

DOCKETED	
Docket Number:	20-IEPR-02
Project Title:	Transportation
TN #:	235672
Document Title:	COVID-19, Commuting, and Clean Air A Look at Pandemic-Era Mobility and Transportation Emissions in California
Description:	COVID-19, Commuting, and Clean Air: A Look at Pandemic-Era Mobility and Transportation Emissions in California July 2020
Filer:	Raquel Kravitz
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	11/18/2020 11:17:15 AM
Docketed Date:	11/18/2020



Economy White Paper Series

COVID-19, Commuting, and Clean Air: A Look at Pandemic-Era Mobility and Transportation Emissions in California

July 2020



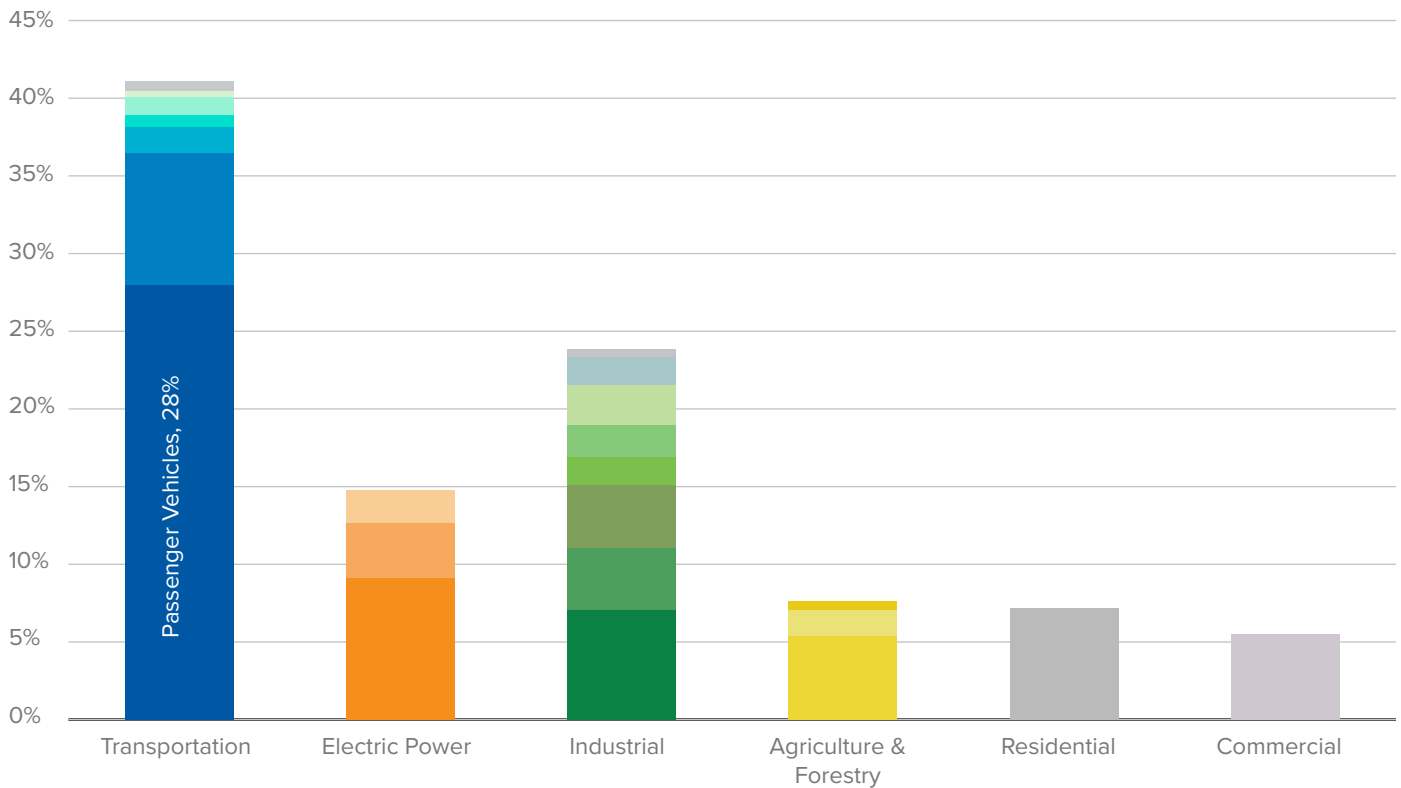
The coronavirus pandemic (COVID-19) has had a tremendous upending effect on the everyday lives of people worldwide. As part of that disruption, the workforce in California is experiencing an unprecedented shift in commuting, whether due to job loss or transitions to working remotely. As a result, there has been significantly less road traffic in the state.

In the long run, after the pandemic has diminished, jobs that require in-person contact, including most positions in the leisure and hospitality industry, will require workers to return to worksites. On the other hand, the rise in the number of people who are working from home, and the share of positions that will become permanently remote in industries such as professional services and administrative services, could lead to a sizable drop in motor vehicle fuel (e.g., gasoline) demand into the future. This has led to a perception that the pandemic is a boon to greenhouse gas reduction, at least in the short run. However, as demonstrated in this analysis, long term reductions will not likely result from the crisis, and that even after accounting for a sizable decrease in demand for oil, California will still not meet its climate change/GHG reduction goals based on the status quo.

ON-ROAD TRANSPORTATION: GREENHOUSE GAS EMISSIONS IN CALIFORNIA

The transportation sector has long been the largest greenhouse gas (GHG) emitting economic sector¹ in California, accounting for over 40% of total included emissions statewide.² In 2017, it overtook the electric power industry as the largest GHG emitting sector in the entire nation. In California, on-road passenger vehicles alone accounted for more than two-thirds of the transportation sector's GHG emission in 2017, making up 28% of the state's total included emissions.³ Figure 1 illustrates the dominance of passenger vehicles as by far the largest emitting subsector.⁴

Figure 1. On-Road Passenger Vehicle's Contribution to Greenhouse Gas in California



Source: California Air Resources Board, California Greenhouse Gas Inventory - by Sector and Activity; Analysis by UCR Center for Forecasting

¹ California Air Resources Board groups GHG emissions by either economic sector or by scoping plan categories. The other economic sectors are: Industrial, Commercial, Residential, Agriculture Electricity (Import), and Electricity (In-State).

² The GHG inventory was developed in accordance with the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories, the internationally recognized standard for developing national GHG inventories. There exist other categories besides included emissions: excluded emissions, carbon dioxide from biogenic materials, emissions and removals from forest lands and wood products, and other emissions. Excluded emissions are discussed elsewhere in this chapter.

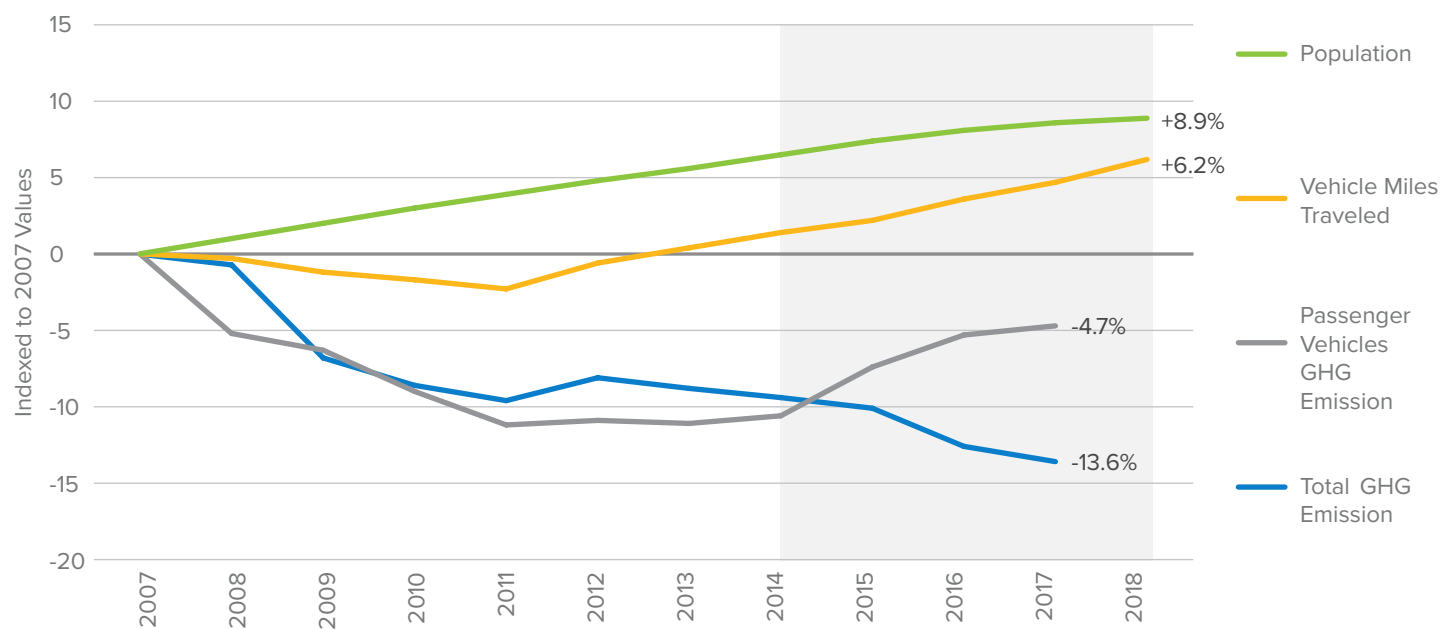
³ Based on California Air Resources Board 2017 GHG Inventory Data.

⁴ On-road passenger vehicles refer to light-duty vehicles: Passenger cars, motorcycles, and light-duty trucks and SUVs. On-road heavy-duty vehicles (heavy-duty trucks, buses, and motorhomes) contributed 35.8 MMTCO₂e in 2017.

In 2017, GHG emissions from on-road passenger vehicles totaled 118.7 million metric tons of carbon dioxide equivalent (MMTCO₂e).⁵ While this is about 5% lower than in 2007,⁶ GHG emissions from passenger vehicles have ticked up each year, consecutively, from 2014 to 2017. Over that same period, statewide GHG emissions have declined by 13.6%, primarily driven by the electric power sector, which has become much cleaner over time.

Figure 2. Changes in Greenhouse Gas Emission, Vehicle Miles Traveled, and Population

California, 2007-2018



Source: California Air Resources Board, California Greenhouse Gas Inventory - by Sector and Activity; California Department of Finance; U.S. Department of Transportation, Federal Highway Administration, Highway Statistics; Analysis by UCR Center for Forecasting

Despite the most recent uptick in emissions from on-road passenger vehicles, and despite a continuous rise in vehicle miles traveled, the overall decrease in GHG emissions from passenger vehicles is the result of California’s ambitious clean transportation policies. Still, GHG emissions from passenger vehicles are expected to rise again in 2018 and 2019 (data not yet available), clearly indicating that they are trending in the wrong direction. California must address this problem head on if the state intends to reach subsequent GHG reduction milestones.

The ongoing coronavirus pandemic has thrown an unexpected wrench into worker’s mobility and commute patterns and, subsequently, lowered GHG emissions. For those who are able, there has been a massive shift to remote work arrangements. In addition, with the health mandated lockdowns, many businesses deemed non-essential have been temporarily shuttered, and those workers furloughed or laid off. Both circumstances have led to a dramatic decline in commuting, and as a result, GHG emissions from passenger vehicles are expected to decline notably in 2020.

⁵ As of June 11, 2020, 2017 is the most recent year in which GHG inventory data is available. California Air Resources Board has not released GHG inventory data for 2018.

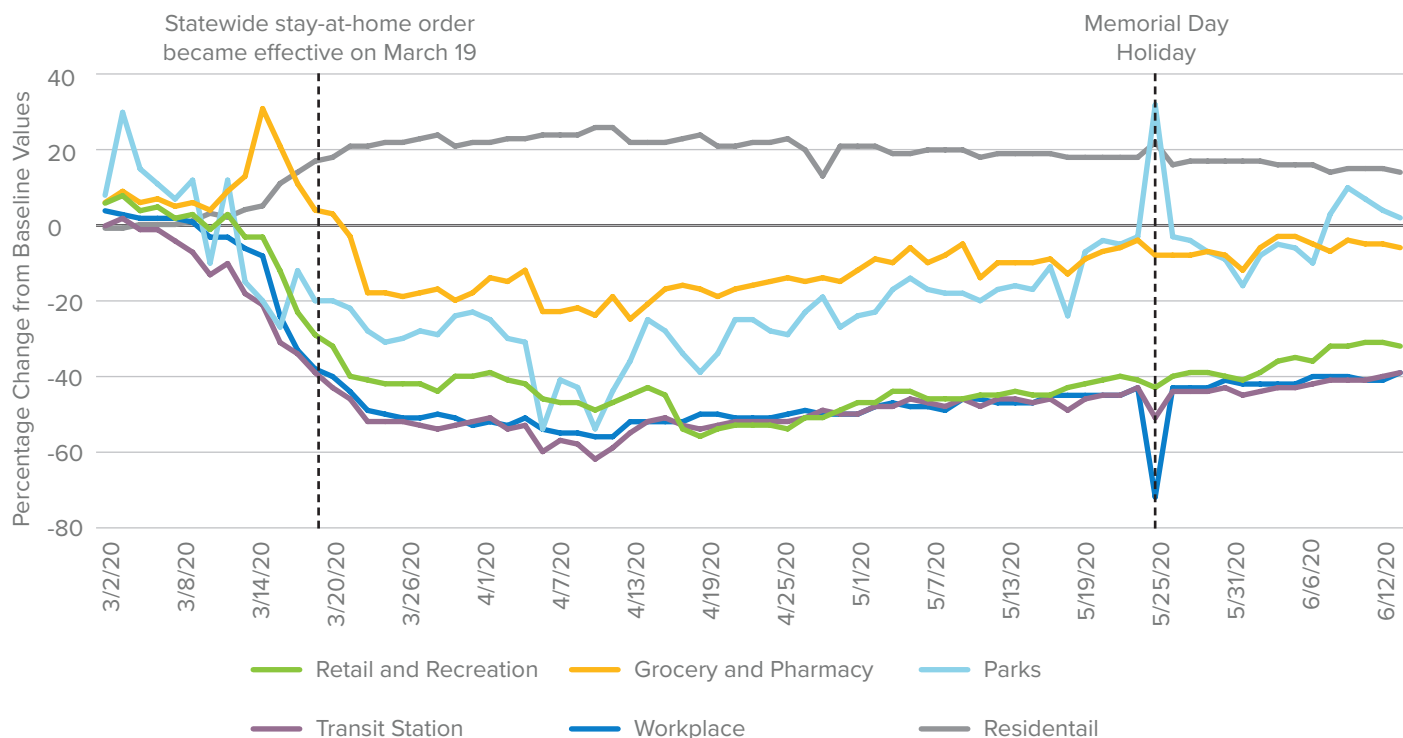
⁶ GHG emissions tend to decrease during the recession. The Great Recession started in December 2007.



MOBILITY PATTERNS BEFORE AND DURING COVID-19

Mobility experienced an unprecedented drop in March 2020 when the COVID-19 pandemic first began gripping Americans' daily lives. In California, the reduction in mobility bottomed out approximately during the week of April 5 to April 11, and has picked up modestly since then but at different rates across different sectors. Retail and recreation destinations, transit stations, and workplaces, have experienced only slight upticks. As of June 14, mobility to these destinations was still 30% to 40% below the median baseline observed from January 3 to February 6.

Figure 3. Weekday Mobility in California Before and During COVID-19



Source: Google's COVID-19 Community Mobility Reports; Analysis by UCR Center for Forecasting
 Note: The baseline value for each category is the median value, for the corresponding day of the week, during the 5-week period from Jan 3 to Feb 6, 2020.
 Note: This chart shows weekday statistics only, excluding Saturdays and Sundays.

There has been a reduction in mobility compared to baseline values across all categories, except residential, due to stay-at-home orders. Statewide, mobility to workplaces in California bottomed out during the week of April 5 to April 11, which is mostly true at the county level as well. ⁷

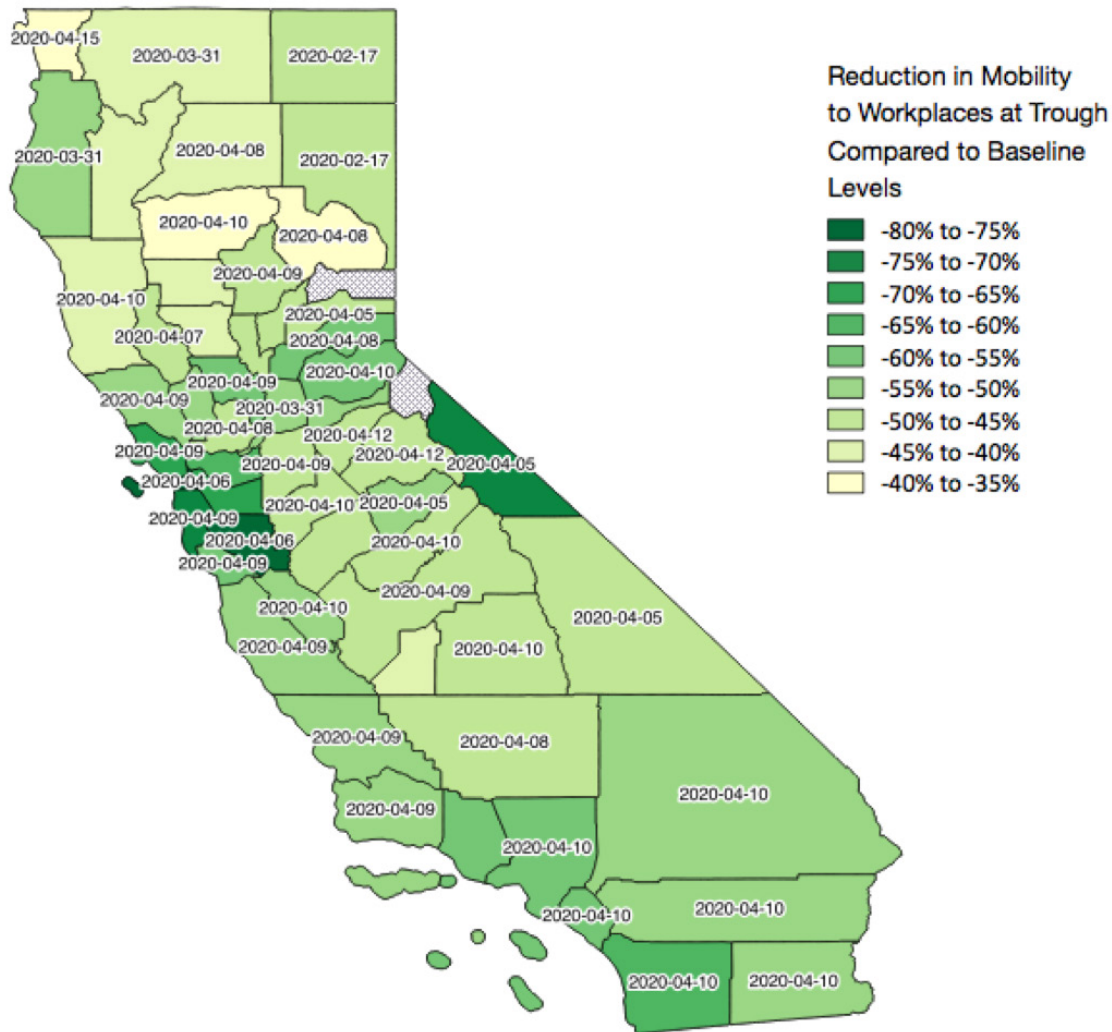
Note that this analysis focuses only on the travel-to-work aspect of the pandemic with respect to changes in future mobility and travel patterns. Residential mobility, which includes grocery and pharmacy destinations, has returned to pre-pandemic levels. People need to buy essential goods and services so it is not reasonable to expect a significant long run reduction in mobility to these destinations. Groceries, especially fresh vegetables, have a short shelf life and people need to take their medications on schedule and without delay. Additionally, although not considered essential, mobility to parks has also returned to pre-pandemic levels. In addition to humans being social creatures and craving outdoor activity, many of the health mandated closures and much of the social distancing guidance has allowed for outdoor activity as it is considered to be far safer.

Inherent human behavior regarding mobility to places that provide essential services, and to parks, implies that travel to these destinations will return to “business-as-usual” levels in the long run. On the other hand, people have a greater degree of control over their preferences regarding mobility to workplaces. That is, workers who can perform their jobs at home may prefer it for a variety of reasons, including a lack of commute. While others may prefer commuting to work for social interactions and other factors, it is realistic to expect overall mobility to workplaces to fall in the long term.



⁷ This excludes the Memorial Day Holiday (May 25, 2020), which observed by far the greatest reduction of mobility to workplaces for most counties except for Modoc County.

Figure 4. Reduction in Mobility to Workplaces at Trough Compared to Baseline Levels, by County



Source: Google’s COVID-19 Community Mobility Reports; Analysis by UCR Center for Forecasting
 Note: Data for Alpine County and Sierra County is insufficient and not included.

Compared to the baseline, pre-pandemic levels, San Francisco County (-78% on April 6, 2020), Santa Clara County (-75% on April 6, 2020), and Mono County (-73% on April 5, 2020) had the largest reduction in mobility to workplaces at trough. Statewide, mobility to workplaces bottomed out on April 10 with a 57% reduction compared to the baseline. Note that King County’s, Lassen County’s, and Modoc County’s largest reductions occurred on the President’s Day Holiday (February 17, 2020) before stay-at-home orders were declared statewide. These three counties observed the greatest reduction in mobility to workplaces in early April (-42%, -35%, and -40%, respectively) if excluding President’s Day and Memorial Day.



COMMUTING PATTERNS BEFORE AND DURING COVID-19

For the average American household, commuting is the largest component of the average annual vehicle miles traveled by trip purpose (see list in Figure 5). In 2017, commuting to and from work made up nearly 30% of the vehicle miles traveled, while social/recreation, the next largest category, made up almost one-quarter.

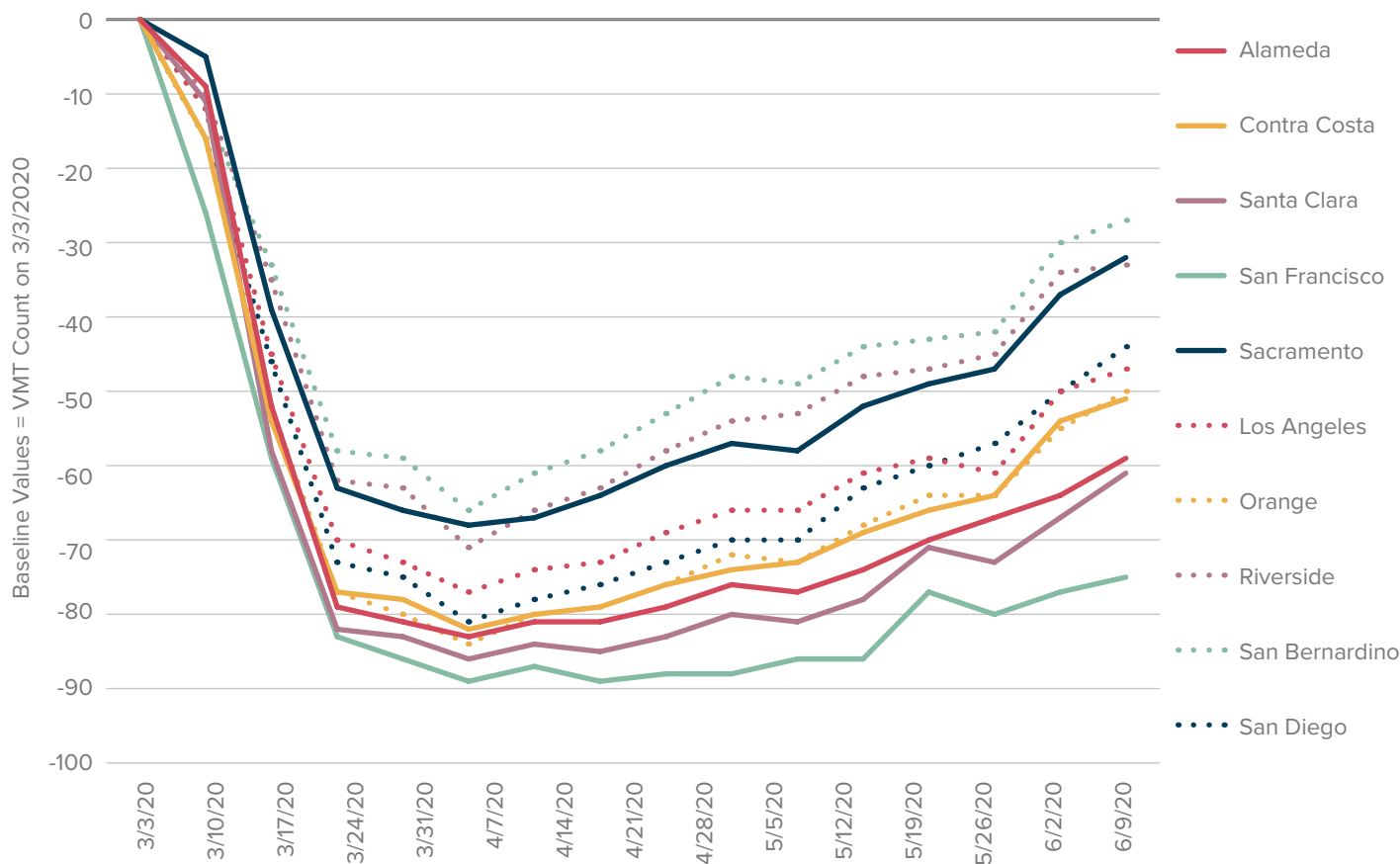
Figure 5. Trends in Average Annual Vehicle Miles Travelled, by Trip Purpose, per Household, United States, 2017

Trip Purpose	Annual VMT per Household	Percentage
To/From Work	5,773.9	29.4%
Social/Recreation	4,825.5	24.6%
Other Family/Personal Errands	3,325.2	16.9%
Shopping	2,919.9	14.9%
Other Purposes	2,797.3	14.2%
All Purposes	19,641.8	100.0%

Source: National Household Travel Survey (2017), Federal Highway Administration, U.S. Department of Transportation; Analysis by UCR Center for Forecasting
 Note: Based on 2017 adjusted figures

The overall reduction in mobility implies a reduction in vehicle miles traveled (VMT), since California, like the United States as a whole, is automobile-centric. From December 1, 2019 to March 31, 2020, total VMT declined by 30% to 40% in the Los Angeles/Ventura area as well as in the San Francisco Bay Area,⁸ and there was an even steeper reduction in early April. Based on a sampling of VMT trends on Tuesdays in ten major California counties, VMT bottomed out the week of April 5.

Figure 6. Changes in Daily Vehicle Miles Traveled, Major California Counties



Source: StreetLight Data (in partnership with Cuebq); Analysis by UCR Center for Forecasting

Even before California began its phased reopening, mobility and VMT had begun to pick up gradually. As of June 16, VMT in these ten major counties ranged between 27% and 75% below the baseline VMTs observed on March 3. Note that the pace of VMT uptick in the state differs significantly between regions, with Southern California counties increasing faster than in the Bay Area. While VMT will continue to increase as the state continues to reopen, it is not expected to return to pre-pandemic levels in the next several months, especially in the Bay Area, where many giant tech firms such as Facebook and Google have already extended their work from home mandates until the end of 2020 or beyond.¹⁰

⁸ Based on VMT count summary compiled by the Institute of Transportation Engineers: <https://www.ite.org/about-ite/COVID-19-resources/COVID-19-traffic-volume-trends/>

⁹ Data based on StreetLight VMT Monitor map: <https://www.streetlightdata.com/vmt-monitor-by-county/#emergency-map-response>

¹⁰ Holmes, A. (2020, May 27). Facebook, Twitter, Google, and Microsoft will let employees work from home through 2020 or longer. Here's how tech companies are reconsidering remote work in the wake of COVID-19. *Business Insider*. Accessed on June 23, 2020. Retrieved from: <https://www.businessinsider.com/how-tech-companies-plan-to-reopen-facebook-google-microsoft-amazon-2020-5>

Overall, the COVID-19 pandemic has drastically reduced commuting in California as workers have either been laid off or shifted to remote work arrangements. Pre-pandemic, about 16 million Californians, or 84% of all commuters in the state, commuted by car, truck, or van.

Figure 7. Means of Transportation to Work, Workers 16 Years and Older

Mode of Transportation	Count	Share
Car, truck, or van (drive alone)	13,681,331	74%
Car, truck, or van (carpooled)	1,854,318	10%
Public transit	914,825	5%
Other	2,079,578	11%
Total Commuters	18,530,052	100%

Source: American Community Survey 1-Year Estimates, U.S. Census Bureau; Analysis by UCR Center for Forecasting

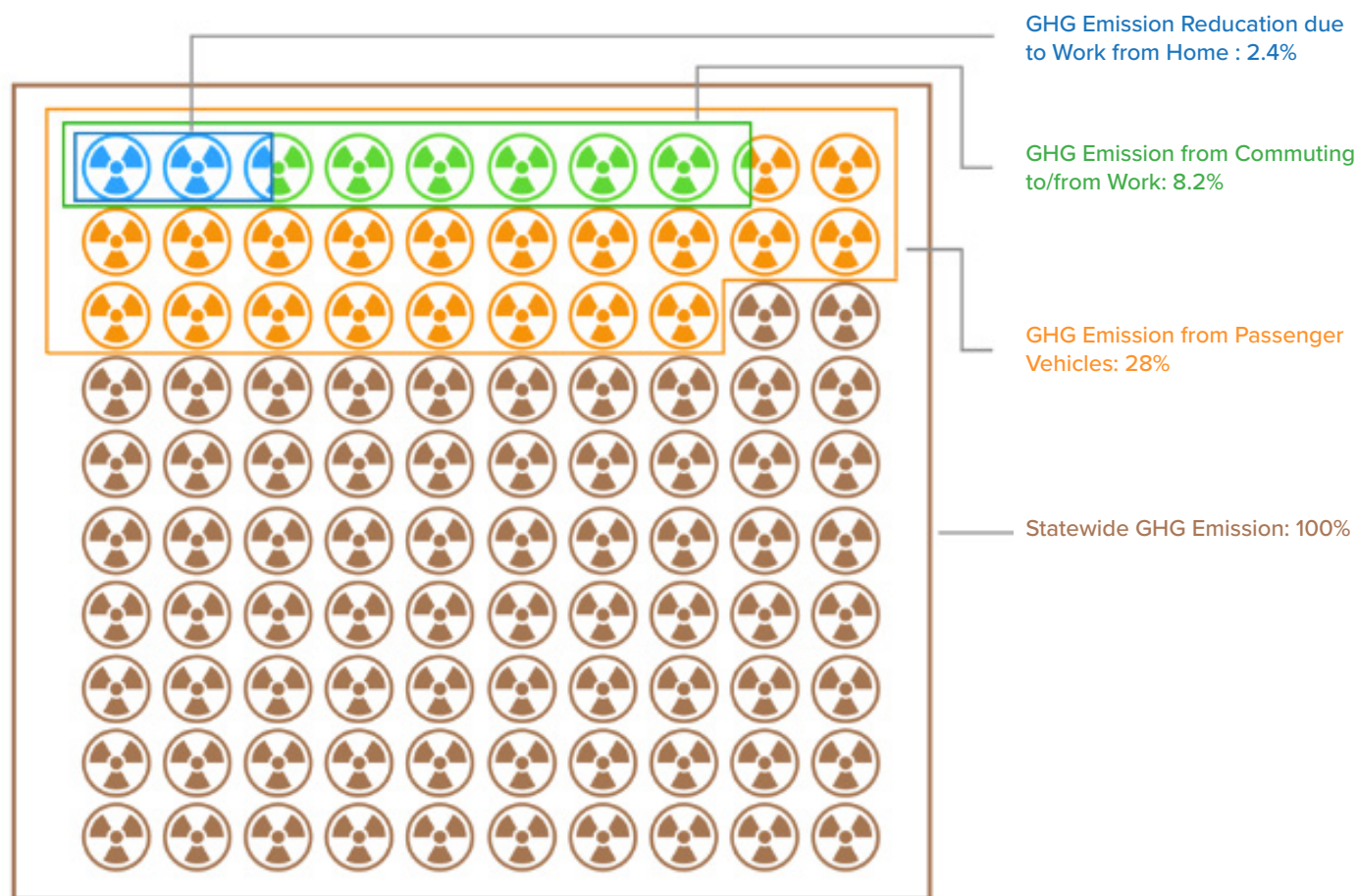
With reopening, California residents have been gradually increasing VMT for shopping and errands, social and recreational activities, and other purposes. Realistically, commuting to and from work is the only category where an ongoing reduction in overall VMT is feasible and likely. In the shopping and errand category, even if more people turn to e-commerce services, overall VMT is expected to stay the same as the move to e-commerce merely shifts the VMT from households to delivery drivers. Finally, as mentioned, people are social beings and crave human interaction and outdoor/recreational activities. Given this strong, natural predilection, in the short run, there may be a spike in mobility associated with social activities due to pent-up demand, and in the long run, people will very likely resume these activities and return to normal pre-pandemic levels if/when the crisis is over.

Not only is commuting to and from work the only category of VMT that is likely to diminish long term, the reduction in commuting VMT is only achievable for the subset of the workforce that can work from home. The reduction in commuting among those who can and elect to work from home would be a boon to at least a temporary decrease in greenhouse gas emissions. So it seems plausible to assume that there is potential for significant GHG emission reduction if most people no longer commute to work.

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Although remote work arrangements have become increasingly more popular in the past decade, only a fraction of jobs are conducive to such arrangements. Drawing from the American Time Use Survey, the U.S. Bureau of Labor Statistics found that in 2017–2018, only 29% of wage and salary workers in the nation could perform their primary job from home, and an additional 15% could work partially from home.¹¹ In addition, as Figure 5 shows, just 29% of the average U.S. household’s VMT is dedicated to commuting to and from work. Add to this equation that on-road passenger vehicles accounted for just 28% of California’s greenhouse gas emissions. Assuming the national ratios of the percent of workers who can work from home and VMT hold true for California, and also assuming that VMT to and from work is more or less uniform across those who can work from home versus those who cannot, this implies an ongoing reduction in greenhouse gas emissions in California of just 2.4%. Overall, the reduction in commute results in only a small decrease in the state’s overall GHG emission levels (see illustration in Figure 9).

Figure 8. Potential Reduction in California Greenhouse Gas Emissions due to Working from Home



Source: California Air Resources Board, California Greenhouse Gas Inventory - by Sector and Activity; National Household Travel Survey (2017), Federal Highway Administration, U.S. Department of Transportation; Bureau of Labor Statistics; Analysis by UCR Center for Forecasting

¹¹ Bureau of Labor Statistics (2019, September 30). 29 percent of wage and salary workers could work at home in their primary job in 2017–18. *TED: The Economics Daily*. Accessed on June 25, 2020. Retrieved from: <https://www.bls.gov/opub/ted/2019/29-percent-of-wage-and-salary-workers-could-work-at-home-in-their-primary-job-in-2017-18.htm>

THE INEQUITY OF COVID-19: THE PANDEMIC IS NOT A GOOD REASON TO CELEBRATE LOWER EMISSIONS

Promoting the idea that public reactions to the COVID-19 pandemic will result in cleaner air and lower levels of greenhouse gas emissions in the long run is both false and could serve to support deep inequalities. The potential reduction in greenhouse gas emissions as a result of people working from home is actually very small, and moreover, the pandemic has had the greatest negative impact on the most vulnerable socioeconomic groups in our society. The crisis has highlighted longstanding health inequities,¹² as well as inequities in terms of who is able to work remotely and who has greater job security.

Employment wise, the pandemic has disproportionately affected women and people of color¹³ as well those with lower levels of educational attainment (see Figure 8). These workers overwhelmingly work in contact-intensive and low-paying jobs (e.g., hospitality, retail, tourism, and childcare) with few benefits, which means they have the smallest safety net (e.g., job benefits, job security, and emergency funds). It will take at least several months and possibly significantly longer before employment levels among these workers returns to pre-pandemic levels. State and local leaders should attempt to target economic and financial relief aid at the neediest groups.

Figure 9. Means of Transportation to Work, Workers 16 Years and Older

Educational Attainment	May-2019	May-2020	YOY Change
Less than High School	5.4%	19.9%	14.5
High School Graduate	3.6%	15.3%	11.7
Some College or Associate Degree	2.8%	13.3%	10.5
Bachelor's Degree or Above	2.1%	7.4%	5.3

Source: Bureau of Labor Statistics; Analysis by UCR Center for Forecasting

¹² Hernandez, S. R. and Carter, K. (2020, April 10). *COVID-19: A Perfect Storm of Health Care Inequality*. California Health Care Foundation. Accessed on June 24, 2020. Retrieved from: <https://www.chcf.org/blog/covid-19-perfect-storm-health-care-inequality/>

¹³ Kalev, A. (2020, April 20). *Research: U.S. Unemployment Rising Faster for Women and People of Color*. Harvard Business Review. Accessed on June 24, 2020. Retrieved from: <https://hbr.org/2020/04/research-u-s-unemployment-rising-faster-for-women-and-people-of-color>

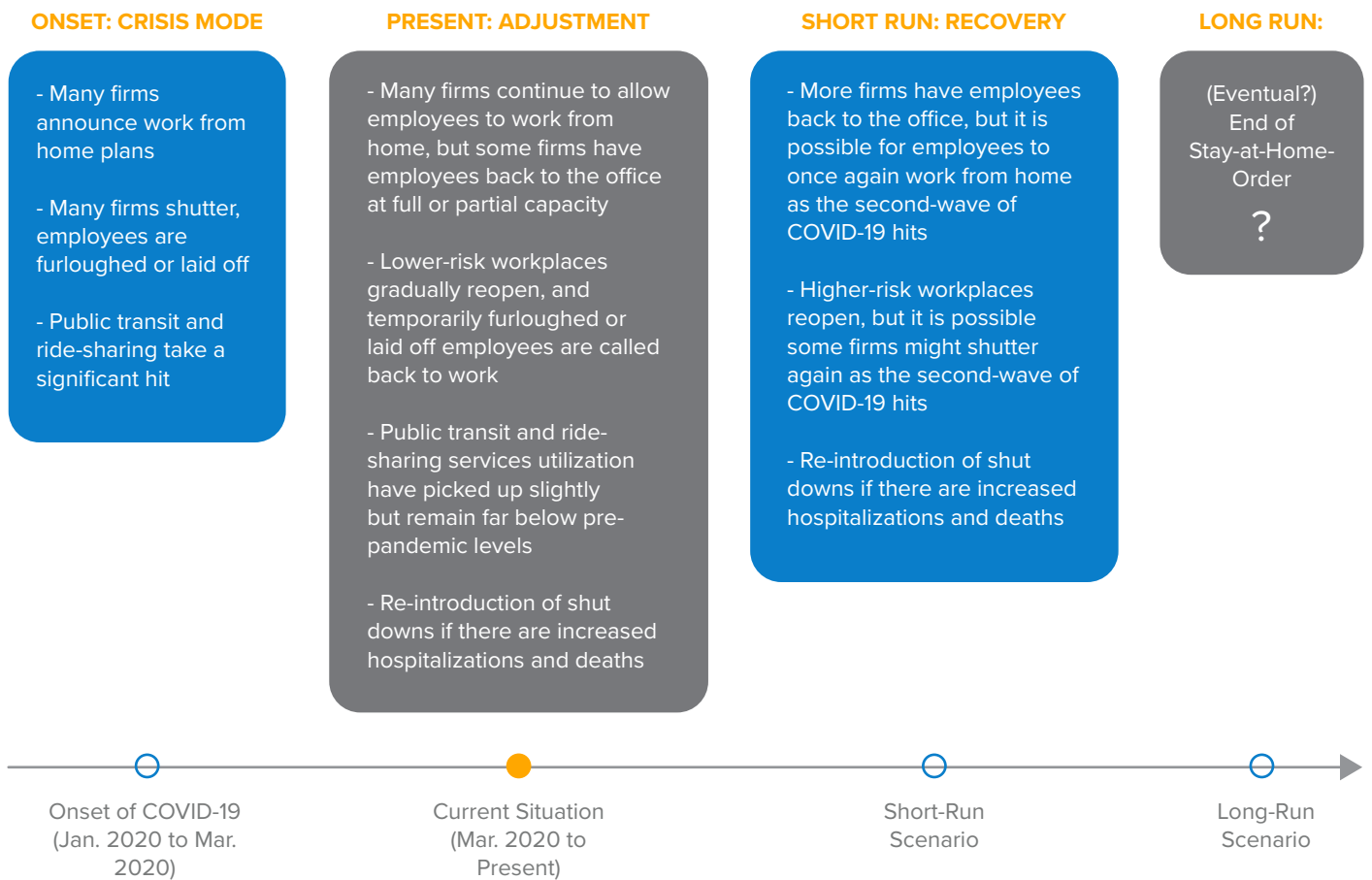


COVID-19 AND FUTURE RISK TO SHARED MOBILITY

There are other reasons why reduced mobility to and from work is unlikely to result in a significant reduction in California's GHG emissions. Figure 9 assumes business-as-usual mobility behavior as related to commuting, as well as a uniform VMT by car among all workers. These assumptions are unlikely to be true. Furthermore, Figure 9 assumes a best-case scenario in terms of GHG emission reduction; that is, all who can work from home will elect to do so. In reality, some workers will choose to commute to the office for reasons ranging from wanting social interaction with coworkers to the desire to separate work and home boundaries, to the ineffectiveness of working from home due to distractions.

Even more influencing, however, is that the COVID-19 pandemic has driven people away from shared modes of transportation such as public transit and ride-sharing services. Although there is significant uncertainty about how permanent the change will be, this indicates that some commuters who formerly used shared mobility will switch to driving alone, and the net result, all else equal, will be a slight increase in GHG emissions. This is an unwelcome shift as increasing public transit usage in lieu of driving has long been one of California's climate change goals. Even if some commuters opt for active transportation (e.g. walking and bicycling) in lieu of public transit or ride-sharing, active transportation tends to displace much shorter trips than driving.

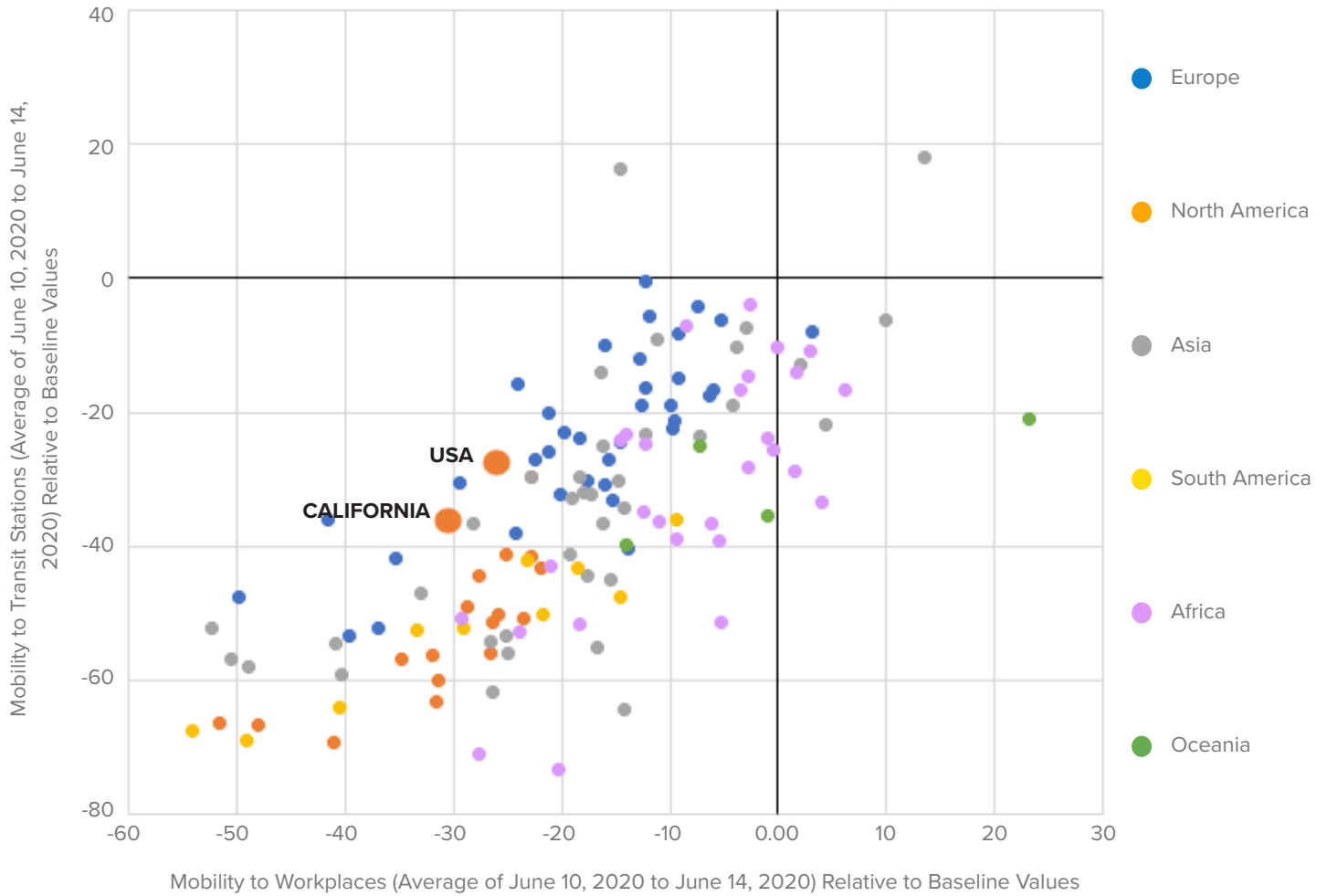
Figure 10. COVID-19's Impact on Mobility Behavior and Transportation



Source: Adapted based on California's COVID-19 Resilience Roadmap (<https://covid19.ca.gov/roadmap/>)
Analysis by UCR Center for Forecasting

It is clear that shared mobility as a mode of transportation has become very unpopular during the pandemic. What is unclear is whether avoiding public transit and ride-sharing will persist in the long term, or whether usage will return to normal levels when the pandemic ends. One clue is to look at mobility behavior outside of the United States, especially in countries that have successfully kept the spread of COVID-19 under control and are currently at more advanced stages of reopening.

Figure 11. Mobility to Workplaces (x-axis) vs. Mobility to Transit Stations (y-axis) by Country



Source: Google’s COVID-19 Community Mobility Reports; Analysis by UCR Center for Forecasting

Note: The baseline value for each category is the median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020.

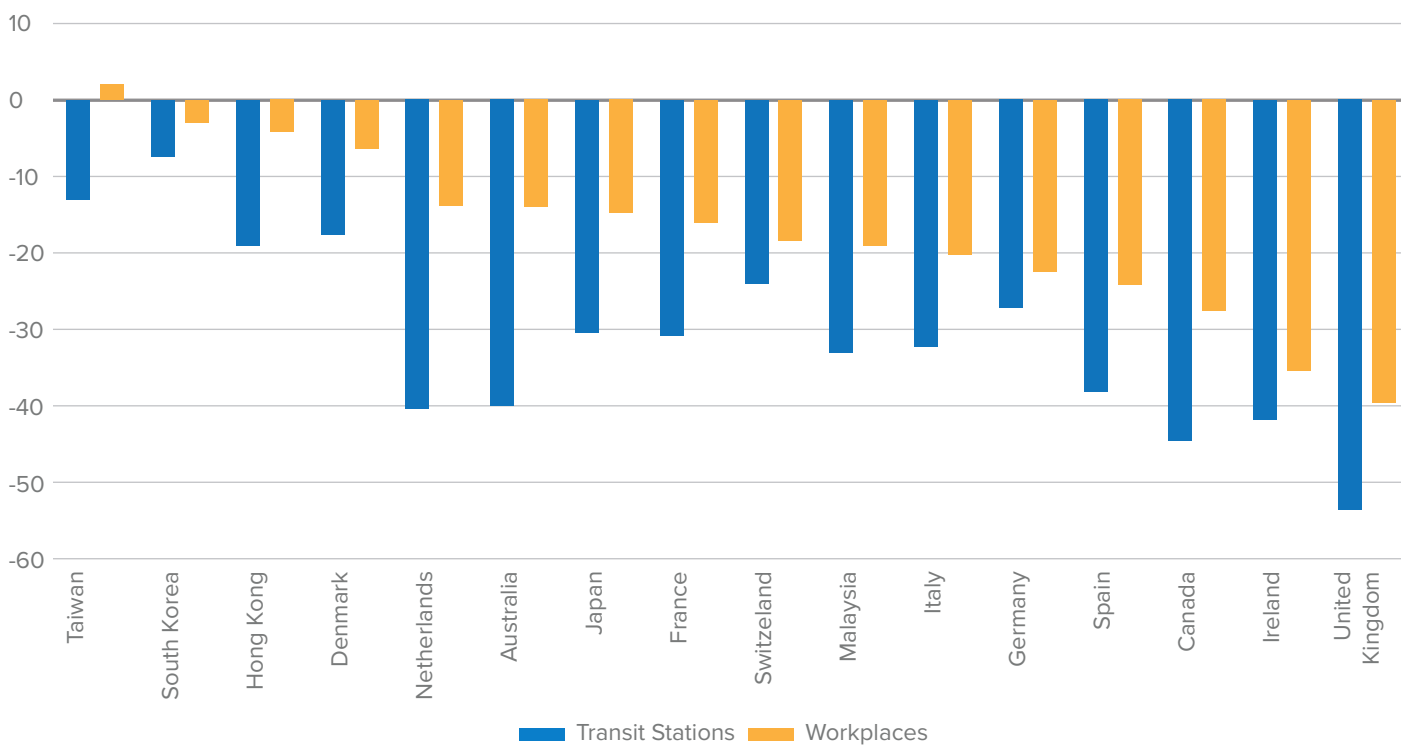
Google’s Mobility Reports suggest that mobility to workplaces and mobility to transit stations are highly-correlated ($R^2 = 0.52$). In countries where most workers have returned to work, transit station patronage has returned to a certain degree but remains far below pre-pandemic levels. However, the decline in mobility to transit stations is still more severe than the decline in mobility to workplaces. Worldwide, as of the week of June 10 to June 14, compared to baseline levels, mobility to transit stations is down 34%, on average,¹⁴ while mobility to workplaces is down 18%.

Although there is tremendous uncertainty about the future behavior and preferences of workers and employers, looking at countries where the first wave of COVID-19 cases peaked at least one month ago may offer some insight into ongoing mobility patterns. Figure 12 displays 16 major countries or regions where the first wave of COVID-19 cases peaked at least one month ago and the current known infection and death rates associated with the virus have declined significantly compared to the peak. In all 16 countries or regions, mobility to transit stations remains far below mobility to workplaces compared to baseline (pre-COVID) levels.

¹⁴ Arithmetic mean where each country is assigned an equal weight instead of weighted by population or other metrics.

Figure 12. Mobility to Workplaces and Transit Stations in Countries

Countries (Where the First Wave of COVID-19 Peaked on or Before May 10) During the Week of June 10-June 14, 2020 vs. Baseline Levels, Average for the Week



Source: Google’s COVID-19 Community Mobility Reports; Analysis by UCR Center for Forecasting

Note: The baseline value for each category is the median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020.

Since mobility to transit stations is more depressed compared to mobility to workplaces in all these countries, public transit patronage is also expected to remain low for the foreseeable future even though these are places where the first wave of COVID-19 cases is almost contained. When California eventually reaches this stage of containment, public transit usage is also likely to remain low compared to baseline levels.

This is bad news for the state’s climate strategy as encouraging people to use public transit is an important part of California’s—as well as many local jurisdictions’—climate action plans. The COVID-19 pandemic has already thrown a wrench in another aspect of the state’s climate strategy: disappointing auction results in the Cap-and-Trade Program. The recession induced by the pandemic-related shut down of economic activity has led to less demand for energy and, thus, less demand for carbon allowances. The Cap-and-Trade Program is a major source of funding for the state’s Greenhouse Gas Reduction Fund (GGRF), supporting climate programs aimed at reducing GHG emissions. A mix of events—the COVID-19 pandemic, the oil market collapse, and the poor auction results—recently prompted California to re-evaluate its landmark climate strategy.¹⁵ At only ten years away, under the current trajectory, it is unlikely the state will meet its 2030 goal (SB 32) of cutting GHG emissions by 40% below 1990 emission levels.

¹⁵ Becker, R. (2020, June 24). *California re-evaluating its landmark climate strategy*. *CalMatters*. Accessed on June 26, 2020. Retrieved from: <https://calmatters.org/environment/2020/06/california-climate-strategy-cap-trade/>



IMPLICATIONS FOR POLICY AND IMPLEMENTATION

As workplaces have shuttered, the COVID-19 pandemic has prompted an unprecedented and widescale experiment in remote working arrangements, both temporary and permanent. In terms of California's ambitious climate policies, in the short term, stay-at-home mandates have vastly reduced VMT, the largest source of GHG emissions in California. But it won't last. While the COVID-19 pandemic has been a boon in terms of cleaner air and lower levels of GHG emissions from a reduction in all types of driving, it is a temporary advantage. China, which began reopening over a month ago, is already showing signs of its GHG emissions returning to pre-pandemic levels.

Moreover, commuting, the one category of VMT that has potential for long term reduction won't make a significant difference. The findings of this analysis indicate that even if there is a massive and long term shift to working from home, it will only result in a marginal drop in greenhouse gas emissions. Although on-road passenger vehicle transportation makes up the largest component of GHG emission, only a fraction of VMT are attributed to commuting, and only a fraction of commuters have jobs that are conducive to remote work. This means the efficacy of reducing GHG emissions by cutting VMT to and from work is very limited.

At the same time, as mentioned, the pandemic has depressed the use of public transportation and it is uncertain if, and how quickly, riders will return. As long as fear of infection exists, people are likely to abandon public transportation in favor of driving, which will drive up GHG emissions in the long run. Unfortunately, increasing alternative modes of transportation to driving is a key part of the state's long term climate goals.

All said, the pandemic has provided a temporary reduction in GHG emissions, at best. The economic recession, induced by health-mandated closures, has actually played a greater role in reducing (even if temporarily) California's GHG emissions in both transportation and other sectors than the state's climate policies. Given that the greatest reduction in California's GHG emissions occurred from 2008 to 2009, when emissions fell by more than 6%, and that in the years since GHG emissions have decreased by only 1% to 2% annually, state policymakers need even more expansive and permanent solutions if they are serious about having a meaningful effect on slowing or reversing climate change.

RECOMMENDATIONS

Both during and after the COVID-19 pandemic, there are a number of ways that California's climate leaders and policymakers can improve outcomes related to the state's climate policies and goals:

Educate Californians about the full cost of driving. Although it is generally true that private passenger vehicles are the fastest mode of transportation, yielding strong time savings, many people may only take fuel, and repair and maintenance costs into consideration when determining the cost of driving. There are key social costs that most people do not take into consideration including roadway fatalities,¹⁶ air pollution, and GHG emissions.

Promote walking and cycling as viable alternative modes of transportation, where possible. Although social distancing has prompted people to abandon public transportation, at the same time more people are walking and riding bicycles,¹⁷ both of which are emission-free modes of transportation. The pandemic may present a unique opportunity for policymakers and leaders to promote a continuation of walking and bike riding, not just as recreation but as reliable and resilient forms of transportation. Because American roads, by and large, prioritize motor vehicles over all other modes of transportation, outside of city centers and a few neighborhood pockets, infrastructure for sidewalks, bike lanes, and other roadway uses beyond motor vehicles is either non-existent or lacking. Expanding such infrastructure so people feel safe walking or cycling could help keep the momentum going. Examples of infrastructure expansion include but are not limited to sidewalk expansions, protected bike lanes, and speed management of motor vehicles.

Accelerate electrification of motor vehicles. Even if walking and cycling become more popular modes of transportation, most people will likely still opt to drive. And decades of urban sprawl mean driving will remain the only viable form of transportation for many. Furthermore, the COVID-19 pandemic could push people away from urban areas, to suburbs, which will increase the demand for driving. One of the most effective ways for the state to reduce GHG emissions from transportation is to electrify passenger vehicles on a large scale.

Although reducing VMT from commuting has only a modest effect on GHG emissions, as most commutes occur during rush hour, it may be a worthwhile goal to pursue in that it greatly reduces traffic congestion during peak hours.

¹⁶ Olaisen, R. H., Rossen, L. M., Warner, M., and Anderson, R. N. (2019, July). *Unintentional Injury Death Rates in Rural and Urban Areas: United States, 1999–2017*. Centers for Disease Control and Prevention. Accessed on July 1, 2020. Retrieved from: <https://www.cdc.gov/nchs/products/databriefs/db343.htm>

¹⁷ Schwedhelm, A., Li, W., Harms, L., and Adriaola-Steil, C. (2020, April 17). *Biking Provides a Critical Lifeline During the Coronavirus Crisis*. World Resources Institute. Accessed on July 1, 2020. Retrieved from: <https://www.wri.org/blog/2020/04/coronavirus-biking-critical-in-cities>

CONCLUSION

As the coronavirus pandemic has disrupted the everyday lives of workers and residents across the United States, state and local governments, as well as transit agencies, have been on the front lines of responding to the crisis. The pandemic has been a trying time for California's climate sustainability and resiliency goals, throwing an unexpected wrench into workers' mobility and commute patterns and, subsequently, lowering GHG emissions temporarily.

What is unknown is whether COVID-19 will cause a permanent paradigm shift, one where people social distance from one another, including turning away from forms of shared public transportation, or whether the population returns to business as usual once the crisis ends.

While the answer is not yet clear, the post-COVID recovery presents a major opportunity for California to promote and scale-up cleaner, more sustainable modes of transportation and solutions that already exist, including active transportation such as walking and bicycling. Moreover, as people may continue to favor private passenger vehicles over public transit due to health concerns, policymakers should help public transit agencies prepare for an ongoing or future decline in usage. If California can implement sound policies, aligned with the state's climate goals, the resulting emission reduction could be more significant and have a greater impact than the temporary dip brought on by the pandemic.



About the Center for Economic Forecasting and Development

The UC Riverside School of Business Center for Economic Forecasting and Development opened its doors in October 2015 and represents a major economic research initiative in one of California's most vital growth regions. The Center produces a wide variety of research both independently and in collaboration with academic, business, and government partners. Research products include monthly employment analyses, quarterly regional economic forecasts, a quarterly business activity index, a white paper series, and a major regional economic forecast conference, hosted annually.

About the Author



Hoyu Chong is a Senior Research Associate at the UC Riverside Center for Economic Forecasting and Development. Ms. Chong leads research in the areas of sustainable growth and development and housing and land use. She works heavily with geographic information system (GIS) software and U.S. Census data in support of economic and policy analysis related to energy, the environment, housing, land use, and transportation. In 2020, she was a graduating fellow of Leadership Southern California, an esteemed program run in partnership with the Los Angeles Area Chamber of Commerce.