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What California Gains from Reducing Car Dependence

April 2020

A White Paper from the National Center for
Sustainable Transportation

Susan Handy, University of California, Davis



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16. Abstract Cars provide an unparalleled level of mobility but have negative financial, public health, environmental, and social impacts. Reducing the need for driving in California would produce a range of household- and community-level benefits. Driving is associated with adverse health effects (e.g., obesity, high blood pressure, depression, injuries, fatalities), while commuting by walking or biking provides numerous physical and mental health benefits. A reduction in driving would also improve public health by decreasing air pollution and greenhouse gas emissions. It would save substantial sums of money: households spend about \$9,000/year or 16% of their expenses on private vehicle ownership (2017 data) and the state spends over \$500 million per year on highway maintenance. A less car-dependent society would also be more equitable for those with limited income or limited physical abilities who cannot drive, to the benefit not just of those individuals but the community as a whole. While it is not realistic in the foreseeable future for most Californians to live without their cars, it is possible to decrease car dependence. Doing so requires a shift away from a century-old prioritization of the goal of reducing vehicle delays over other important goals. Creating a less car-dependent world is not necessarily more costly to the public and can be achieved over time through changes in land use and transportation planning practices. Answers to many of the frequently asked questions about such efforts are provided.			
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What California Gains from Reducing Car Dependence

A National Center for Sustainable Transportation White Paper

April 2020

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TABLE OF CONTENTS

Benefits of Driving Less	1
Individual and Household Benefits	2
Community Benefits	4
Strategies to Move Toward Less Driving	6
Frequently Asked Questions on Strategies for Reducing Car Dependence.....	7
References	11

What California Gains from Reducing Car Dependence

Benefits of Driving Less

Imagine a world where you could do everything you do now but with less driving. You would have the option of walking to a transit center where you could board a train that would bring you within steps of your workplace. You would be able to find housing that you could afford not far from where you work. You would have coffee shops and restaurants within a long walk or a short bike ride from home. The supermarket where you do your weekly shopping would be just a short drive away; you might call up a ride-hailing service rather than driving a car of your own. In this world, you would have options for getting where you need to go in your everyday life, and you would be able to get there easily.

Reducing the need for driving makes it possible to reduce the amount of driving we do and the myriad negative impacts that come with it: greenhouse gas emissions, air and water pollution, injuries and fatalities from crashes, wear-and-tear on the roads that is costly to repair, ambient noise levels, and the stress of driving in congested conditions, among others.¹ Some of these impacts are being reduced through technology that lessens the per-mile impact of driving without changing the amount of driving. Electric vehicles, for one, are essential to the goal of reducing greenhouse gas emissions from transportation and are a key strategy in California's 2017 Climate Change Scoping Plan. But electric vehicles and other technologies do not yield enough reductions in greenhouse gas emissions for the state to meet its goal: the state also needs a 15% reduction in total light-duty vehicle travel by 2050 [10]. And electrification does little to reduce many of the other negative impacts of driving. Even with electrification, households and communities would benefit in many ways from reduced auto dependence.

This paper outlines the benefits that accrue to individuals and households as well as the community as a whole from a reduction in the need to drive (Figure 1). Some of these benefits stem from a reduction in driving itself. Others stem from the changes associated with reductions in driving, especially from a shift toward active modes and changes to the built environment that are necessary to support this shift as well as shorter driving distances.

¹ This paper draws heavily on Fang and Volker (2017).

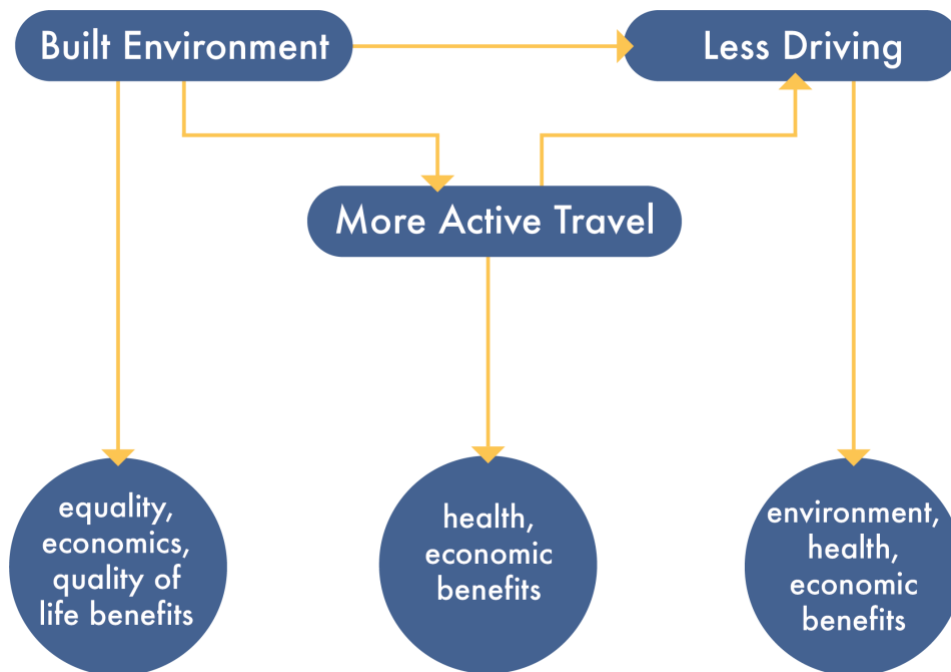


Figure 1. The benefits of changes that lead to less driving

Individual and Household Benefits

Individual and household benefits for those who drive less include reduced financial burden, improved, health, and better accessibility to opportunities.

- Financial burden:** Reducing the need to drive could save households substantial sums of money. U.S. households spent an average of \$9,032 on their cars in 2017; this represents 16% of expenditures for the average household and nearly all of its transportation costs of \$9,737 (Figure 2) [5]. Across the income spectrum, transportation accounts for 17% of all spending for households, though the burden is far greater for low-income households. Of households with annual incomes under \$20,738, 67% own a car, despite the substantial cost [5], and 60% of households below the poverty level feel that transportation is a financial burden [1]. In communities with good regional transit connections and accessibility to jobs and amenities, households have the potential to reduce transportation costs by reducing driving [23, 24, 51]. Money saved by driving shorter distances or switching to active modes is money that can be spent on other important household needs.

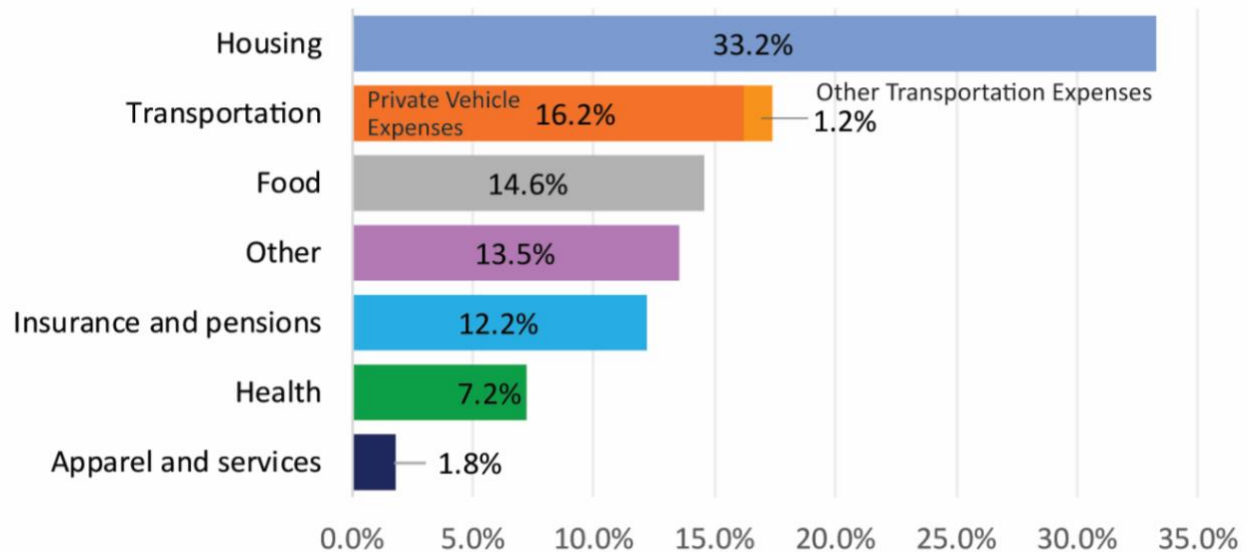


Figure 2. Average Individual Household Expenditures (major categories), 2017 (Bureau of Transportation Statistics, 2017 [5]). Average total expenditures \$55,866; average spending on transportation \$9,737; average spending on purchasing, operating, and maintaining private vehicles, \$9,032.

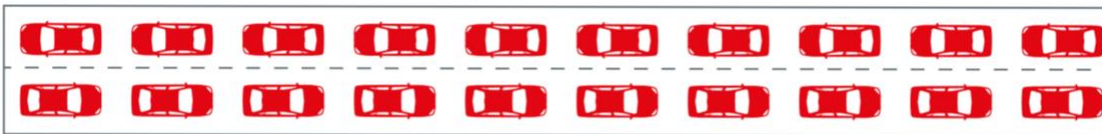
- Personal health:** Reducing driving reduces its negative effects on health. Driving is a sedentary activity, contributing to obesity as well as other health problems [2, 31]. California counties with the highest amount of driving per capita tend to have the highest mean obesity rates [35]. Commuting by car is also stressful [45]. Long driving commutes are associated with poor mental health outcomes and related consequences, including negative mood, poor concentration, driver error, and traffic collisions [28]. Living in more auto-dependent areas can contribute to increased blood pressure, headaches, and social isolation [48] as well as depression [21]. By comparison, according to a 2007 survey, commuters rated walking and bicycling to be less stressful and more satisfying (i.e., pleasant and stimulating) than driving [20]. Moreover, active modes increase daily physical activity, leading to a broad range of health benefits [12, 46].
- Access to opportunities:** Changes to the built environment that enable less driving also give households more options and thus more flexibility as to how to get places. Options are especially important for individuals who are unable to drive themselves, whether owing to age or ability. Transit access is especially important for low-income households. With more limited access to cars, households below the poverty level make fewer and shorter trips each day than households with greater resources. Among these households below the poverty level, those without cars account for more than half of all walking, biking, and public transit trips [1]. Having more travel options improves access to services, jobs, and other activities and thus expands economic and social opportunities [36].

Community Benefits

The more that individuals reduce their driving, the more the community as a whole benefits. Everyone benefits with respect to system efficiency, economic sustainability, environmental sustainability, public health, and social equity, not just those who reduce their driving.

- **System efficiency:** Because active modes of travel and transit are more efficient from the standpoint of both energy and space, the overall system is more efficient when these modes replace driving (Figure 3). With good transportation options, it is possible to reduce driving without decreasing participation in activities such as work and shopping, thereby increasing the overall amount of activity per unit of driving. Reducing driving doesn't necessarily reduce traffic congestion at peak hours, particularly in urban areas with high densities of activity, but having alternatives to driving gives people a way to avoid it. In fact, reducing congestion is not a requirement for improving system efficiency: proximity to destinations is a more important determinant of accessibility than congestion is [39].

30 people in 20 cars (1.5 average)



30 people on 30 bicycles (3.5m bikelanes)



30 people in 1 bus (75% full)



Figure 3. Alternative transportation modes can move people much more efficiently than private vehicles. (Image courtesy of Transformation Urban Mobility Initiative)

- **Economic sustainability:** An approach that enables the same level of economic interaction with less dependence on driving can keep the economy humming at a far lower cost to the public. A reduction in driving would decrease highway maintenance costs which have ballooned to over \$500 million per year in California [4]. As compared to development beyond current urban boundaries, infill development within existing urban areas can reduce road and utility line lengths as well as the travel distances

needed to provide public services like police, garbage collection, and emergency response [6, 7, 34]. Investments in bicycle infrastructure directly generate economic benefits, on top of their contribution to reduced driving [16]. Increased efficiency in passenger travel can help to free-up highway capacity for the movement of freight, but freight efficiency can also be improved by reducing trucking. Shifting freight from truck to rail and discouraging one-day (or less) home deliveries are just two of the potential strategies for increasing the amount of economic activity per mile of trucking.

- **Environmental sustainability:** Reducing driving reduces emissions of greenhouse gases and other air pollutants. On-road transportation accounts for nearly one-third of greenhouse gas emissions in the state, over 10% of PM 2.5 emissions, and nearly half of nitrogen oxides emissions [8, 9]. Reducing driving also reduces other kinds of pollutants deposited on roads that wash into water sources and noise that affects human health as well as wildlife [14, 18, 55]. These pollutants come from fossil fuels but also from tires and brake pads [44]. The impacts of driving on wildlife are substantial, not just from pollutants but also collisions with vehicles, costing California as much as \$225 million per year [54]. The paving over of land for roads and parking lots produces impacts—starting from the sourcing of materials, to installation, to maintenance, to decommissioning. Reducing driving could enable a reduction in the extent of impervious cover, thereby helping to improve water quality, decrease the heat island effect (that makes urban areas warmer than surrounding rural areas), and reduce fragmentation of wildlife habitat.
- **Public health:** Reducing driving reduces air pollution and its substantial health impacts, particularly its contribution to respiratory and cardiovascular disease in California. A reduction in driving that comes at least in part from a shift from driving to active modes would yield even greater benefits; reaching the state’s goals for increased active travel would represent a major public health achievement [37]. Encouraging infill development as a way to promote this shift adds to the benefits: locating 85% of new housing and jobs added in the state through 2030 within existing urban boundaries would result in \$8.2 billion in avoided public health costs by one estimate [7].
- **Social equity:** Providing good alternatives to driving helps to reduce the social and economic exclusion of individuals without access to cars and helps to ensure fuller participation in society by everyone [36]. Beyond the direct benefits to households constrained by a car-dependent system, the community as a whole benefits from this fuller participation in both tangible and intangible ways.

Strategies to Move Toward Less Driving

Achieving a world that enables less driving requires some deviation from century-long traditions of transportation and land-use planning. Entrenched transportation planning practices—at state, regional, and local levels—that prioritize reductions in vehicle delays over other goals support the car-dependent status quo. Exclusionary zoning that separates land uses, caps densities, and requires abundant parking has created communities where driving is a virtual necessity. Impediments to the building of affordable housing in job-rich areas, ranging from insufficient public funds to a costly environmental review process to vocal resistance from neighborhood groups, contribute to long-distance commutes. Achieving a closer alignment of transportation and housing policies is essential to achieving a less car-dependent—and more equitable—world.

Creating a less car-dependent world is not necessarily more costly to the public. Such a world can be achieved over time through changes in land use and transportation planning practices. For example, state, regional, and local governments can change the criteria by which transportation investments are prioritized to focus on goals other than reducing vehicle delay. Rather than raising fees and taxes, the state can restructure them so that they have a more direct impact on the choices that individuals make about their daily travel. Shifting from sales taxes to congestion pricing, for example, could encourage a shift away from driving while raising revenues needed to improve alternatives to driving.

The vast amount of driving that we Californians do generates substantial benefits but also serious problems. It is not realistic in the foreseeable future for most Californians to live without their cars. But it is realistic to aim for a world where they can use them less.

Frequently Asked Questions on Strategies for Reducing Car Dependence

Question: Will Californians accept higher densities?

Not all Californians will opt for communities designed around active modes, but evidence shows that the demand for such places is substantial. High housing values in these areas point to an excess of demand over supply. A national survey shows that a small majority of residents in metro areas in the U.S. would choose a walkable community with a short commute over living in a suburban community with a longer commute, even if it means living in attached housing [42]. Studies focusing on the millennial generation predict that they will increasingly locate in the suburbs as they age but will retain a preference for areas that are walkable, with good access to retail and transit, as long as concerns over school quality do not win out [41]. This finding points to the importance of creating communities within the suburbs that are less dependent on driving, where a shift to even somewhat higher densities, particularly around rail service, could make a big difference. Think European-style (Figure 4) rather than Manhattan-style density.



Figure 4. Mixed-use urban development in Freiberg, Germany (left) and moderate-density, multi-unit housing in Sweden (right).

Question: Does infill development necessarily lead to gentrification?

Many cities have seen a strong connection between infill and gentrification, but the direction of causality is not always clear. Infill development can directly displace current residents and lead to rent increases that further displace residents. But gentrification can also precede infill development, creating the kind of market dynamics that make infill projects attractive to developers. With the right policies in place, it may be possible to encourage infill development, particularly around transit stations, without exacerbating gentrification pressures [3]. Communities might adopt policies to minimize physical displacements and limit rent increases for current residents, as well as policies that ensure that infill developments include—or pay for—enough affordable housing to offset losses. The role of public investments such as rail systems must also be considered: these investments could be paired with policies to ensure

that those who would most benefit from access to high quality transit have the opportunity to live near them.

Question: Would building more housing at the fringe of metropolitan areas be a better approach?

Building housing at the fringe of metropolitan areas is generally cheaper and easier than building infill housing. The trade-off is that these areas are more dependent on driving. Commuters may save on housing cost but pay more for transportation, financially as well as in other ways. Long commutes impact physical and mental health with spillovers to family life [13, 15, 43], though some evidence shows that long commutes do not affect life satisfaction [40]. Bringing jobs and housing into closer proximity, as can be done through infill development, gives workers the possibility of opting for shorter commutes. One study estimates that locating 85% of new housing and jobs added in California through 2030 within existing urban boundaries would reduce per capita driving amounts by about 12% below 2014 levels and would save households \$2,000 per year on average [7].

Question: Won't infill development increase congestion?

Infill development is likely to increase traffic congestion in the vicinity of the development to the degree that it increases population or economic activity or both. But it may reduce the total amount of driving in the area by enabling shorter distances for driving trips as well as the use of active modes in place of driving. This possibility is the rationale for California's shift from a focus on level-of-service, a measure of traffic delay, to vehicle-miles-traveled as a measure of the environmental impact of development projects. At the personal level, if the infill development means that residents, customers, and employees are closer to destinations, then the increase in congestion may not reduce their ability to get where they need to go. The closer they are to destinations, the less that congestion matters.

Question: Can driving be reduced without harm to the economy?

During economic recessions in the U.S. in the last half century, driving has typically declined. But that does not mean that a decline in driving would contribute to an economic recession [38]. What is important to the economy is not the amount of driving but the amount of interaction and exchange. But not all driving contributes to interaction and exchange [26], and driving is just one way that interaction and exchange can happen. If the alternatives to driving are of sufficient quality, a shift from driving to other modes will not hurt the economy and can in fact benefit it by improving the efficiency of the system and saving money for households, businesses, and governments. Recent evidence suggests that the economy is less dependent on physical movement than it used to be, given the growing role of virtual interaction and exchange [32].

Question: Does adding more highway capacity help or hurt?

Adding more highway capacity may reduce congestion somewhat in the short term but perpetuates dependence on driving in the long term. Research shows that increased capacity

eventually induces additional driving in roughly equal proportions to the increase in capacity [27]. This means that while the expanded system now accommodates more driving, congestion levels return to previous levels before long, and that any reductions in emissions that might result from smoother traffic flow following a highway expansion are soon erased. Conversely, not expanding the system creates an incentive for drivers to consider alternatives to driving and helps to fuel a less car-dependent world. Expanding highway capacity makes sense if the goal is to accommodate more driving, but it will not appreciably reduce congestion and it will do little to reduce the other negative impacts of driving.

Question: Is ride-hailing helping or hurting?

The long-term implications of ride-hailing services like Uber and Lyft, often called transportation network companies or TNCs, are not yet clear. Although an early study concluded that TNCs can reduce congestion [33], more recent evidence suggests otherwise: TNCs have added 5.7 billion miles of driving annually; growth in TNC trips far exceeds the decline in taxi trips; and TNCs mostly replace transit, walking, and biking rather than driving one's own car [53]. By one estimate, 51% of the increase in vehicle hours of delay in San Francisco between 2010 and 2016 is attributable to TNCs [11]. On the other hand, these services may make it easier for households to make do with fewer cars or even forgo owning a car altogether, though so far car ownership has gone up not down since the advent of TNCs [53]. TNCs will have a more positive effect if it serves as a complement rather than a substitute for public transit, as some evidence suggests [25]. The shared versions of these services—e.g., UberPool and Lyft Line—offer some promise of increased efficiency: studies show that sharing is likely to be necessary for driving to decline [19, 56]. But the degree to which users will choose shared service is uncertain.

Question: What will vehicle automation mean for the goal of reducing auto dependence?

The implications of vehicle automation are also uncertain. Predictions of the advent of fully automated vehicles vary widely, but many experts are skeptical about widespread adoption any time soon. The impacts are likely to be mixed [52]. On one hand, the ability to ride in a vehicle without having to drive it may make driving yet more attractive, especially if these vehicles can travel at higher average speeds (owing to reductions in delays caused by human operators and the packing of more cars within the same roadway capacity). On the other hand, the spatial efficiency of such vehicles may reduce the land area that must be paved, whether for roads or parking, creating opportunities for the reuse of space for other modes and other public uses. Automation also has the potential to reduce crashes and driving stress, with benefits for public health. The best-case scenario could be a shift from personal ownership of cars to a fleet of publicly available cars that operate like an on-demand transit system. If the goal is to reduce car dependence, policies are needed to ensure that automated vehicles help to support this goal rather than work against it.

Question: Won't more bicyclists mean more injuries and fatalities?

Bicycling is the most energy-efficient transportation mode of all, producing environmental as well as health and equity benefits. But bicyclists are vulnerable to collisions with vehicles. An increase in bicycling is likely to lead to an increase in the number of injuries and fatalities in the state, but this increase should slow over time. Through the “safety in numbers” effect, as the amount of bicycling increases in a community, the rate of collisions and the attendant injuries and fatalities decrease [30]. Countries with high rates of bicycling as a mode of transportation have low rates of injuries and fatalities [50]. Bicycling becomes safer the more that people do it.

Question: What about electric scooters?

Time will tell whether the new electric scooters systems appearing in cities around California become a permanent fixture or a passing fad. Initial evidence suggests that scooter rides are replacing walking and biking more than they are replacing driving [47]. Reports of injuries, for scooter riders themselves or for pedestrians they run into, are abundant [29], though hard data will take some time to accumulate. In the meantime, these systems represent just one example of the growing suite of transportation options available to residents in urban and at least some suburban areas of the state.

Question: Can we reduce car dependence in rural areas?

Reducing car dependence in rural areas is especially challenging. The low density of development and wide dispersion of housing and employment means that public transit is far less efficient than in urban areas. Long distances to destinations make walking and bicycling impractical or infeasible. Rural residents are, as a result, more dependent on their cars than residents of urban and suburban areas, and thus even more subject to the personal dis-benefits of driving. Car dependence becomes especially problematic for elderly residents in rural areas as their ability to drive safely declines and they find few available alternatives. Reducing car dependence and providing alternatives to driving in rural areas will take creativity. Small towns offer potential as oases of active travel. In areas that are growing, policies that direct development into existing towns—infill development appropriate to the setting—can provide the option for less driving to more people. Electric-assist technology increases feasible distances for bicycling and can increase the comfort that bicyclists feel in proximity to fast-moving car traffic [49]. Some rural areas are experimenting with subsidies for TNC rides as a replacement for expensive paratransit service.

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