More Choices Less Traffic

Achieving Greater Efficiency & Equity from California's Transportation Investments

A Framing Document

Presented by Climate Resolve in partnership with ClimatePlan

June 2018

Times change. Ideas shift. New paradigms emerge to meet the needs and wants of today's society. May this framing document contribute to such a fruitful, prosperity-enhancing transition.

Foreword

This framing document was prepared in the lead-up to the first joint meeting of the California Air Resources Board and California Transportation Commission, the purpose of which is to coordinate implementation of programs and policies that have a nexus to achieving State transportation and air quality goals.

The organizations that contributed to its drafting are all part of the ClimatePlan network, which works with non-profit organizations throughout the state of California to change how land use planning and transportation investments occur in California. Their vision is to create a healthier, more sustainable California, where people of all backgrounds and incomes have the opportunity to thrive.

Authorship

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Executive summary

This framing document describes the interrelation of transportation investments and land use patterns that are behind our congestion woes, and then suggests an alternative path forward -- one in which per capita VMT reduction is a central strategy. It then describes the numerous co-benefits besides curbing congestion and improving mobility that go hand-in-hand with such a reduced VMT scenario, and recommends an intersectional, cross-jurisdictional, equity-enhancing approach as having the most potential to improve lives.

It presents evidence and case studies to support the following policy recommendations:

1. Prioritize investments in sustainable mobility options, and stop the misguided practice of adding road capacity in the name of congestion relief in urban, high-growth areas. Due to induced travel, urban highway expansion does not relieve congestion nor improve mobility in the long-run, and by increasing VMT, it runs counter to our climate goals. VMT reduction is crucial to meeting our climate goals and relieving congestion. Instead, we should invest in transit and other sustainable transportation modes, both for their social equity benefits and as a more enduring strategy to reduce VMT.

2. Align California's transportation investments with its climate goals. With better informed and performance-driven funding decisions, we can better serve Californians and shift transportation dollars away from inefficient, sprawl-oriented highway expansion projects towards sustainable mobility options, including transit and active transportation. In order to reduce VMT, people need viable alternatives that are safe, convenient and affordable. Investments in mobility options other than single-occupancy vehicle use should be prioritized.

3. Ensure that investments in sustainable mobility modes are accompanied by robust strategies to minimize displacement pressures. Doing so preserves transit ridership and delivers important mobility, equity, public health and environmental gains.

This vision of a reduced per capita VMT future is not one of sacrifice, deprivation, nor anti-growth -- quite the contrary -- it is one of improved mobility, increased prosperity and better health and well-being. It has the potential to significantly boost people's quality of life, to improve access to opportunity and make our society a more equitable, healthy, and environmentally-responsible one. By directing resources strategically and consistently aligned with a reduced VMT paradigm, we can gain greater coherence between State goals and allocations of resources, and in doing so, unlock tremendous opportunity for smart, equitable growth. Whereas the waters of today are muddied with mixed signals and barriers to opportunity, we can course correct at any time and set ourselves up for a tomorrow of more smooth sailing. Let's...

Introduction

The California of today is one bridled by congestion, hungry for greater mobility. Traffic puts a drag on our otherwise-thriving economy, and a daily grind on our hard-working families. Our quality of life is marred by that infuriating feeling of being trapped by gridlock, of not having any way to avoid the congestion. Across all sectors, we share a common bond over our frustration with the inefficiencies of traffic.

The reason for that chart-topping traffic: without other viable options, Californians are driving more now than ever before. People yearn for alternatives, yet the public funding to support sustainable modes of transportation lags far behind. Auto-centrism and automobile-dependence persist, and mobility across all modes suffers, as too many cars try to use our congested roadways.

Population growth, increased access to cars, and other demographic trends, such as displacement pressures, have contributed to this increase in driving. So have sprawl development patterns, as enabled by an overbuilt freeway system, and a lack of affordable, viable transportation alternatives to solo driving. This increase in driving is measured as an increase in vehicle miles traveled (VMT).

Meanwhile, we have learned that we cannot build our way out of congestion simply by adding more road capacity in what would be a perpetually-insufficient attempt to try to meet that increasing demand for driving. That is because the added road capacity only soon comes to be filled with yet more congestion -- induced travel demand research shows at a ratio of 1:1 in congested, high-growth

areas -- for all road capacity added, that creation of new space for driving spurs an equal amount of new driving to promptly fill it.[1] The science is clear on this: added road capacity induces additional driving, to the extent that such road expansions do not reduce congestion nor improve mobility in the long-run.

Without improving mobility, such road widening projects are not only a drain on current-day capital program funds, they also entail a continuing need for increased maintenance funds since they add to the amount of paved infrastructure in the transportation system that then must be maintained. As such, this rise in ongoing maintenance costs cuts further into the transportation funds that are available to actually deliver enduring mobility-enhancing investments.

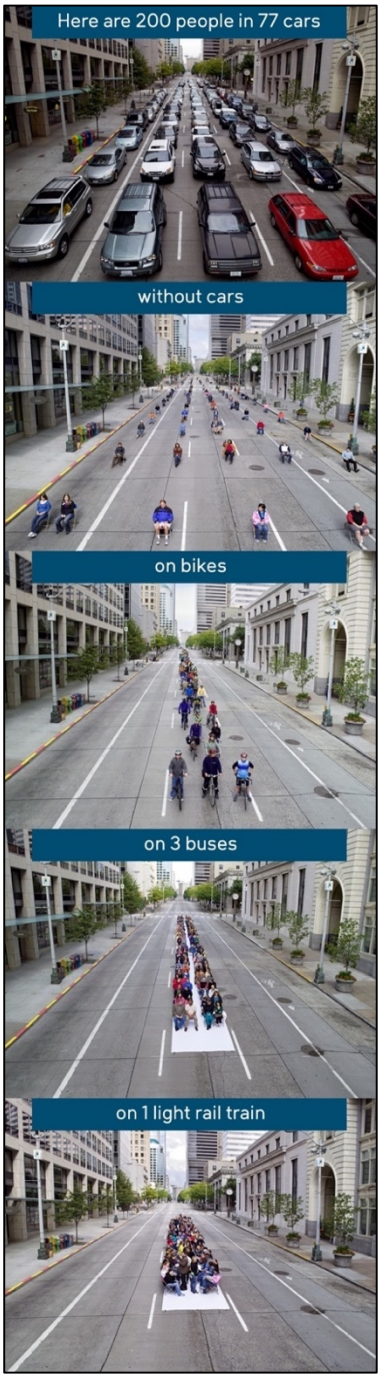

Figure 1: Road is Most Congested When People Drive Alone. Source: International Sustainability Institute[2]

Our transportation dollars can and must be used more effectively and efficiently than that. To prevent ever-worsening congestion, people need alternatives, not wider lanes that only beget more traffic.

To improve mobility and allow people to better meet their needs and wants without having to suffer through so much time stuck in traffic, our transportation system must be a more efficient one than what we have today. Phrased another way: people must be able to meet their mobility needs without taking up so much space in single-occupancy vehicles on our roads. Yet another way to say that: per capita VMT must decrease.

Electric vehicles will not solve this problem of congestion. An electric vehicle stuck in traffic provides for no greater mobility than the current congested status quo. Nor can autonomous vehicles in and of themselves guarantee congestion relief. To reduce traffic and improve mobility, reducing per capita VMT is crucial. It is our moral imperative to go about that transition in a way that improves equity.

Background -- the interrelated problems associated with increased VMT

Before arriving at what the solution looks like, it is important to first unpack what the current problem space is made up of. That way, a solution can be proposed that addresses all aspects of the problem, not only some, and has the potential to be a more enduring, sustainable way forward.

10 Most Congested Cities in the World in 2017

2017 Rank	Global City	2017 Hours Spent in Congestion
1	Los Angeles	102
2	Moscow	91
2	New York City	91
4	Sao Paulo	86
5	San Francisco	79
6	Bogota	75
7	London	74
8	Atlanta	70
9	Paris	69
10	Miami	64

Figure 2: 10 Most Congested Cities in the World in 2017. Source: INRIX[4]

Roads are congested

California has some of the worst traffic in not only the nation, but the world. Its two largest metropolitan areas, Los Angeles and the Bay Area, top the national charts in terms of most commute time spent in highway congestion.[3]

Other California urban areas that make the list of the nation's most congested cities include San Diego, Riverside, Sacramento, Fresno, Bakersfield, Oxnard, Stockton, Palmdale-Lancaster, and Indio-Cathedral City.[5]

Every year, Californians lose more and more time to being stuck in traffic. This worsening congestion detracts from quality of life and is economically wasteful.

There are several factors that are contributing to this trend, including: demographic shifts, such as increasing population; macro-economic influences, such as easier access to car loans; as well as characteristics of the built

environment, such as shortages of affordable housing near jobs and inconvenient transit systems.[6] It is not only a matter of more people driving, though. The amount that each person is driving is also on the rise.

VMT per capita is increasing

Since the end of the recession, the amount that each person in California drives has been increasing. In the period from 2012 to 2016, the total amount of VMT in California increased by 4.2%, at a time when population increased by 3.4%, meaning that the VMT per capita increased by 0.8%.[7]

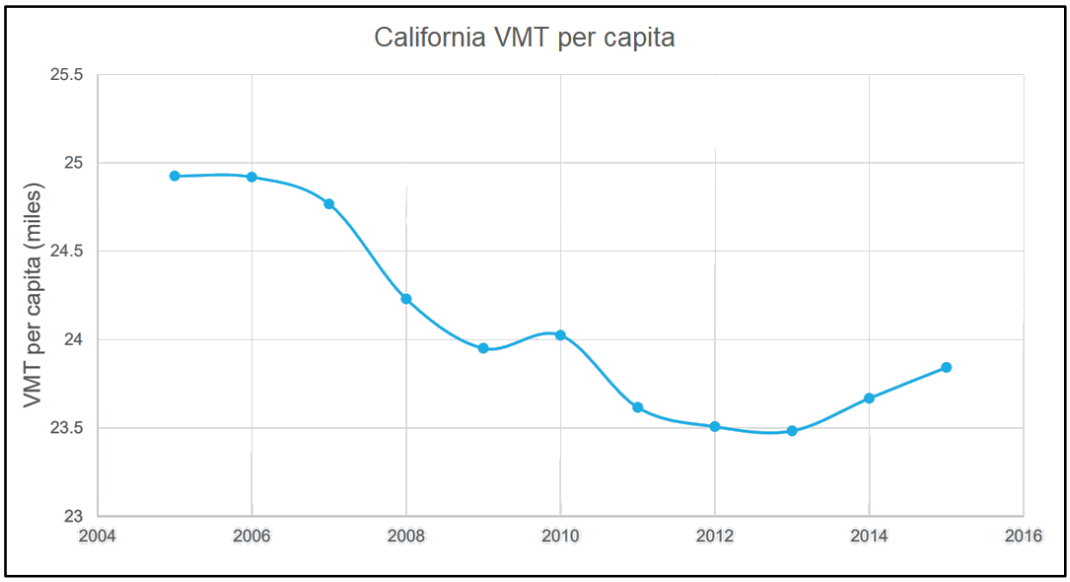

Figure 3: California VMT per capita. Source: Highway Performance Monitoring System, Caltrans[8]

Autonomous vehicles impact to VMT and congestion is uncertain

Much is yet to be determined about the impact that the advent of autonomous vehicles (AVs) will have on travel behavior and our roadways. The future policy context and market mechanisms will determine whether AVs are mostly or all shared or individually owned, affordable to many, the few, or everybody. If shared, and/or if pooled rides or connections to transit service are sufficiently incentivized, AVs could potentially reduce VMT. That future is far from certain, though; significant policymaking work would be needed to bring about that reduced VMT scenario.

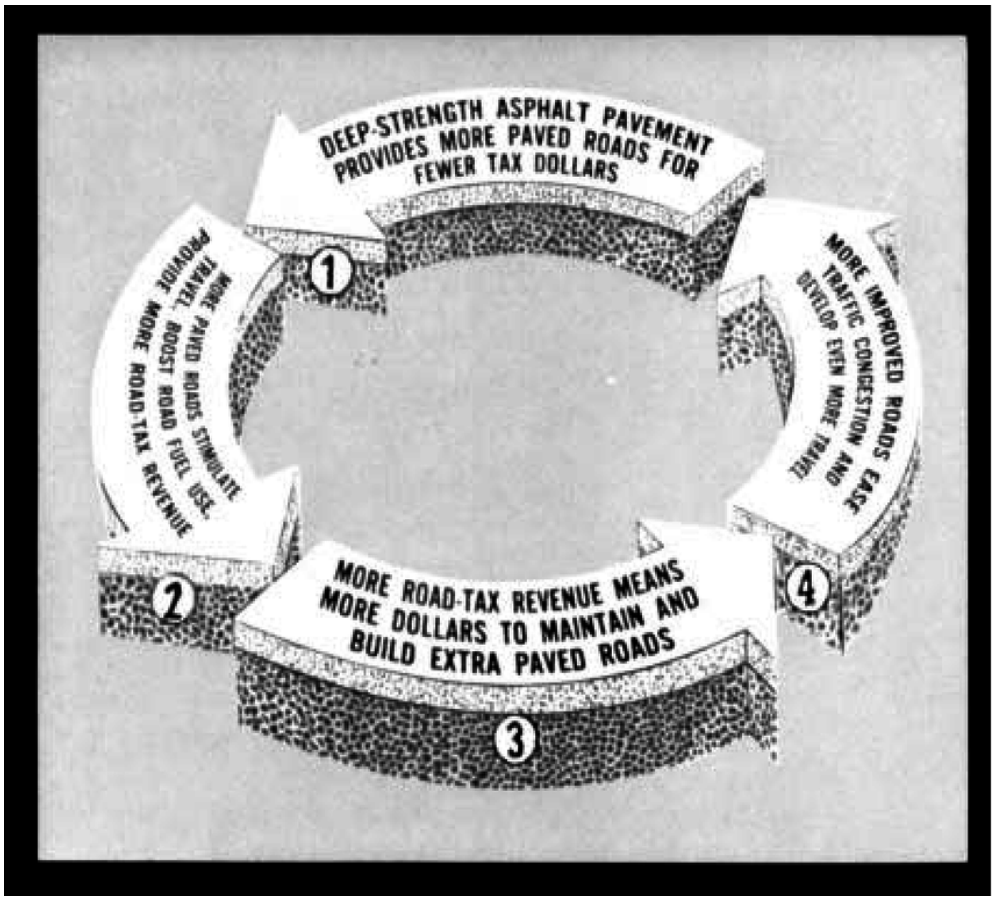

Figure 4: Roads beget roads. Source: Cover of Asphalt Bulletin, April 1966.[9] Note the phrases: "roads stimulate travel" and "more improved roads ease traffic congestion and develop even more travel."

One could also conceive of future in which AVs attract trips away from public transit. As a consequence, transit providers may cut service, which could entail significant equity harms. For those people who cannot afford to travel by AVs, or for whom language or structural barriers (such as ADA needs and unbanked households' lack of access to shared mobility apps) prevent them from accessing AVs, their only mobility option will then have been degraded.[10] This regressive outcome must be avoided.

It is anticipated that AVs could likely make car travel more appealing, as drivers become riders who are able to shift their attention away from navigating the road, towards other activities, such as work or entertainment. AVs could also spur new car trips from people who are currently not drivers, such as the young, elderly and disabled. One estimate of the increase in VMT that would likely result

from just 50% AV market penetration is in the range of 30-90% more VMT than the baseline, current-day scenario.[11] It is presumed that if 100% of the vehicles on the road were AVs with connected communication channels, they would be able to use the road space more efficiently by driving more safely and merging more logically than humans do. It is uncertain, though, in this far-off-in-the-future scenario whether or not those efficiency gains would be sufficient to make up for the congestion-worsening impact of a 30-90% increase in VMT.

Adding road capacity in congested, high-growth areas does not reduce congestion

Induced travel research has shown that adding road capacity is not an enduring, feasible strategy for relieving congestion.[12] That is because by adding road capacity, the immediate improvement in congestion conditions entices more people to drive more and longer trips.[13] In urban congested areas, that new induced travel is proportionate to the amount of new road capacity added, such that congestion conditions do not actually improve.[14] This proportional induced travel ratio is described as new road capacity having an elasticity of 1.0. Congestion is not alleviated whatsoever, as the new road capacity is entirely filled by induced VMT.

Highway expansion continues

Despite the findings of the latest induced travel research -- that widening congested urban highways does not relieve traffic in the long-run[i] -- adding highway capacity has historically been pursued in an attempt to relieve congestion. In California, the already extensive amount of urban interstate lane miles was increased by 7.3% from 2012 to 2016, while the amount of other urban freeways and expressways lane miles was increased by 10.2% over that same period.[15] Since more lower-income people live near highways than does the general population, this highway widening has a disproportionate negative impact on those already overburdened communities.[ii]

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[i] In the long-run, in urban areas experiencing growth.

[ii] These negative impacts are discussed in more detail in the section to come entitled 'Poor health outcomes from...air pollution'.

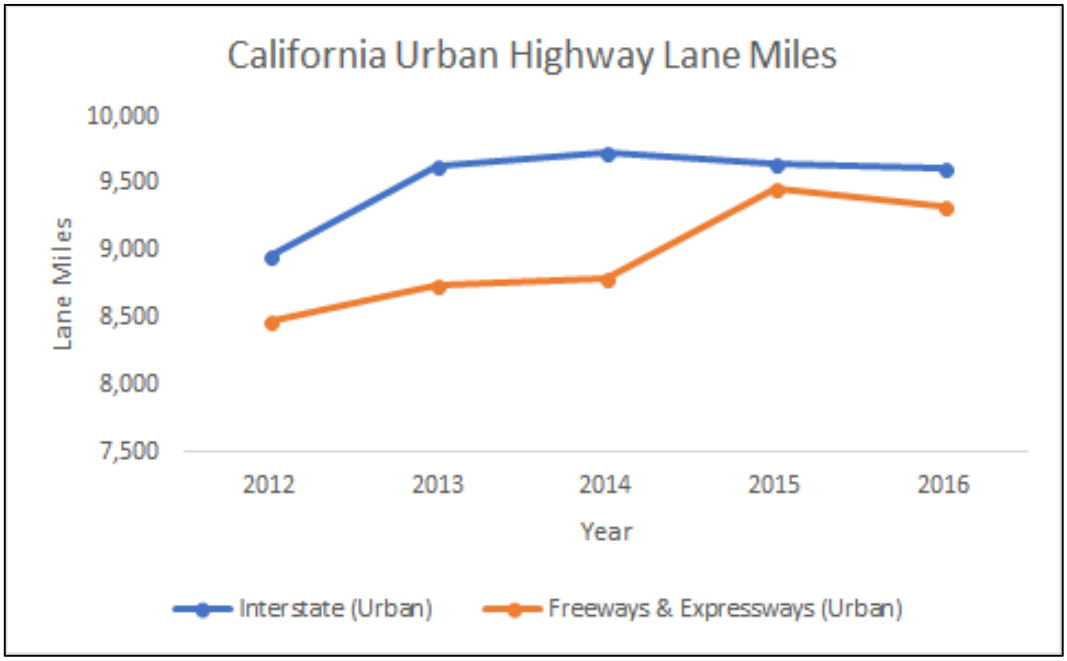


Figure 5: California Urban Highway Lane Miles. Source: FHWA Highway Statistics Series[16]

While not improving congestion over the long-run, this expanded highway capacity does increase the maintenance needs of the system for every year from then out. The additional maintenance costs from the 1,516 urban highway lane miles that were added to the system in the four-year period from 2012 to 2016 will fall somewhere in the range of $10.5 million to $97.4 million on an annual basis. The lower cost estimate assumes that the new roadway will be maintained in good condition and not need major rehabilitation work, at the maintenance price point of $6,923 per lane mile per year.[17][iii] The higher cost estimate reflects California's current annual maintenance expenditure of $64,262 per lane mile in the system.[18]

A poignant example of ineffective freeway widening comes from the Westside of Los Angeles, where the five-year, $1.6 billion I-405 widening project, which was completed in 2015, did not improve congestion nor reduce travel times.[19] In fact, traffic speeds through the widened corridor are now slower than before the

[iii] Average lane widths and maintenance costs were determined from a survey of all of California's 58 counties and 482 cities in 2016; the information collected covers over 99 percent of the state's roadways. For these calculations, an average lane width of 14.6 feet was used for major roads, and the unit cost of $4.85 per square yard for preventative maintenance once every six years was assumed.

widening project began, and the time it takes a car to travel through the widened corridor has actually increased.[20]

Figure 6: The I-405, congested, at twelve lanes width. Source: L.A. Times Crossword Corner[21]

The public has grown disillusioned by the (false) promise of congestion relief through highway expansion projects. This is evidenced by the recent large public outcry in opposition to the proposal of widening the I-710 S, which has led the Metro Board of Directors to put the brakes on that project and rethink the alternatives.[22] So, too, has public opposition killed the idea of extending the I-710 N, but only after millions of dollars were spent on studies and legal challenges.[23]

Budget squeeze on other modes

The ineffective and thus inefficient use of transportation dollars on highway widening diminishes the availability of funds for supporting mobility via other transportation modes. Because highway spending makes up such a large part of transportation infrastructure investments, spending on transit and active transportation modes is limited. This is evident, for example, in the regional portion of State Transportation Improvement Program (STIP) funds, which, as shown in Figure 7, goes mostly towards highway expansion, and with that, ever-growing highway maintenance costs, at the expense of not being able to invest more heavily in transit and active transportation.

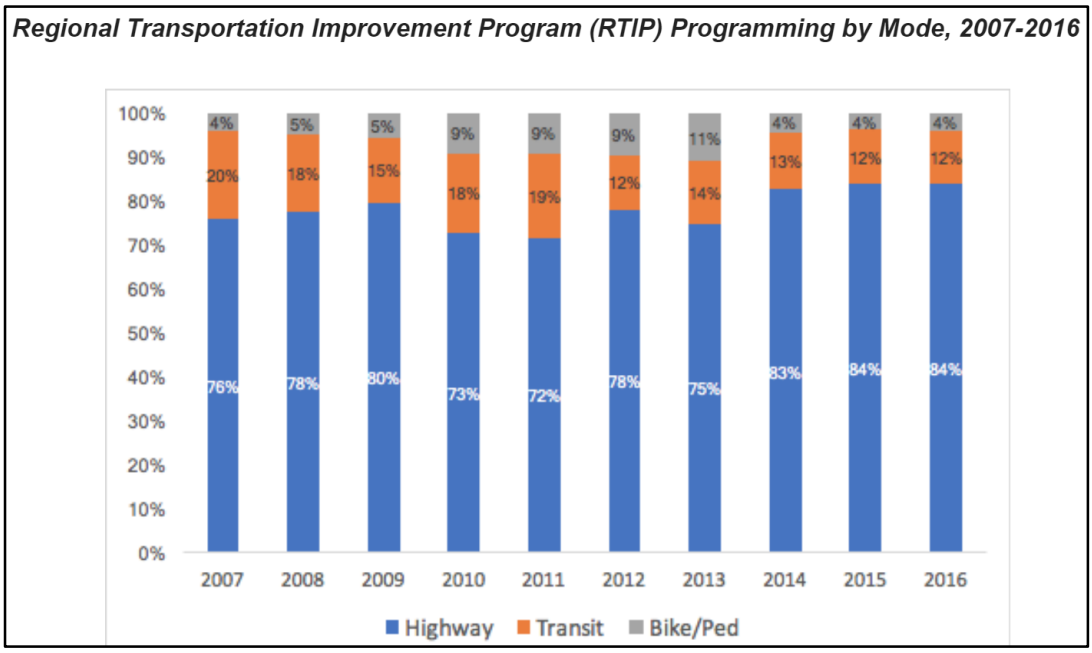


Figure 7: Regional Transportation Improvement Program (RTIP) Programming by Mode, 2007-2016. Source: California Transportation Commission's "Orange Books"[iv]

A ten-year analysis of all State spending on transportation infrastructure, shown in Figure 8, found that $56 billion of the total $81 billion -- 69 percent -- was spent on highway infrastructure, excluding routine highway maintenance.[24] That routine maintenance makes up about 10 percent of Caltrans' budget, coming in around $1.2 billion annually for that same ten-year period.[25] On top of all that, an additional roughly $1.5 billion annually was spent replacing degraded State highways, for a grand total of about $8.3 billion annual expenditures on highway infrastructure.[26] That amount far exceeds the amount of State funds expended for public transit capital projects, which varied from roughly $200 million to $1.5 billion annually over that same ten-year period.

[iv]This data was summarized by the California Bicycle Coalition to analyze the regional share of STIP funding. Note that each of these years represents 5 years of spending, e.g., the 2007 figures represent the spending planned for 2007-2011.

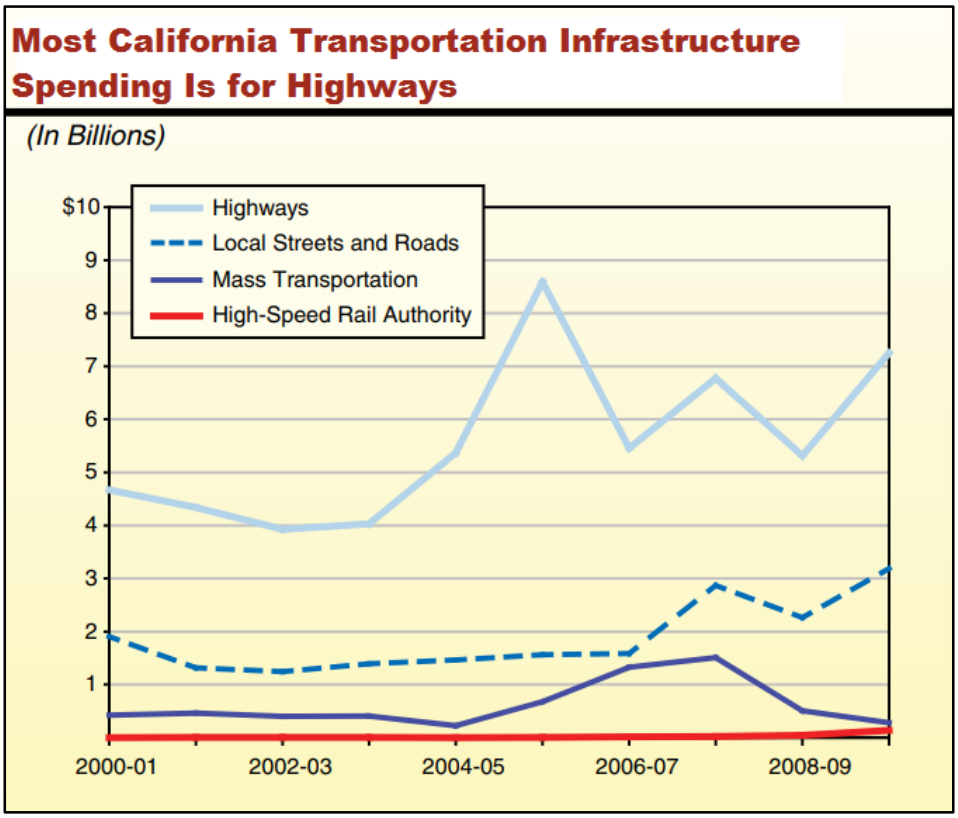


Figure 8: Most California Transportation Infrastructure Spending Is for Highways. Source: CA Legislative Analyst's Office[27]

A recent study of the end-uses of the entire suite of California transportation funding programs, including capital and operation funds, found that that dominance of automobile-oriented expenditures persists. It concluded that "current allocation practices do not support the establishment or growth of communities oriented towards reduced auto reliance or alternative modes of travel, and some view the formulae as antiquated."[28]

Not only has excessive highway widening prevented transit and active transportation infrastructure and service from substantially improving, in many cases, the squeeze that it puts on local transportation budgets has also led to cuts in transit service, which contributes to ridership decline.

Such transit service cuts were especially severe and widespread during the recession. For example, in 2010, the Sacramento Regional Transit District cut service hours by 20%.[29] Despite small increases in service provision in recent years, its level of service has still not yet reached 2008 levels again. In the Los

Angeles region, over the period of 2004 to 2018, the bus service offered declined by 15% -- the most severe of anywhere in the U.S.[30] In terms of both vehicle revenue miles per capita and vehicle revenue hours per capita, Los Angeles still lags behind most major urbanized areas.[31]

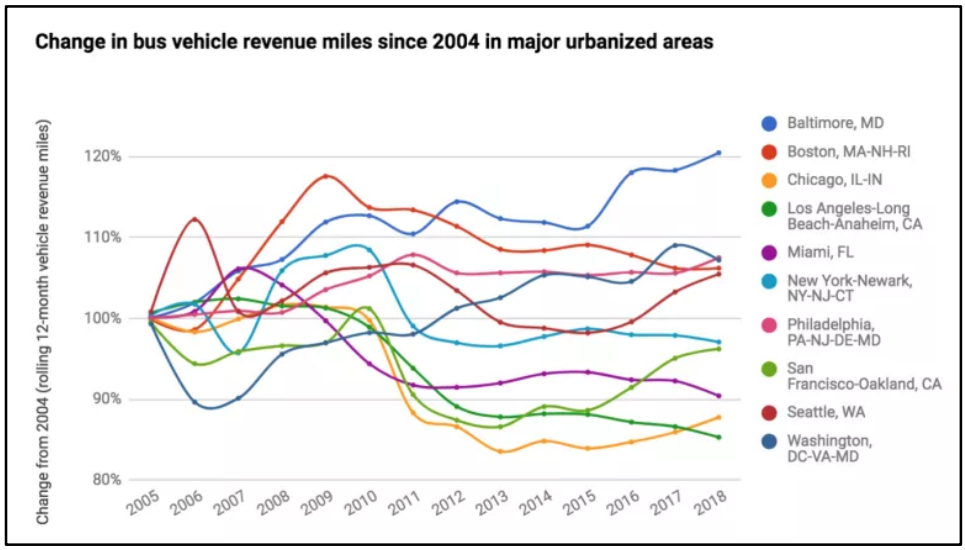


Figure 9: Change in bus vehicle revenue miles since 2004 in major urbanized areas. Source: Federal Transit Administration, National Transit Database[32]

Figure 10: Transit service cuts in 2009-10. Source: Transportation for America[33]

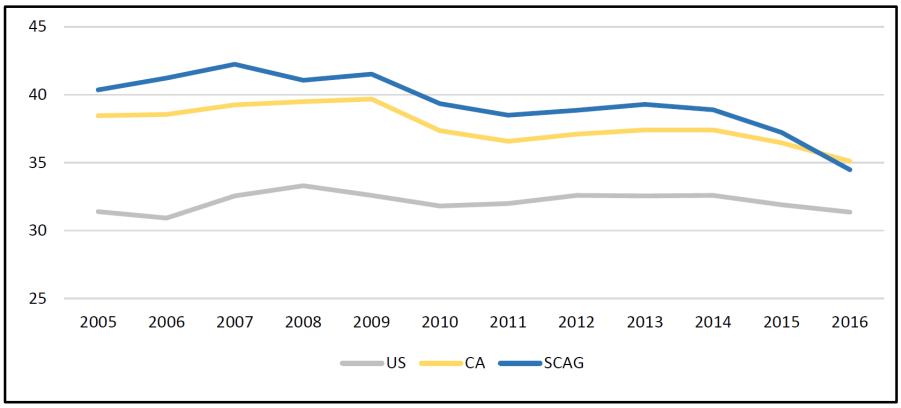


Figure 11: Transit trips per capita (includes combined bus and rail). Source: National Transit Database (2000-2016)[34]

Our state's failure to invest sufficiently in transit and active transportation infrastructure and service has prevented these sustainable modes of transportation from becoming viable options for most Californians. There is a latent demand for these sustainable mobility options, though. According to polls, a much greater percentage of people want more public transit service and active transportation infrastructure than are currently using these modes in their sub-standard form. Respondents also say that if improvements were made to transit and active transportation networks, they would gladly switch to those modes. For instance, even among Californians who rely on driving as their primary mode of travel, 43% of respondents support investing as much or more transportation funding in alternatives to driving as investments in freeways. For respondents that have to commute 20-30 miles a day, this support jumps to 61%.[35]Also, nearly two-thirds of California voters claim they would bike more with more protected bike lanes on streets.[36]

Yet, as funding for these sustainable transportation modes lags far behind public demand, disparities between transportation modes persists. Slow transit service and unsafe walking, biking and rolling conditions tilt the scale, such that the majority of people who have the option to drive, choose to do just that, rather than subject themselves to inferior travel conditions on public transit or active transportation modes. However, many low-income households do not have that choice; it is those transit-dependent people, who already face numerous barriers to accessing opportunity, who are most burdened by funding allocations that

prioritize highway expansion over transit and active transportation infrastructure improvements.

A burden that is disproportionately borne by lower-income, transit-dependent households when we fail to allocate sufficient funds to improve transit service comes in the form of a sizeable time burden associated with transit use. As shown in Figure 12, in California's major metropolitan areas, commutes by bus, trolley, subway or streetcar take about twice as long as drive alone commutes, and commutes by commuter rail take about three times as long.

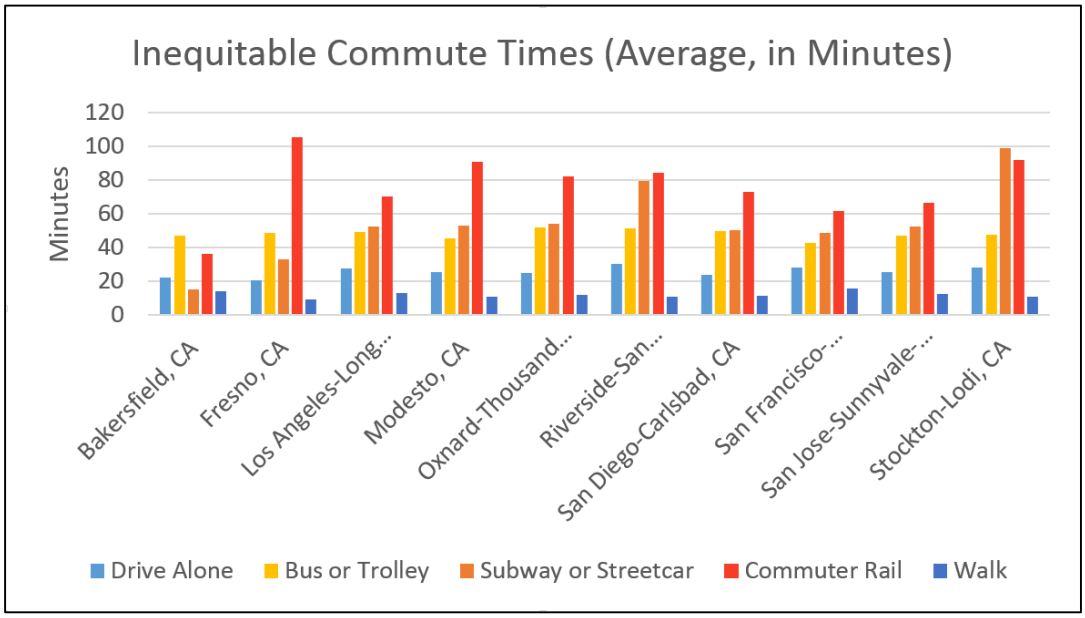


Figure 12: Inequitable Commute Times (Average, in Minutes). Source: Governing Magazine[37]

The large time burden of transit commutes impacts the accessibility of jobs and other opportunities for transit-dependent households. As shown in Figure 13, for city residents in California's major metropolitan areas, on average, only about 41% of workers are able to access their job within a 90-minute transit commute; for workers living in the suburbs, only 23% of them are able to do so.

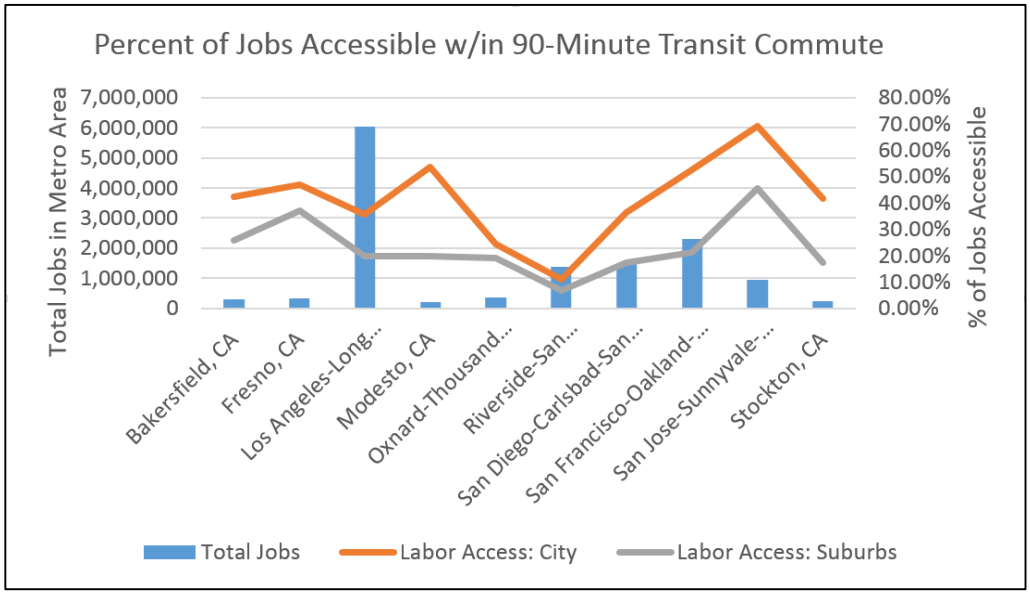


Figure 13: Percent of Jobs Accessible w/in 90-Minute Transit Commute. Source: Brookings Institution[38]

Historical prioritization of automobile travel in California's transportation infrastructure provision has stunted the development of active transportation infrastructure. Limited funds have been allocated for active transportation infrastructure, and space for safe passages has been stingily allocated, too. Inferior conditions for walking and biking are all too common across the state, but the largest loss of pedestrian and cyclists lives is amongst its lower-income communities. As shown in Figure 14, within California metropolitan areas, pedestrian deaths are approximately twice as common in low-income census tracts as they are in more affluent neighborhoods. Bicycle crashes are also highly correlated with lower-income levels and ethnicities other than white across the state.[39] Figure 15 shows an example of the correlation between lower-income areas and pedestrian and bicycle fatalities, as well as a relative lack of bicycle infrastructure in the City of Los Angeles.

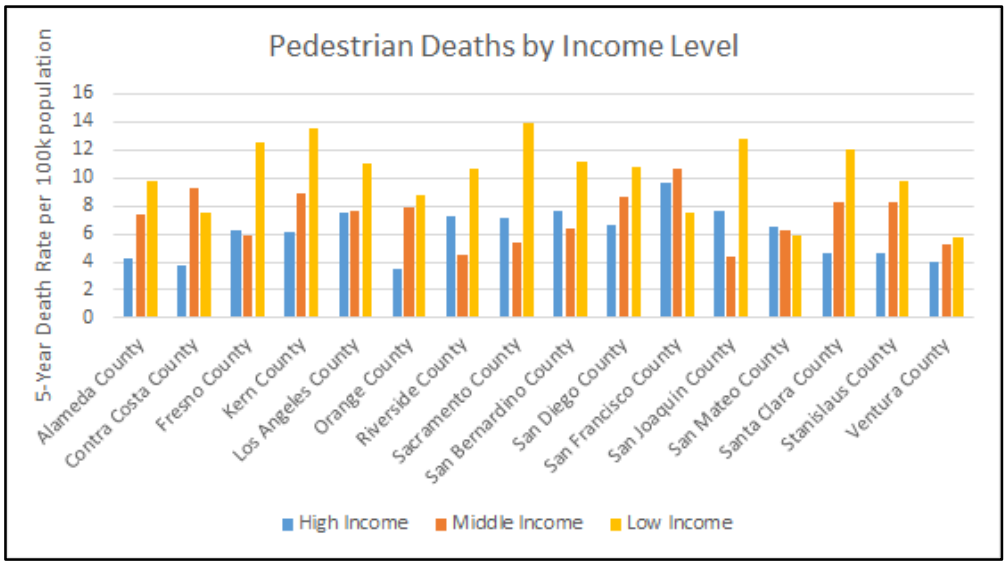


Figure 14: Pedestrian Deaths by Income Level. Source: Governing analysis of NHTSA Fatality Analysis Reporting System data and U.S. Census Bureau 2008-2012 American Community Survey estimates[40]

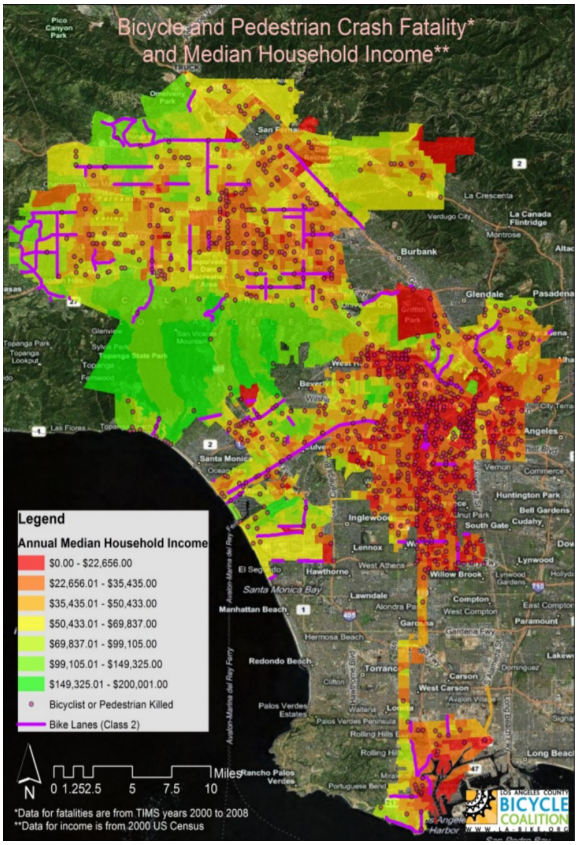


Figure 15: Bicycle and Pedestrian Crash Fatality and Median Household Income. Source: Los Angeles County Bicycle Coalition[41]

Highway expansion induces sprawl

The causal relationship between highway expansion and sprawling development patterns is one that has been much studied by regional planners, and the findings are conclusive. It is by widening highways and extending them into previously undeveloped land, that low-density car-oriented development patterns are spurred and reinforced. In California, we have a history of expanding our freeway system to enable cheap land development on the fringes of suburbs. One study of development patterns that followed 24 distinct freeway widening projects across California found the hypothesis of induced land development "substantially confirmed". It found that home building is especially responsive to such highway capacity expansion projects, having an elasticity well above 1.0.[42]

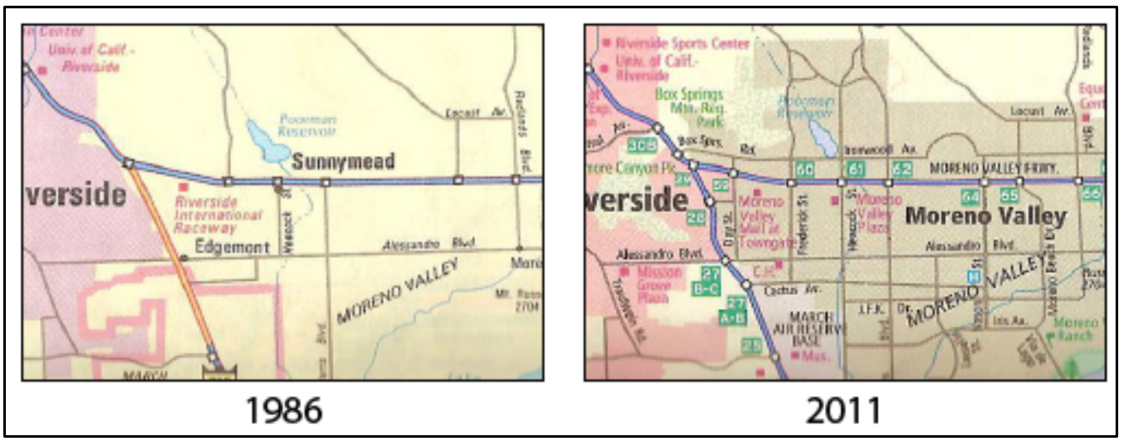
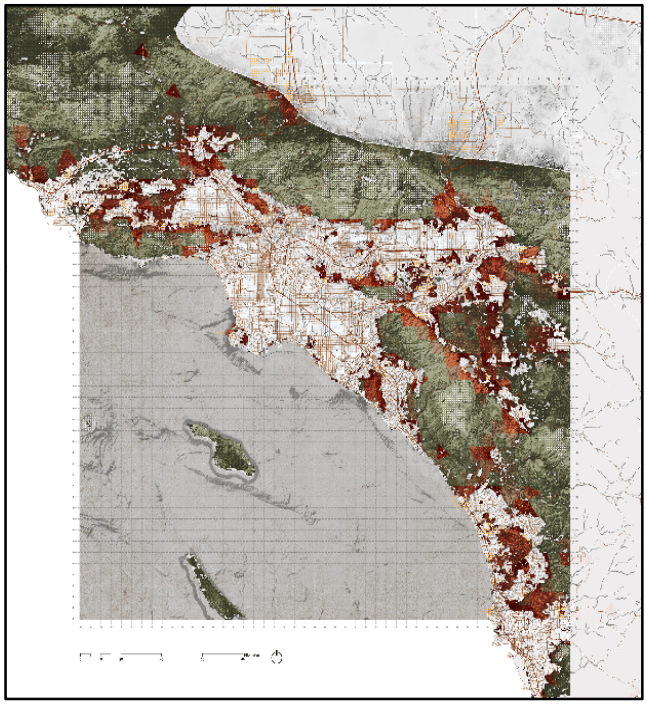


Figure 16: Moreno Valley population grows by nearly 400%, from 40,000 in 1986 to 195,000 in 2011 following highway capacity expansion. Source: Graphicarto[43]

Figure 17: Sprawl development following the extension of the I-15 freeway south of Rancho Cucamonga and the east-west 210 freeway to the north. Source: Graphicarto[44]

Such mostly residential, low-density outward development results in people living far from commercial centers and where they work, which makes it difficult to provide transit service to meet their needs and traps them in long, car-dependent commutes.

This outward land development pattern on the urban fringes also cuts into previous natural and working lands, diminishing not only people's access to open space and the availability of remaining wildlife habitat, but also putting a strain on our food production systems and deteriorating ecosystem services like groundwater recharge, flood abatement and carbon sequestration.[45] This is particularly true in the San Joaquin Valley, which has some of the most productive farmland on the planet, severely over drafted aquifers, and a pattern of low-density, car-dependent development.



As natural land areas shrink and become increasingly fragmented, ecosystem functions suffer and numerous endangered species face mounting threats to their continued existence. For instance, the anticipated urban growth of Los Angeles would shrink increasingly sparse habitat for 219 imperiled species.[46]

Figure 18: Los Angeles's biodiversity conflict zone, where the 2030 growth forecast[47v] would destroy natural habitat of endangered species[48vi]. Source: Atlas for the End of the World[49]

Displacement

As outward sprawl development persists, there has been a shortage of equitable development occurring in infill areas, and mounting displacement pressures in the urban core are resulting in a "suburbanization of poverty."[50] Severe housing shortages across the state are most pronounced for low-income households near job centers, where 2.2 million low-income households compete for only 664,000 affordable rental homes.[5152]

The demand for compact, walkable living is high and on the rise; national poll results find that 6 in 10 respondents are willing to pay more to live in a walkable community.[53] Low-income households prioritize living close to convenient public transit at a higher rate than any other economic group.[54]

Without producing and/or preserving sufficient affordable housing for low-income people living in the urban core, housing prices in those areas, which are

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[v] As modeled by the Seto Lab on Urbanization & Global Change at Yale University.

[vi] These are based on the International Union for Conservation of Nature (IUCN)'s data for Terrestrial Mammals, Amphibians, Birds, Reptiles and Freshwater Groups.

best served by transit, are on the rise.[55] Lower-income households, which have historically used public transit at much greater rates than higher-income people, are not able to afford those rising housing costs and are getting displaced further out onto the urban fringe.[56] Low-income people, people of color and immigrants are often hit the hardest by displacement pressures.[57]

This has consequences for ridership declines, as the incoming higher-income households do not use transit as much as those lower-income households that are getting displaced.[58] It also creates a situation where we are presented with a false social imperative: either we build affordable housing on the fringe, or these lower-income households will have nowhere to live. Currently, outward sprawl is producing a "drive until you can afford to live" scenario, in which displaced lower-income households are now faced with mega-commutes that are not well served by transit, and so must turn to an automobile-dependent lifestyle instead.

This displacement of lower-income households to the urban fringe not only contributes to increasing VMT (and thus congestion) and increasing the environmental footprint of expanding urban areas, it also has serious personal and social consequences for individuals, families and communities. Communities and social networks get disrupted, displaced people experience higher rates of stress and depression, displaced children's academic performance suffers, and displaced teenagers have higher pregnancy rates and earlier initiation of illicit drug use.[59]

Displaced individuals to areas without access to transit options sacrifice countless hours in long car commutes -- time that could otherwise be spent strengthening family bonds or trying to get further ahead in life. The negative consequences of increasing the transportation burden that low-income households bear are numerous and contradictory to an equity agenda. Rather than making life harder for our most vulnerable people, we must aim to reduce barriers to accessing opportunity for those people most in need, and to create healthy communities of opportunity for all.

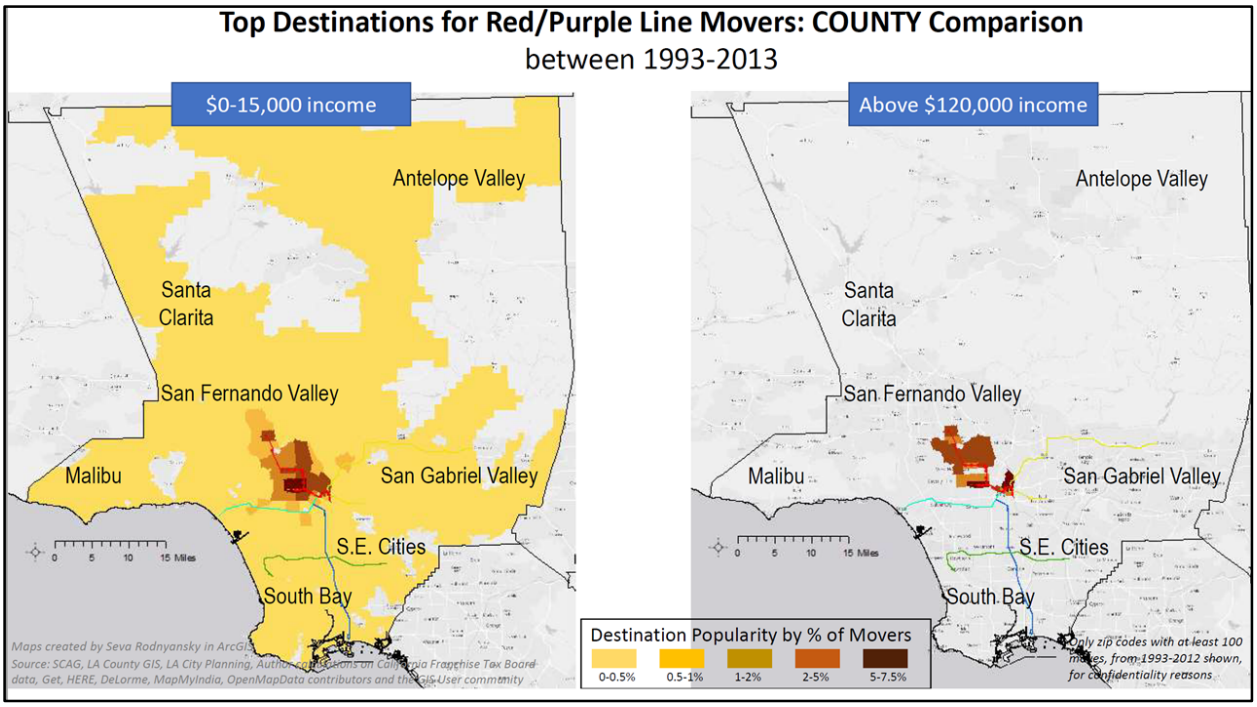

Figure 19: Top Destinations for Red/Purple Line Movers: COUNTY Comparison between 1993-2013. Source: California Franchise Tax Board data[60]

Poor health outcomes from lack of physical activity, air pollution, and motor vehicle injuries

Automobile-dependence and lack of active transportation options also places a burden on human health. Less physical activity due to personal automotive travel is associated with premature mortality, an increased risk of strokes, and a variety of chronic diseases, including diabetes, hypertension, heart disease, osteoporosis, and depression. The California Department of Public Health (CDPH) attributes more than 23,000 deaths in the state to lack of physical activity. In a nationwide study, shown in Figure 20, researchers found a 99.6% correlation between VMT per licensed driver and obesity rates, indicating that more miles traveled is very closely related to a higher obesity prevalence among the U.S. population.[61]

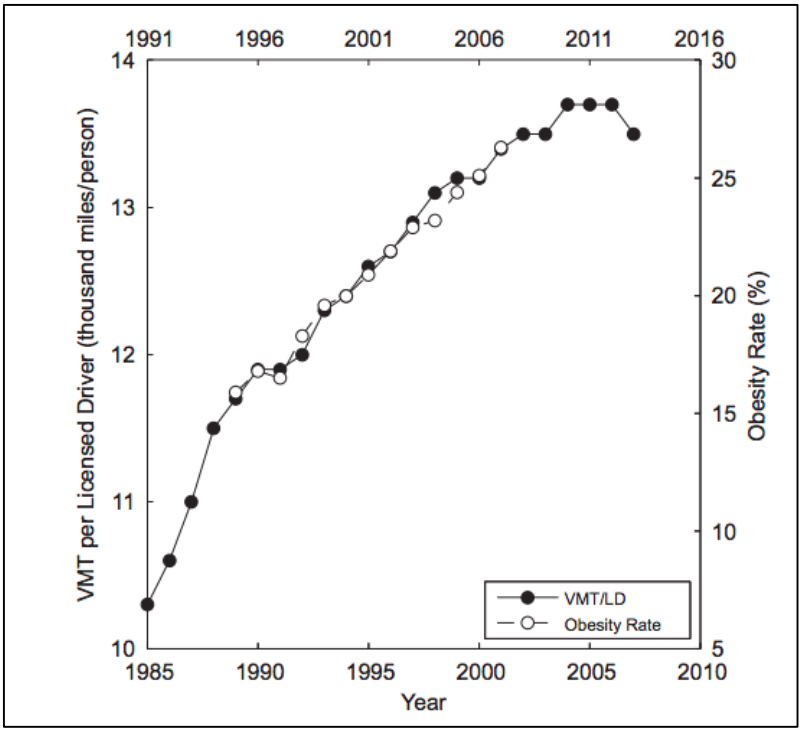

Figure 20: Time series for VMT/LD (1985–2007) and adult obesity rate (1995–2007), with a six-year lag applied to the obesity rate trend. Source: Transport Policy [62]

Greenhouse gas and particulate matter pollution from transportation emissions also impacts local air quality. Automobiles powered by fossil fuels emit heat-trapping carbon dioxide and other pollutants that perpetuate increased ambient temperatures and directly harm respiratory health. Ground level ozone production accelerates under higher temperatures, worsening air quality and causing respiratory illness, such as asthma. California is home to the top cities with the worst air quality in the U.S.; in 2017, the nation's s eight most ozone-polluted counties were all located in California.[63]

Air quality is a key indicator of health outcomes, and proximity to highways is a large driver of disease burden, especially in vulnerable populations (low-income people and people of color) who are more likely to live closer to major pollution sources.[64] Studies conclude that areas most affected by traffic pollution globally are located within .2 to .3 miles of a highway and experience increased levels of childhood asthma.[65] In Southern California, high-poverty areas have more than double the exposure to freeways and major roadways compared to the wealthiest communities. Predominantly minority areas also experience 2.5 times more traffic density than non-minority areas.[66]

This increased exposure to air pollution translates to worse health outcomes for low-income and minority communities. For example, about 20% of African American children in California are hospitalized for asthma-- four times more than Non-Hispanic White children.[67] These numbers are especially pronounced in San Joaquin Valley, which is considered to have some of the worst air pollution in the United States. Air pollution in San Joaquin is responsible for 1,300 premature deaths annually and $11 billion lost to decreased productivity from health related issues (shown in Figure 21).[68] The majority (85%) of this pollution is attributed to transportation emissions from mobile sources like vehicles, trucks and buses.[69]

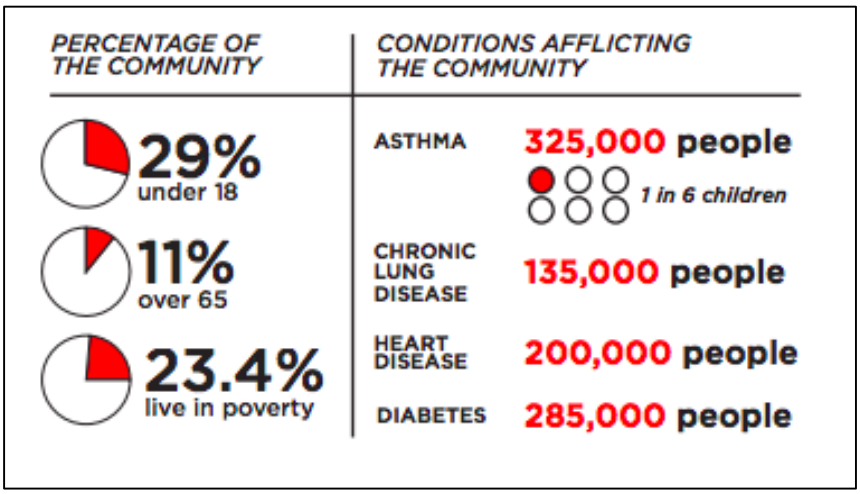

Figure 21: Percentage of San Joaquin Valley residents afflicted with diseases caused by local air pollution. Source: American Lung Association [70]

Aside from the health impacts, this strong relationship between VMT, obesity, and air quality translates to economic costs in the form of increased health care costs and loss of productivity. SCAG estimated that costs from diabetes, heart disease and hypertension, all diseases associated with a lack of physical activity, costs the region over $8.5 billion annually.[71]

Furthermore, motor vehicle collisions pose a major health risk in California. In 2015, 3,345 people were killed and 254,561 people were injured from motor vehicle traffic crashes.[72] Although the majority of these fatalities are from motor-on-motor vehicle collisions, a CDPH study noted an 11% increase in pedestrian fatalities from 2007 to 2013 and determined that during that time period, one-third of children killed in traffic crashes were pedestrians in California.[73]

Additionally, in 2016, about 4.1 percent of motor-vehicle fatalities in California were bicyclists, well above the national average of 2.2 percent.[74] These statistics indicate a need for safer motor vehicle operations as well as more protected pedestrian and biking zones.

Climate pollution is on the rise

Greenhouse gas emissions (GHGs) from the transportation sector make up the largest source of California climate pollution. Yet even as other sectors have had success in cutting GHGs, California's transportation sector is headed in the wrong direction; with passenger VMT increasing, this climate pollution is on the rise.

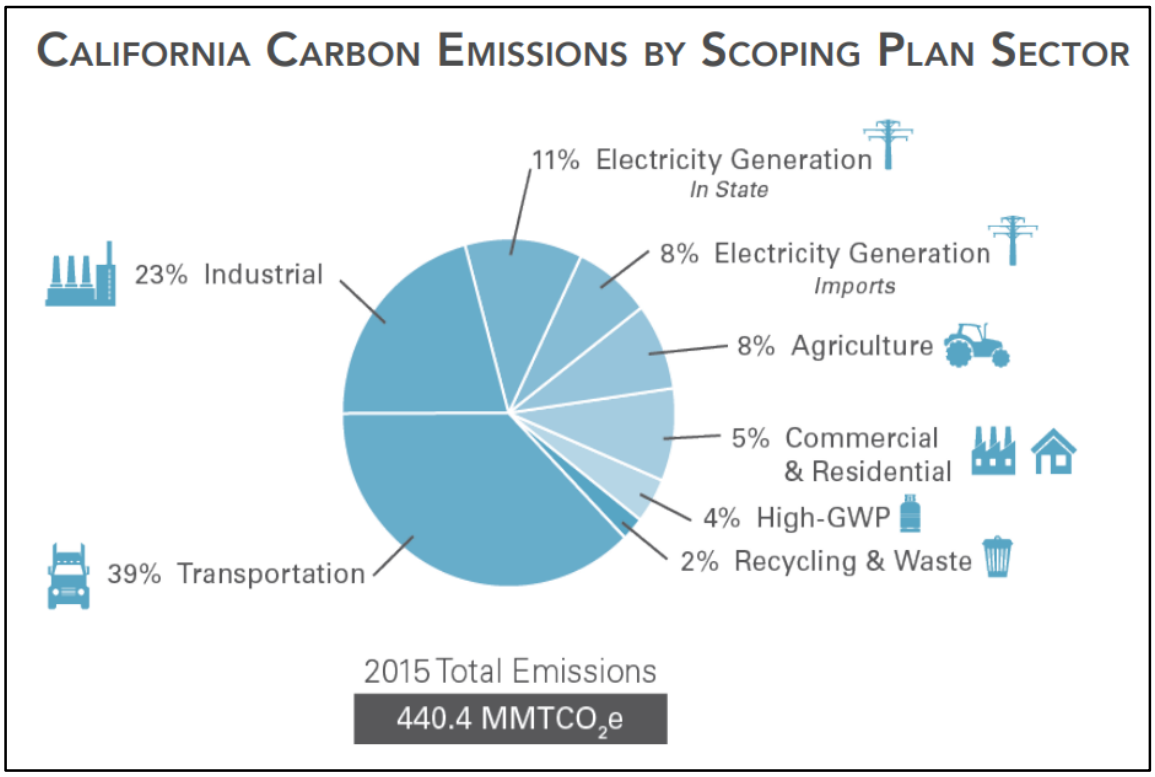

Figure 22: California Carbon Emissions by Scoping Plan Sector. Source: California Air Resources Board[75]

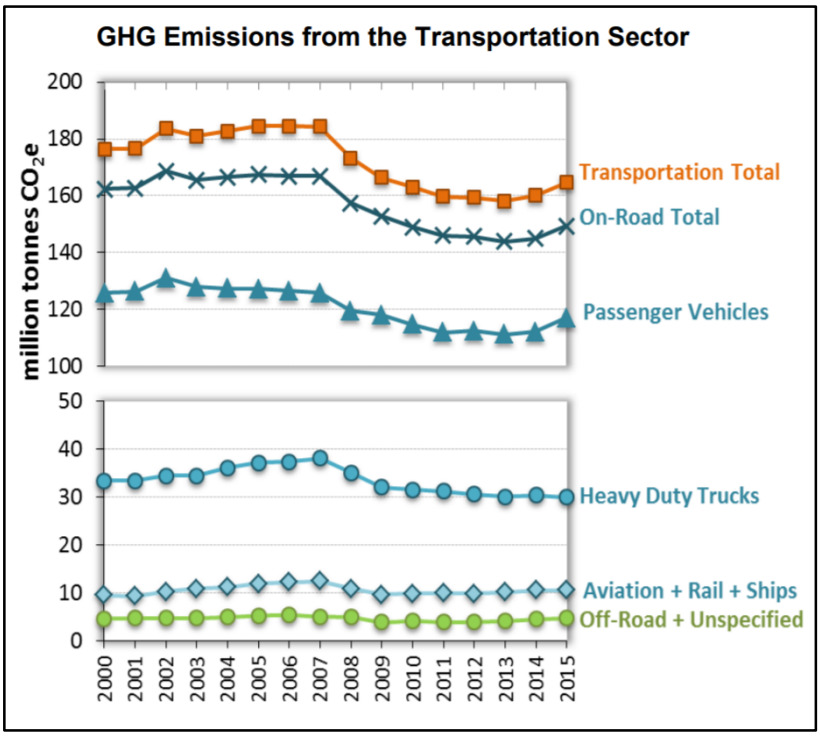

Figure 23: GHG Emissions from the Transportation Sector. Source: California Air Resources Board[76]

As a leader on the global stage for showing how prosperity and GHG reductions can go hand-in-hand, the California Air Resources Board prepares a Scoping Plan once every five years to chart out how we as a state can meet our climate goals. The process involves consulting experts across all of the GHG-emitting sectors of the economy to identify where emissions reductions are feasible and at what pace. Most of the Scoping Plan's GHG reductions come from the Cap-and-Trade program and other sectors, but emissions reductions in the transportation sector are critical to us being able to meet our target and do our part to stop catastrophic climate change. For the transportation sector, the GHG reduction strategy is three-fold: 1.) make cars as clean as possible; 2.) make fuels as clean as possible; and 3.) reduce VMT. Our climate goals cannot be met without all three aspects being pursued in the immediate near-term future.

The amount of VMT reduction that is required to meet our climate targets is a function of the remaining GHG reductions that are needed after already maximizing the amount achieved via clean cars and fuels. For cars, this means that 4.2 million zero emission vehicles (ZEVs) should be on the road by 2030 (up from ~200k in 2016), and that 100 percent of car sales in the light-duty sector will

be ZEVs by 2050. For this to be possible, EV charging infrastructure must undergo a rapid and massive expansion, from the 16,549 public and nonresidential private-sector charging outlets currently in existence to "125,000 to 220,000 charging ports from private and public sources by 2020 in order to provide adequate infrastructure."[77] The Scoping plan scenario also entails significant progress in ZEV penetration in non-light-duty sectors, and for the remaining internal combustion engines in the heavy-duty truck sector to be 90 percent cleaner than current standards.[78] For liquid and gaseous fuels used in the transportation sector, at least an 18 percent reduction in carbon intensity must be achieved by 2030.

Most of the GHG reductions from California's transportation sector are projected to be achieved via these ambitious clean car and fuel trajectories; however, a reduction in VMT is essential as well. As shown in Figure 24, the existing set of clean vehicle and fuel standards that make up the current control programs are sufficient only to meet our 2020 GHG target; however, "beyond 2035, on-road GHG emissions begin to increase without adoption of additional policies as growth in VMT outpaces vehicle fuel efficiency improvements."[79] To meet our GHG target, the amount of VMT reductions needed is: by 2030, a 7 percent reduction in total light-duty VMT below what currently-adopted RTP/SCSs project, and by 2050, a 15 percent reduction in total light-duty VMT below those extended projections.[80]

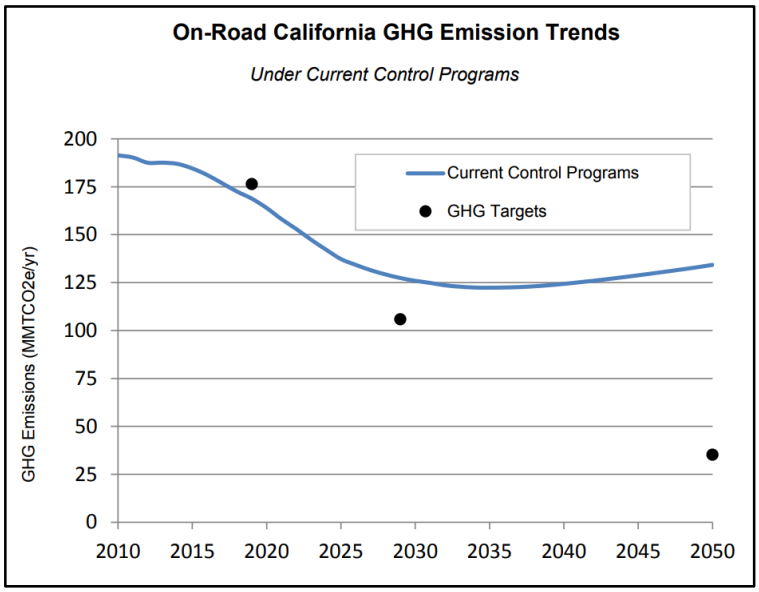

Figure 24: On-Road California GHG Emission Trends -- Under Current Control Programs. Source: California Air Resources Board[81]

Since the passage of the Sustainable Communities and Climate Protection Act of 2008, Senate Bill 375, regional targets have been set for how integrated land use and transportation policy will achieve reductions in VMT. The latest iteration of these SB 375 targets, adopted by the California Air Resources Board in February 2018, falls short of charting the course for where and how we will achieve the necessary VMT reductions to meet our climate goals. Whereas the new SB 375 targets would achieve, in aggregate, a 19 percent reduction in statewide per capita GHG emissions from transportation (relative to 2005 by 2035), in order to meet our climate goals, a 25 percent reduction is needed.[82]

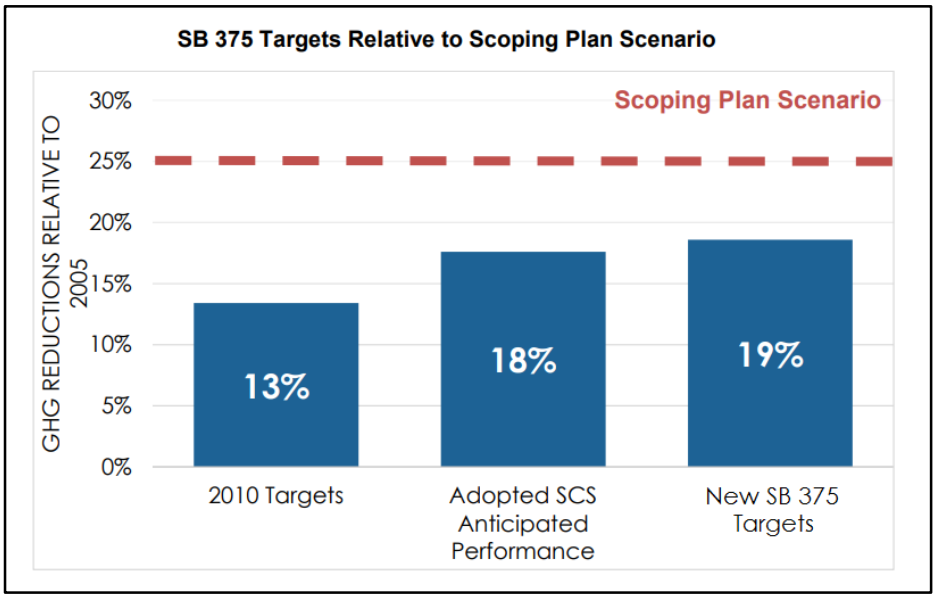

Figure 25: SB 375 Targets Relative to Scoping Plan Scenario. Source: California Air Resources Board[83]

This means that if we were to build out all of the transportation infrastructure projects that are included in all of the Regional Transportation Plans (RTPs) across the state and implement all of the strategies that have been identified by Metropolitan Planning Organizations (MPOs) in their Sustainable Communities Strategies (SCSs), we would still fall significantly short of our climate goal. This "VMT gap" of additional strategies needed to improve transportation sector efficiency cannot be left ignored. The existence of this gap makes transportation the only sector in the Scoping Plan that does not have a fully charted-out path for where the responsibility lies to meet the necessary GHG reductions.[84] We cannot rely on existing policies and planning processes alone; we need to be aiming for

reductions in per capita VMT equivalent to 1.6 vehicle miles per person per day less in 2035 than the trajectory that our current RTP/SCS implementation path has us on.[85]

It is worth noting, that while clean cars and clean fuels have a significant role to play in reducing climate and some local air pollution, they cannot solve all of the other problems associated with increasing VMT. It is only through a reduced VMT scenario that we can also reduce congestion, dedicate sufficient funds towards sustainable transportation modes to make them more viable options, curb sprawl and in doing so preserve natural and working lands, address displacement pressures, improve poor health outcomes that are associated with automobile-dependence, and truly meet our climate goals.

Solution -- improving accessibility & the many co-benefits of a reduced VMT future

Reducing VMT has the potential to increase quality of life and deliver many co-benefits, if pursued in a proactively intersectional, equity-enhancing way.

Most people do not derive joy or utility from the act of driving itself, but rather from the access to opportunity that that mobility makes possible for them. Transportation planning paradigms have evolved accordingly to better reflect this goal of improved accessibility, recognizing that improved mobility is only part of the answer.

For most of the 20th century, transportation professionals considered maximizing speeds and vehicle throughput their fundamental pursuit. However, from the 1970s onward, the inefficiency of that over-reliance on single-occupancy vehicle (SOV) use became clear and the goal shifted to one of mobility -- moving people and goods as efficiently as possible. This shift recognized the importance of mass transit, high-occupancy vehicle use, walking, biking and other sustainable modes of transportation as more efficient than SOV use. It was still based on the misguided assumption, though, that moving people and goods around more is better than less movement.

The next shift to an accessibility paradigm recognized that moving people around just for the sake of moving them around was not the goal to be pursued either, but rather that mobility is a means to achieve access to opportunities.

Accessibility is a function of not only the quality of the transportation options that exist to get people where they want to go, but also the land use patterns that shape where those destinations are located. The aim of contemporary transportation planning should be to effectively integrate with land use planning in a way that improves accessibility -- defined as the ease of reaching a destination or activity. [86] Often, this emerging field of trying to create more efficient access to places is referred to as placemaking.

With this in mind, the following sections describe the mobility and accessibility improvements that are only possible in a reduced VMT future, as well as other co-benefits of reduced societal and personal costs associated with a reduction in driving.

Reducing VMT can help us build better corridors

A reduction in the amount of VMT through a corridor means not only a reduction in congestion, but also an increase of available space for more sustainable modes of transportation to provide safe and convenient mobility.

Some successful examples of corridor improvements that reduced VMT by shifting people to transit and active transportation modes can be found in Los Angeles' investments in a Bus Rapid Transit (BRT) system. Along two of the region's most heavily-traveled arterials, Wilshire Boulevard and Ventura Boulevard, bus service was improved by adding a BRT line with increased frequency, fewer stops and traffic signal priority. These improvements decreased bus travel time by 29 percent and 23 percent respectively, and resulted in a 40 percent and 26 percent increase in ridership.[87] Another full feature BRT line, called the Orange Line, was implemented in the San Fernando Valley on a dedicated right-of-way that also includes a separated bike path. The enormous ridership that it attracted is directly responsible for reducing congestion on the parallel US 101 freeway in the magnitude of a seven percent increase in freeway travel speeds due to reduced congestion, which has reduced the total amount of time spent in congestion by 14 percent.[88] An extensive rider survey of Orange Line passengers found that approximately two-thirds of the riders who previously drove on the US 101 said their travel time had been reduced by taking the Orange Line.[89]

Another study on the effect of transit provision on traffic congestion looked at freeway speed data for a 200-day window surrounding the October - November 2003 strike of Los Angeles County Metropolitan Transportation Authority (Metro) workers that shut down all Metro bus and rail lines for 35 days. During that period, it found an abrupt increase in average delays of 47 percent, or 0.19 minutes per mile, for freeway traffic as a result of the sudden loss of transit service. An extrapolation of those findings is that Metro transit service in Los Angeles is relieving 114 million hours of congestion delay per year on freeways alone, and approximately 222 million hours per year on arterial roads.[90]

The examples go on. In the rural area of the San Joaquin Valley, the Kings County Area Public Transportation Agency (KCAPTA) farmworker vanpool service, which operates on a full cost recovery basis via fares that are collected according to mileage ridden on a monthly basis, is responsible for eliminating 375,500 vehicle commuting trips a year.[91] Another project that would connect the San Joaquin Valley towns of Merced and Modesto to the Tri-Valley and San Jose in the South Bay via commuter rail service, the planned extension of the Altamont Corridor Express (ACE), is projected to decrease annual VMT by 21.5 million in the near-term, and 30.1 million by 2040.[92] In the East Bay, awareness-raising about public transit service in the form of individualized transit marketing, called the TravelChoice program, resulted in a 14 percent reduction in drive-alone trips and a 34 percent increase in transit use.[93]

Another vibrant example is the removal of the Embarcadero Freeway in downtown San Francisco following earthquake damage in 1989. It was replaced by an attractively landscaped boulevard, a pedestrian promenade, and trolley service. Vehicle throughput dropped by 50 percent, transit commute trips increased by 75 percent, and economic development in the form of a 54 percent increase in housing units and 23 percent increase in jobs quickly ensued.[94] This waterfront corridor has been transformed, without detriment to traffic conditions, because of its transition from being dedicated to automobility towards greater multi-modal mobility and livability.[95]

In all of these cases, and potentially many more to come, investments in sustainable modes of transportation are providing congestion relief by reducing VMT and improving people's lives by liberating them from automobile dependence. It is important to note, though, that such improvements to multi-

modal mobility that make a place more desirable, are also likely to have the consequence of driving up property values, and the displacement pressures that go with that. This is why it is crucial that such multi-modal transportation investments are made in tandem with the implementation of strategies to reduce displacement risk, such as what the Affordable Housing & Sustainable Communities program was set up to do.

Reducing transportation burden of long commute times means more time for other, more rewarding activities

With more alternatives to driving alone to work, congested roadways will be relieved. VMT reduction lessens road congestion and by effect transportation burden of all commuters, including drivers, whether measured in time or price. For example, the Bay Area Commuter Benefits program incentivizes employees of participating organizations to switch from driving alone to other transportation options. Over the first year of program implementation, the program estimated it reduced 85,600,000 VMT.[96] Even a 4% decrease in traffic volume in the Bay Area Interstate 80 corridor can cut road congestion in half. This highlights the benefit of VMT reduction as a way to reduce road congestion and overall time spent in traffic.[97]

Shorter commute times have a plethora of benefits to drivers, including more time to complete desired activities, increased work productivity, lessened opportunity cost of commutes, lower insurance premiums and mental and physical health benefits. For instance, one study found that spouses with commute times shorter than 45 minutes are 40% less likely to get divorced compared to couples with longer commutes. Along with other impacts, long commute times limit couples' time spent together and strain opportunities for relationship building.[98]

Furthermore, while there are some critiques of longer commute times using public transportation, there are opportunities to engage in other meaningful activities that require complete attention, such as reading or working, which could free time for post-commute activities. One study concluded that although individuals in San Francisco on average have longer commute times than Los Angeles, commuters in San Francisco were less stressed than their southern counterparts due to transit mode.[99]

Increasing accessibility to essential services improves equity

A more integrated society where people have easier access to destinations is better than a sprawling, stratified one. Instituting equitable smart growth practices to curb sprawl, minimize displacement, and reduce VMT will improve transit options and streetscapes' vibrancy. This will benefit all Californians, but especially vulnerable populations such as elderly and low-income individuals who may not have access to operating an automobile.

Investing in transit options with greater reach and frequency increases access to jobs, education, grocery retailers and healthcare facilities. This greater access to opportunity will help to reduce some of the great disparities that exist today, reducing racial and socio-economic segregation and alleviating political, social and economic problems. A study on upward mobility identified commuting times as the strongest factor correlated with escaping poverty.[100] Assessing commute times of various counties in the U.S., researchers determined that in counties with shorter commute times, low-income residents were more likely to increase their earnings. Furthermore, the study determined that within specific commuting zones, communities with higher rates of upward mobility also have less economic and racial segregation, less income inequality, less violent crime, better schools and more two-parent households.[101]

Aside from reducing commute times and barriers to accessing viable transit options, VMT reduction policies will also promote more compact, walkable community development. Such centralized development patterns are expected to increase general access and proximity to essential services for low-income communities, as compared to the current displacement trend. Affordable compact development will also lead to more mixed-income communities and better distribution of resources, such as quality education, healthcare, and grocery retailers.

Investments in multi-modal mobility and infill areas should be accompanied by policies that mandate community engagement practices and prioritize jurisdictions where anti-displacement policies have been adopted. Equity considerations and community engagement when making investments are crucial to avoid inflicting harm and to direct significant benefit to already disadvantaged communities by both maintaining existing communities and creating new opportunities for those communities to thrive. For example, the Affordable

Housing & Sustainable Communities program requires various levels of community input to receive project grant funds during the project development and implementation stages. This includes mandating MOUs from community representatives and attendance of community meetings.

By reducing VMT, offering mobility options other than solo-driving, and supporting equitable infill development, essential services will become more accessible for both drivers and non-drivers.

Curbing sprawl conserves open space

Prioritizing VMT reduction policies that reduce the amount of solo-driving that occurs in personal vehicles also means offering solutions for compact development. VMT reduction provides an opportunity to redirect sprawl inducing investments such as highway expansion towards mobility options for greater transportation-efficient land use patterns, and in doing so curb sprawl and by effect conserve open space.

Figure 26: SOAR protected areas in Ventura County as indicated by the green overlay. Source: County of Ventura- IT Services[102]

One protection against urban sprawl is to institute an Urban Growth Boundary (UGB), in which development boundaries for cities are established to preserve natural and working lands outside of that boundary. Currently, the city of Ventura has a similar initiative called Save Open Space & Agricultural Resources (SOAR), which requires Ventura citizens to vote before rezoning agricultural land or open spaces for development.[103] This measure alleviates pressure from city officials to expand urban boundaries for sprawl development, while not restricting infill development to accommodate population growth needs.

It is important to note that UGBs most effectively reduce VMT when accompanied by policies that promote equitable infill development and preserve affordability of housing within the boundary so as to not inflict displacement pressures on low-income residents. Investments in public transit service and active transportation infrastructure are also key to reducing VMT in UGB areas. These solutions should not be pursued in silos, but rather through an integrated, equity-based approach.

Reduced VMT and active transportation benefits to public health

Shifting investments from highway expansion to public transit and active transportation infrastructure will enhance opportunities for daily commutes and other trips to include more active transportation, since the majority of transit riders get to and from stops by foot. A robust active transportation infrastructure network has been linked to many co-benefits, including increased physical activity and reduced air pollution and traffic injuries.

Models project that if California achieves its stated goal of doubling walking and transit trips and tripling bicycling by 2020, there would annually be 2,095 fewer deaths and 30,124 fewer years of life lost and disability just from this increased physical activity alone.[104]

To encourage this mode switch and achieve such improved health outcomes, there must be infrastructural investments to keep pedestrians and cyclists safe. Without such investments, reaching California's active transportation mode share goals is expected to cause 254 additional deaths annually from more road collisions.[105] While traffic injury risk associated with each mode share is expected to decrease as these modes become more common and achieve greater visibility, the sheer increase in the amount of pedestrians, cyclists, and transit passengers on the road is attributed with this anticipated rise in deaths, if infrastructure

improvements are absent. Therefore, it is necessary to prioritize more robust active transportation infrastructure to accompany mode shifts, such as separated bike lanes and well-lit crosswalks, to minimize future harm to pedestrians and cyclists.

The benefits to public health of active transportation are substantial. In the Southern California Association of Governments (SCAG) region, 13.3% of trips taken in 2016 were by active mode, such as walking and biking. The physical activity from this current share of active transit has preventative health benefits in the form of preventing annually 84,773 cases of hypertension, 14,016 cases of heart disease and 29,824 cases of diabetes in adults in the SCAG region, along with $273 million in reduced associated healthcare costs.

To go further in this more active direction, the SCAG 2016 RTS/SCS plan includes a substantial build-out of the region's active transportation infrastructure network. The plan allocates funds to improve active transportation regional-trips, short-trips, transit integration, and education, which is expected to increase the active transportation mode share by 32.5% by 2040.[106] From these planned investments, along with land use planning that supports active transportation modes, SCAG anticipates an increase in physical activity that would annually prevent an additional 81,657 cases of hypertension, 15,985 cases of heart disease and 15,076 cases of diabetes. Lower fuel and vehicle maintenance costs from using active transportation compared to personal passenger vehicles, as well as increased economic return from active transportation infrastructure construction, programmatic and strategic spending costs also would provide significant economic benefits, as demonstrated in Figure 27.[107]

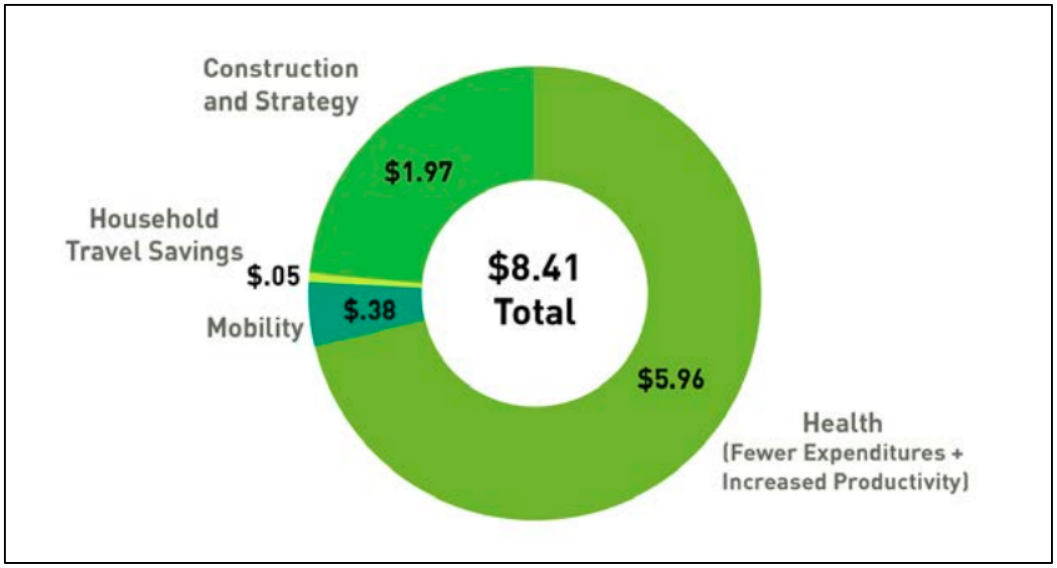

Figure 27: Increased Sale Output per $1 in AT-RTP Spending. Source: Southern California Association of Governments[108]

Yet, there is still much room for improvement in the SCAG region as 84.7% of daily trips are currently taken by automobile.[109] Increased activity not only improves physical health, but also has a plethora of benefits that support improved mental health and overall quality of life. This presents a large opportunity to ameliorate public health issues and costs by prioritizing active transportation investments.

Reduced VMT reduces transportation-related injuries and deaths

Furthermore, less driving will reduce driver, passenger, pedestrian, and bicyclists' exposure to motor vehicle collisions. Transitioning to a lower VMT/per capita transportation system by promoting public and active transportation is expected to provide an overall safer multi-modal transportation system. This is because public transportation has less than a tenth of the per mile traffic casualty rate as automobiles.[110] Furthermore, policies that limit sprawl and rural expansion will also reduce crash rates. From 1994 to 2005, 57% of all traffic fatalities in the United States were in rural areas, although only 21% of the population lives in rural areas.[111] This divide could be attributed to a number of different variables, such as higher roadway speeds or more VMT per capita in rural areas due to less dense destinations.

Action -- must be intersectional, equity-enhancing, and coordinated across jurisdictions

The reduced VMT paradigm described in the preceding pages, if pursued in a well-coordinated, thoughtful way, has the potential to not only stop congestion from worsening, improve multi-modal mobility, enhance access to opportunity, deliver better public health outcomes, and preserve essential ecosystem functions -- it also has the potential to make our state a more just and equitable one. In order for this to be the case, though, a number of strategies must be pursued in an intentionally intersectional, thoughtfully equity-enhancing, and strategically coordinated way across multiple jurisdictions.

For example, multi-modal mobility enhancements should be prioritized for our communities of greatest need and accompanied by a set of anti-displacement strategies, so as to not diminish core transit riders' accessibility to transit service. Efforts to increase active transportation use must go hand-in-hand with safety improvements, including those that minimize the risk of crashes with cars, and those that protect people from exposure to extreme heat conditions.

In a follow-up to this framing document, we will be preparing a proposed action plan, in which we recommend how State agencies should move forward with implementing a number of VMT-reducing strategies in an equity-enhancing way. This includes a number of strategies that were named in the Scoping Plan Appendix C and alluded to in this framing document already, as well as others that deserve swift and considered action.[112]

Our ask is that leaders in these State agencies be prepared to respond to our proposed action plan either affirmatively, or affirmatively with amendments by the December 2018 joint meeting of the California Air Resources Board and California Transportation Commission.

The time for committing to a paradigm shift is now. If we do, the future for California is bright. If we do not, congestion will only get worse, access to opportunity will suffer, and Californians' quality of life will be imperiled.

It is our impassioned hope that in the future, investments aimed at reducing congestion will create mobility options alternative to driving (long distances)

alone. We need to be investing in projects that reduce VMT, and not ones that induce additional VMT.

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