends in Europe







Mobility Trends in Australia



Source: Apple Maps

Will driving increase dramatically as a result of the pandemic? According to a recent poll, 31.5% of New Yorkers plan to use transit less by walking, biking, or driving when the lockdown is lifted.<sup>19</sup> A survey conducted by the University of Toronto of more than 2,700 Toronto Transit Commission riders revealed 87% of respondents say they do not plan on using public transit until a COVID-19 vaccine is made available.<sup>20</sup> Additionally, a survey by Sydney University found 84% of respondents considered car travel their most comfortable option, with 42% finding buses the least comfortable, followed by trains at 33%.<sup>21</sup> In another survey, Australians would prefer to suffer through traffic jams during their daily office commute than risk catching or spreading COVID-19 on public transport.<sup>22</sup> More recently, researchers at Vanderbilt University predict a sweeping modal shift to single-occupancy vehicle commuting, resulting in the risk of extreme traffic in large metro areas.<sup>23</sup> As London cautiously reopens, a poll finds 70% of surveyed Londoners are anxious about commuting via public transit.<sup>24</sup>

<sup>19</sup> <https://elucd.com/covid19/new-york>

<sup>20</sup> <https://uttri.utoronto.ca/files/2020/05/Preliminary-Report-on-the-Public-Transit-and.pdf>

<sup>21</sup> <https://7news.com.au/news/transport/traffic-jams-may-be-worse-than-pre-virus-c-1035951>

<sup>22</sup> <https://www.afr.com/politics/federal/traffic-jams-better-than-public-transport-afr-reader-poll-20200524-p54vvd>

<sup>23</sup> <https://news.vanderbilt.edu/2020/06/05/transportation-lab-predicts-extreme-traffic-for-some-cities-following-covid-19/>

<sup>24</sup> <https://www.citylab.com/transportation/2020/06/public-transit-coronavirus-risk-london-tube-bus-commute/612988/>

Over the past few months, tens of millions of workers have been forced into telecommuting. In the U.S., big tech companies such as Facebook, Google, and Microsoft plan to continue major work-from-home strategies well into 2021.<sup>25</sup> Some companies such as Twitter and Square are allowing their employees to work from home permanently.<sup>26</sup> In a May 2020 working paper from M.I.T., survey results indicate that 50% of those who were employed before the pandemic are now working remotely; this is a significant increase from the 15% who reported working remotely in the days before the pandemic, and 5.3% working remotely in 2018.<sup>27</sup> Telecommuting might remain the norm for many industries that can function that way. Post crisis, few may want to return to the commute grind if they don't have to, be it on the subway or highway.

Researchers at the University Transportation Research Center (“UTRC”) at The City College of New York have observed a shift towards bicycle sharing systems and non-mass transit options in New York City. Prior to the reopening of the city, a short-term shift in mobility patterns seems to have emerged, including:

- A decrease in shared modes such as public transit and trains;
- An increase in non-shared modes of travel such as private cars and bicycle sharing systems;
- An increase in freight volume due to online shopping; and
- A reduction in travel due to stay-at-home orders.

#### Summary of Transportation Trends across Modes in NYC

Mode	Percent Change in May (or April) from 2019 to 2020
Subway	(-)90% ridership
Bus	(-)70% ridership
Metro North	(-)94% ridership
LIRR	(-)94% ridership
PATH	(-)95% ridership from Feb to April
Traffic	+26-100% average speed
Taxi	(-)91% trips (from March)
Bike	(-)69% ridership, +23% longer trips ridership (April)
Environment	(-)38.6% NO2 AQI. (-)53.7% CO AQI (from March) -38% PM2.5 AQI (from April)

Source: [UTRC](#)

<sup>25</sup> <https://www.washingtonpost.com/technology/2020/05/18/facebook-google-work-from-home/>

<sup>26</sup> <https://www.cnet.com/news/twitter-ceo-jack-dorsey-extends-permanent-work-from-home-policy-to-square/>

<sup>27</sup> <https://www.brynjolfsson.com/remotework/>

## The Future of Transportation – Life Beyond the Pandemic

To make future predictions is always a risky proposition, but we can look at a number of historical incidents that similarly induced mass fear to make analogous predictions of potential changes to travel behaviors (Note: Superstorm Sandy isn't included since it was a singular event with no lasting impact expected). The first that comes to mind is September 11, 2001. The Bureau of Transportation Statistics analyzed the effects of that event on transportation patterns and found the following trends following 9/11:<sup>28</sup>

- There was a strong statistical relationship between the events of 9/11 and aviation and highway travel, but not rail travel;
- People switched from air travel to highway travel over the six-month period after 9/11;
- Highway travel dropped quickly immediately after 9/11 but then leveled off in the following four months; and
- Vehicle Miles Traveled dropped for one month in September 2001, but did not show any unexpected deviations in the 11 months between September 2001 and September 2002.

The other salient event that we can refer to is the 2003 Severe Acute Respiratory Syndrome (SARS) epidemic.<sup>29</sup> Based on figures from the World Tourism Organization (“WTO”), it reduced international passenger traffic by 2.6% in the first four months of 2003.<sup>30</sup> With respect to transit, 75% of respondents in five European and three Asian countries affected reported that they would avoid public transportation.<sup>31</sup> During the peak of the epidemic in March 2003, there was an immediate 50% decrease in daily ridership of Taiwan's underground transit system, but it rebounded to pre-SARS ridership levels within three months.<sup>32</sup>

All said, there are notable differences in considering the severity, impact and time period of 9/11, the 2003 SARS outbreak, and the current COVID-19 outbreak. Nonetheless, if these prior two events were to provide any hints on mobility trends in the aftermath of great catastrophes, it would be one of eventual recovery. That said, full, or even partial recovery is predicated on the ability of transportation providers to regain the trust and loyalty of riders who have shifted to alternative forms of transportation. In the aftermath of 9/11, policy changes in transit such as employee training, public awareness, and emergency preparedness helped increase public confidence and charted the recovery in ridership.<sup>33</sup> The other complication lies in the fact that most, if not all, transit agencies are currently strapped for cash due to the dramatic drop in fare revenues over the past few months.

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<sup>28</sup> [https://www.bts.gov/archive/publications/estimated\\_impacts\\_of\\_9\\_11\\_on\\_us\\_travel/executive\\_summary](https://www.bts.gov/archive/publications/estimated_impacts_of_9_11_on_us_travel/executive_summary)

<sup>29</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2857294/>

<sup>30</sup> World Tourism Organization. Prospects for international tourism getting steadily better. World Tourism Barometer 2003; 1:1–14.

<sup>31</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2857294/>

<sup>32</sup>

[https://www.researchgate.net/publication/260950137\\_How\\_Change\\_of\\_Public\\_Transportation\\_Usage\\_Reveals\\_Fear\\_of\\_the\\_SARS\\_Virus\\_in\\_a\\_City](https://www.researchgate.net/publication/260950137_How_Change_of_Public_Transportation_Usage_Reveals_Fear_of_the_SARS_Virus_in_a_City)

<sup>33</sup> <https://www.transportation.gov/testimony/security-america%E2%80%99s-transit-systems>

### *Expected Short-Term Modal Shifts*

When social distancing rules are relaxed and personal mobility resumes in the immediate months following the gradual re-opening of businesses, transportation can begin its return to pre-pandemic levels. Psychological factors such as fear and heightened perception of risks, along with societal factors such as political and economic forces may shape travel behavior. At this point, it is hard to speculate how long these factors may last into the future.

In the aftermath of significant ridership declines, transit agencies have seen a massive reduction in farebox and sales tax revenues. Their ability to rebound will be largely dependent on government funding to make up for lost revenue and sustain jobs. In the U.S., Congress has included \$25 billion for transit as part of the historic \$2 trillion stimulus package, but an estimate puts the annual loss of transit agencies at \$26 billion to \$40 billion due to lost fare revenue and additional coronavirus-related costs.<sup>34</sup>

If service is slow to rebound to pre-outbreak levels, the public may lose confidence in public transit systems. As a result, the use of personal vehicles, rental cars, taxis and for-hire vehicles may see a better rebound as commuters, tourists and travelers seek to travel in a manner that better ensures social distances. This could be especially true if additional health and safety measures like partitions, disinfecting of the vehicles, and use of PPE by the drivers is accepted by riders.

In addition, bikeshare and e-scooter use may grow in the same manner as the pre-pandemic, especially in the near future with the warmer summer weather in the northern hemisphere. As one example, New York City does not allow e-scooters to operate. However, in the wake of the pandemic, City Council Speaker Corey Johnson has indicated that he will be advancing legislation to allow for e-scooters for New Yorkers seeking to travel and maintain social distancing.

### *Potential Long-Term Modal Shifts & Business Impacts*

Systems need time and resources to return to pre-outbreak levels of service offerings, but some services may never fully rebound. For example, it remains to be seen whether drivers for the smartphone app ride-hailing services return to their profession. For taxicabs, executive sedans, and motorcoach operators, the reductions in worker commuting patterns, business travel and tourism will likely continue for some time. Lingering fears of shared transportation modes may direct people to other modes. Those who already own vehicles may begin to drive for local trips they would have otherwise taken on transit, or longer-distance trips for which they would have otherwise flown. The short-term modal shifts can lead to long-term changes in travel behavior. There have been positive externalities to the crisis such as reductions in traffic congestion, air pollution, and accidents. In the midst of this crisis, we may see renewed efforts to enact sustainable policies and strategies, but as business returns, pandemic fears could increase congestion and serve as a counter-balance to any such efforts. Below are some predictions for what could happen in many of the affected industries and travel modes.

**Black Cars, Luxury Limousines & Transportation Network Companies (TNCs):** There may be permanent shrinkage of the for-hire vehicle industry's demand and supply, which may

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<sup>34</sup> <https://transitcenter.org/estimated-financial-impact-of-covid-19-on-u-s-transit-agencies-26-38-billion-annually/>

precipitate an increase in bankruptcies, mergers and acquisitions, and the eventual right sizing of Transportation Network Companies (TNCs) – such as Uber and Lyft- that was already taking place due to driver unrest and pro-labor policies and legislation. First of all, TNCs already had much of the black car and limousine industry on the brink of financial ruin even before the pandemic. Telecommuting may have a permanent impact on business travel for luxury limousines and black cars, further compounding the damage. Also, corporate policies may encourage business travel by car for regional travel instead of airplane; and this trend could continue well beyond the pandemic if proven to be cost effective. Well financed and fewer companies will survive and service quality levels, safety and prices are likely to increase over the long haul.

**Taxicabs & Car Services (Liveries):** Taxicabs and local car services have been decimated for years by TNCs, yet, the advantageous pricing, customer neighborhood convenience of liveries, and the safe partition environment, will position these services well during the pandemic recovery. Taxicabs and liveries delivering packages and food may continue to do so, and taxicabs are well positioned to handle an expected increase in paratransit, non-emergency medical transport and/or wheelchair accessible service, an area of growth and increased reliance for outsourcing by public transit agencies. Taxicabs have also been used during the pandemic while the subways are being cleaned and it is likely this could continue in a subsidized initiative. Local community car services and taxicabs may see a resurgence that could be sustained long-term; especially if first and last mile public transit integration policies and partnerships proliferate during the pandemic recovery and become a way of life long afterwards. This latter development, of course, sets the stage for a more expeditious implementation of Mobility-as-a-Service multi-modal integrated apps and platforms.

**Micromobility:** Micromobility that encourages social distancing, such as e-scooters, e-moped sharing, bike sharing and electric bikes may find a post-outbreak economy hospitable for their business models. The legalization of some of these previously controversial modes is likely to be expedited, and pedicab usage for freight delivery and passenger travel could very well increase (with local passengers, not just tourists). Also, local transportation or traffic departments in urban environments are likely to set and push the pandemic recovery agenda to close off more streets to vehicles and reclaim streets for these new sustainable and socially distant modes. Of course, once streets are reimagined, policymakers will likely use this opportunity that they have been waiting for to attempt to destroy car culture in cities once and for all.

**Bus Industries:** The impact on the bus industry is likely to be permanent. For in-person educational instruction, the new social distancing requirements for school bus operators may lead to an increase in their fleet operations, as well as additional routes and buses given that school districts and private schools may implement staggered education schedules. The need for larger and more diverse school bus fleets is likely, with smaller vehicles and more buses (or more bus contractors per school district). A similar fate or change may take place with respect to Motorcoach commuting and travel. Personal car travel may replace intercity services permanently, if parking policies are not onerous, congestion pricing is not implemented, and public and private parking garages do not substantially raise rates. Also, tour bus operators may need to diversify their operations or expand the size of their fleets. All of these bus industries, like the black car and limousine industries, will face bankruptcies, mergers and acquisitions as the profitability of such operations was not exorbitant before the pandemic.

**Congestion Pricing:** In addition to the above predictions, I do believe that the increased congestion resulting from the short-term comeback, coupled with massive public transit agency deficits, will lead to the adoption of congestion pricing in most major cities, at least in the U.S. The existing MTA or congestions surcharges for taxicabs and for-hire vehicles in NYC will stay, and passenger cars and trucks will shortly follow, with other U.S. cities following NYC's lead.

**Vehicle Rental Industry:** The private car rental industry has been decimated during the pandemic, and its recovery will be slow, as short-term rentals may pick-up during the summer for domestic travel by non-car owners, and car sharing may receive somewhat of a resurgence. This gain will likely be offset by losses in air travel related rentals at airports, which will take a while to recover. The for-hire vehicle rental industry, companies that rent cars to Uber, Lyft and other drivers to engage in passenger and goods transport, was shut down during the pandemic, but is likely to grow significantly in the long-term as drivers cannot afford any longer to buy, lease or finance their own vehicles to work.

**Parking Garages:** The short-term car travel scenario will lead to a resurgence of parking lot or garage revenue, at least in urban environments, but not necessarily at airports. The competition for curb space that will be caused by short-term vehicle congestion, closed streets and other urban policies may lead not just to more garage usage, but the possibility such garages can be used to stage or park for-hire vehicles waiting to pick-up reserved passengers, or be a hub for e-scooters, e-bikes and e-mopeds, instead of the streets.

We are still in the midst of one of the most critical junctures of redefining transportation. This is rare moment for us to alter the mobility landscape and possibly make it more equitable, accessible, sustainable, and resilient. Even before the pandemic, our transportation system was already in transition, moving from privately-owned to on-demand/shared, from fossil fuel-powered to electric, and from disparate to integrated. Through the unexpected and global extent of the pandemic in 2020, we have a blank canvas to start all over again. The future does begin now. We can fix all the negative externalities of transportation by reducing congestion, pollution, and crashes, and establishing integrated services that are sustainable to operate and maintain. The timeline for innovation can now be sped-up. Transportation policy is at a fork in the road due to the pandemic, and public officials and private industry can choose the familiar path down the road of yesteryear with silo thinking, or the yellow brick road to the unknown, experimenting with different business models and multi-modal integration. I hope we take the road to Transportation Oz!