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Special Report 3: Impact of COVID19 Mitigation on Traffic, Fuel Use and Climate Change

ROAD ECOLOGY CENTER

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Impact of COVID19 Mitigation on Traffic Impacts, Fuel Use and Climate Change

Using traffic data from California and elsewhere in the US, we found that total vehicle miles traveled **(VMT) at the county and state level had declined by 61% to 90% following the various government stay-at-home orders.** Although traffic crash data are not available for these counties, media reports and analyses of California conditions suggest that these reductions in total travel could be accompanied by nationwide declines in crash impacts. We used VMT data to calculate that emissions of **US greenhouse gas (GHG) emissions that cause climate change were reduced by 4% in total and by 13% from transportation** in the almost 8 weeks since many stay-at-home orders went into effect. This puts the **US on track to meet its annual goals for GHG reduction under the Paris Climate Accord**. California has a target of 80% reduction in GHG from 1990 levels by 2050. If **traffic remained reduced for one year, the reduction in VMT would allow California to meet half of its 2050 climate change target**. The reduction in VMT per state was correlated with the number of COVID-19 cases and number of deaths (per 100,000 population), meaning that **the more COVID-19 cases and deaths a state had, the greater its reduction in traffic.** California relies on a gasoline tax supplement of 17.6 cents/gallon to supplement other sources of transportation funds, with a total sales tax on gasoline of ~61 cents/gallon. The reduction in travel has resulted in an estimated **$46 million/week reduction in SB1 fuel tax funds and ~$161 million/week in total fuel tax revenues for California state and local transportation projects**.

This report and other tools are available on the Road Ecology Center website: https://roadecology.ucdavis.edu.

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Special Report on Impacts of COVID19 Mitigation on California Traffic Crashes

Top 5 Talking Points

1) **Nationwide traffic data suggests that most residents in all states have hugely reduced their travel.** We used data from Streetlightdata.com to estimate changes in travel ("vehicle miles traveled", VMT) across the US. All states had >60% reduction in local travel, suggesting that the majority of people were taking guidance about staying at home seriously.

2) **US traffic reduction has resulted in a reduction in greenhouse gas (GHG) emissions that cause climate change.** Based on the VMT data, we used an average fuel mileage and emissions for vehicles in the US to calculate the state-level and total GHG emissions before and after the stay-at-home guidance went into effect. We found that, for the whole US the transportation contribution to GHG had declined by 13% from before to after the guidance. This puts the US on track to exceed Paris Climate Accord targets for GHG emissions. Because transportation contributes a larger proportion of GHG in California than other sources, the decrease in GHG represented almost half of the state's goal of 80% reduction in GHG by 2050 to address climate change.

3) **Reduction in traffic correlated with the number of COVID-19 cases and number of deaths.** The traffic reductions in each state were compared to the number of cases and number of deaths attributed to COVID-19. There was a positive correlation between number of cases and deaths and the reduction in county-level travel. This could mean that less traffic resulted in fewer cases (e.g., via community transmission). It could also mean that people paid attention to the number of cases and deaths and traveled less when there was more COVID-19 impact, even in states lacking a statewide stay-at-home order.

4) **There was an estimated 60-80% reduction in US fuel use and state fuel tax revenue and 75% reduction in fuel tax revenue in California (e.g., SB1) with reduced vehicle traffic.** California's fuel excise tax stemming from Senate Bill 1 (SB1) normally would produce 17.6 cents/gallon gasoline in excess revenue that is used to build highway and other infrastructure. The total gasoline tax is ~61 cents/gallon. Following the statewide stay-at-home order, SB1-based revenues declined by an estimated $46 million/week and total gasoline sales tax revenue by ~$161 million/week. For an 8-week reduction in travel, this would equate to ~$370 million less SB1 revenue and $1.3 billion less total tax revenue than would have been collected.

Introduction to Study

In California and other states, mitigation of the spread of COVID-19 has been implemented by cities, counties, and governors' offices through "shelter-in-place" and "stay-at-home" orders and related actions (e.g., closure of non-essential businesses). In previous reports, we have pointed to the potential unintended impact of reduced traffic -- reduced traffic crashes and thus injuries and fatalities for people involved in the incidents. More and more states and municipalities are pointing to this "silver lining" of COVID-19 mitigation actions, as well as the increased rate of excessive speeding.

We investigated several continuing impacts of government shelter-in-place order on rates of traffic, crashes, injuries/deaths, and costs on California highways and certain major roadways patrolled by the California Highway Patrol. Using estimated traffic data from Streetlightdata.com, we analyzed traffic conditions before and after stay-at-home guidance. Using federal standards/averages for vehicle fuel-mileage and emissions of greenhouse gases (GHG), we compared GHG emissions at the state and US scale before and after COVID-19 mitigation (a new "green lining"). For California, we also estimated the decrease in fuel-tax revenue as a result of the Governor's stay-at-home order.

Findings

1) Reduction in Nationwide Travel

Using daily travel data from Streetlightdata.com, we calculated the change in daily "vehicle miles traveled" for every county in the US from early March to mid-April. Streetlightdata uses custom algorithms with cell-phone tracking data to estimate how many miles people drive per day. The total miles traveled in the first week of March in the US was 103 billion miles, whereas the total miles traveled in the second week of April was 29 billion miles This 71% reduction in total miles traveled was reflected in the range of reductions seen across each state (Table 1).

Table 1. Reduction (%) in "vehicle miles traveled" between the first week of March (3/2 – 3/8) and the second week of April (4/11 – 4/17).

State	% Reduction	State	% Reduction	State	% Reduction	State	% Reduction
AL	61%	IN	70%	MT	71%	PA	77%
AZ	72%	IA	71%	NE	75%	RI	81%
AR	60%	KS	73%	NV	72%	SC	63%
CA	75%	KY	67%	NH	77%	SD	75%
CO	78%	LA	66%	NJ	84%	TN	66%

CT	81%	ME	73%	NM	67%	TX	72%
DE	74%	MD	78%	NY	82%	UT	69%
DC	90%	MA	83%	NC	67%	VT	81%
FL	72%	MI	82%	ND	74%	VA	72%
GA	67%	MN	78%	OH	72%	WA	72%
ID	63%	MS	66%	OK	63%	WV	66%
IL	74%	MO	68%	OR	68%	WI	73%
						WY	67%

2) Change in Greenhouse Gas Emissions

The reduction in VMT resulted in a proportional decrease in the greenhouse gases that most vehicle release. In the US, transportation, including personal vehicles, releases about 29% of the GHG per year. These GHG are usually quantified as "carbon dioxide equivalents" (CO_2e), which reflect the greenhouse gas potential for the various gasses released from vehicle fuel combustion. Using average fuel mileage rates for US vehicles (EPA, 2017; https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references), we calculated the GHG emissions equivalent to VMT before and after the government guidance for Covid-19 mitigation, including "stay-at-home" orders. The total for the first week of March was 44 million metric tons CO_2e and in the second week of April was 12 million metric tons CO_2e, a 71% decline overall, with variation among the states (Figure 1). Assuming that the reduction in travel persists for 8 weeks, this represents a 13% decrease in transportation-related annual GHG emissions and 4% decrease of total annual GHG in the US. Although it is possible or likely that this decrease won't "stick", this represents significant

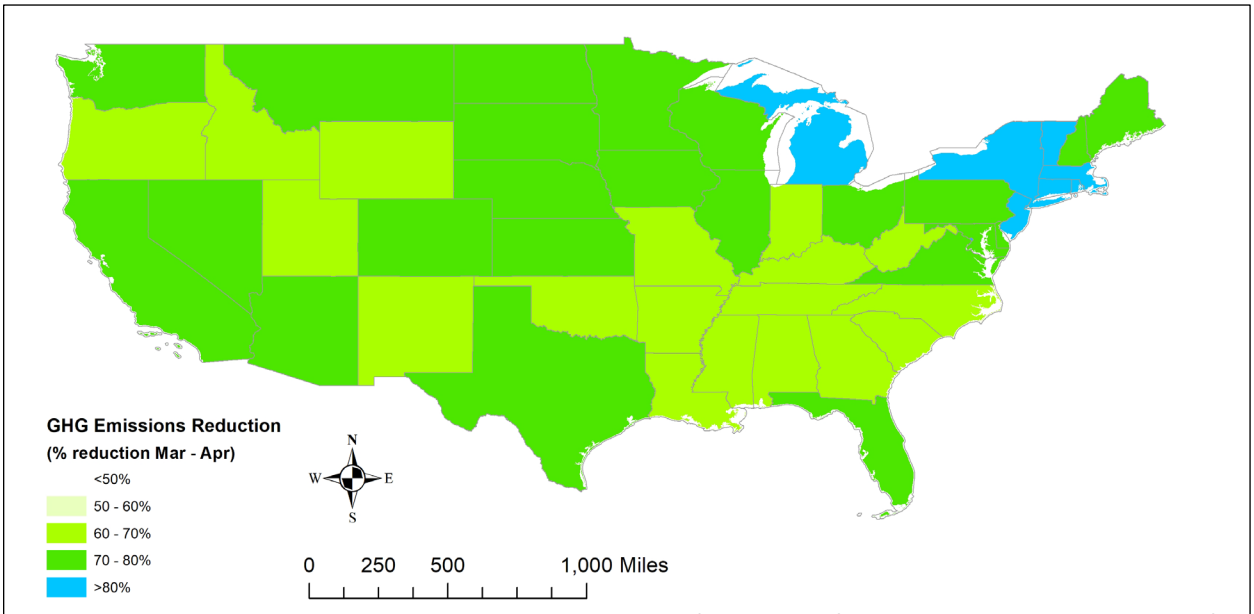

Figure 1. GHG emissions reductions between the first week of March and the second week of April (pre and post stay-at-home orders) for each of the lower-48 states and District of Columbia.

progress toward the Paris Climate Accord goals. For California, the 75% reduction in travel resulted in a concomitant 75% reduction in GHG emissions (Figure 2), putting it well on its way to meeting 2050 climate change targets of 80% reduction in GHG emissions.

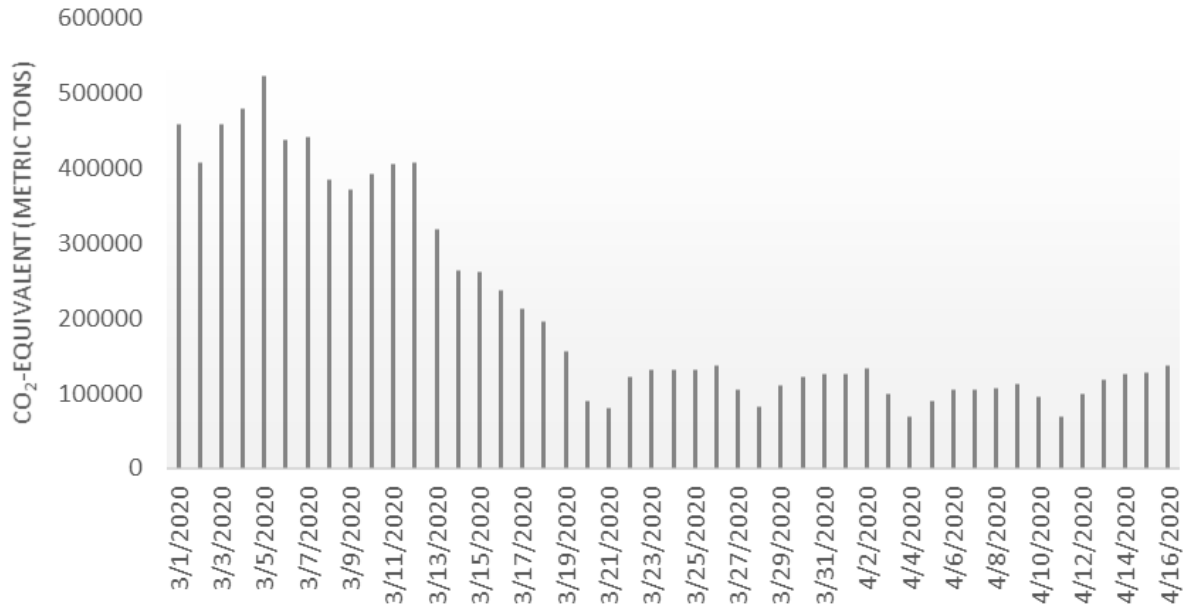

Figure 2. Estimated change in California greenhouse gas emissions as carbon dioxide-equivalents for March 1, 2020 to April 17, 2020.

3) Reduction in Traffic and COVID-19 Cases

Mitigation of Covid-19 community transmission has primarily consisted of discouraging people from moving around. From state to state, compliance with this mitigation guidance has varied. We compared the reduction in VMT with the number of Covid-19 related cases and deaths, by state. The highest rates of cases were for NY and surrounding states (CT, MA, NJ, RI). Although there was a relationship between VMT and cases per 100,000 people, it was not a strong relationship. The possible correlation could indicate that as the rate of cases grew, people reduced their travel by greater amounts. The corollary is that if a state has a low rate of cases, residents may not take seriously government guidance about moving around less.

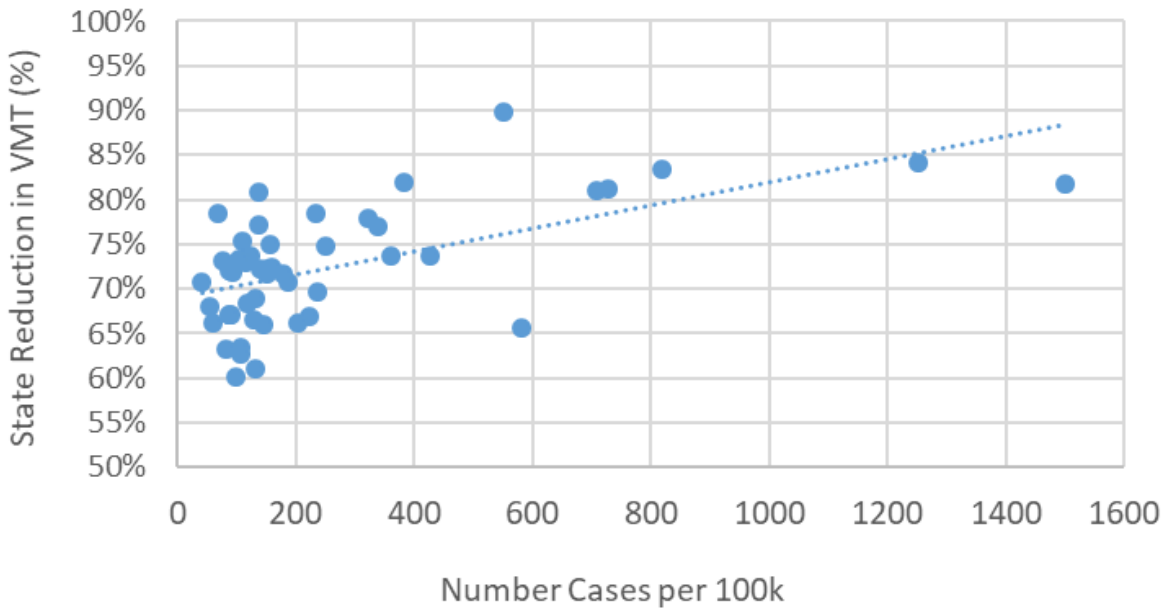

Figure 2. State-level relationship between reduction in VMT (%) and the number of cases per 100,000 people.

4) Reduction in Fuel Use and Tax Revenue

In the first week of March, US daily travel was equivalent to 4.6 billion gallons of fuel. Due to reduced daily travel following government guidance, the US used only 1.3 billion gallons of fuel in the second week of April. At an average gasoline price of $2.59 across the US (source: USDOE, Alternative Fuels Data Center, https://afdc.energy.gov/data/), this reduction in use is equivalent to a savings of $8.6 billion/week to US drivers. For the sake of simplicity, we used gasoline prices and taxation as a proxy for all fuels, while recognizing that this is imperfect. Every US state charges a fuel tax, which varies by state. We multiplied the state-specific tax rate by the estimated fuel use per state to calculate the total revenue per week for the first week of March and the second week of April. The revenue was reduced from $1.6 billion per week in March to $424 million per week in April, a difference of $1.18 billion.

California relies upon a fuel tax triggered by Senate Bill 1 (SB1) in 2017 that potentially will generate $53 billion over 10 years to support highway construction and maintenance and transit improvements to reduce GHG emissions (https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB1). This source of revenue is intended to support state and local transportation and other projects. The current SB1 excise tax rate is 17.6 cents/gallon (gasoline) and the total tax rate is ~61 cents/gallon (gasoline, https://www.api.org/~/media/Files/Statistics/StateMotorFuel-OnePagers-January-2020.pdf). Diesel fuel has higher rates. The fuel use and SB1 tax

revenue for the first week of March was 349 million gallons and $61 million, respectively. The fuel use and SB1 tax revenue for the second week of April was 85.8 million gallons and $15 million, respectively. The difference in weekly fuel use and revenue is 263 million gallons and $46 million. The difference between the total state tax revenue before and after the stay-at-home order was $161 million per week. For an 8-week stay-at-home order, this would be equivalent to 2.1 billion gallons of fuel not being used and an SB1 tax revenue savings (to drivers) and loss (to the state government) of $370 million and total fuel sales tax loss of ~$1.3 billion.

Conclusions

Government guidance to mitigate Covid-19 has primarily consisted of orders to close or limit businesses and non-essential travel by the public. We found that there was a 61 to 89% reduction in daily travel for US states and the District of Columbia. Governor Newsom's shelter-in-place order and similar orders at the jurisdictional scale had a profound effect on daily travel in California, with a 75% reduction in daily travel, expressed as miles traveled. This resulted in a 75% drop in fuel use, which had knock-on effects on greenhouse gas emissions and state fuel tax revenue. US states largely seem to be following government stay-at-home guidance, resulting in the US having sufficient GHG emission reductions over an 8 week period to exceed target reductions under the Paris Climate Accord (>2%/year reduction) by 2%, for a 4% total reduction. California's reduction in GHG emissions were much greater, putting it on track to get half way to its 2050 goal for GHG emissions by 2021. Of course, all of these benefits of the stay-at-home orders could go-away after vaccines or treatments are identified that allow normal economic and travel activity to resume. It is also possible that the U.S. public could embrace the multiple unintended benefits of the pandemic response and retain some level of reduction in harm from travel and economic activity

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