Moving Los Angeles

BY PAUL SORENSEN

People often complain about traffic in Los Angeles, and with good reason. The Texas Transportation Institute publishes annual traffic statistics for metropolitan areas across the United States, and the greater Los Angeles region routinely tops the list for such measures as total congestion delays and congestion delays per peak-period traveler. Against this backdrop, RAND was recently asked to evaluate and recommend near-term strategies that could meaningfully reduce LA's traffic within a period of five years or less. Note that this timeframe precludes land use policies, which take longer to bear fruit, and major infrastructure investments. In addressing this question, we found it helpful (a) to review general insights from the transportation literature on the causes and potential cures for traffic congestion, and (b) to diagnose the specific local conditions that contribute to the notoriously severe congestion in Los Angeles.

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What Do We Know About Traffic Congestion

Traffic congestion is a long-standing urban problem, and researchers have studied it for many years. The resulting literature offers many valuable insights relevant to Los Angeles, along with other cities.

Congestion results from an imbalance between the supply of road capacity and the demand for driving during peak travel hours. Potential solutions thus include managing peak-hour driving demand or boosting road supply. Until supply and demand are brought into closer alignment, congestion will resolve the imbalance by making drivers wait their turn to use the road.

Growth in demand has far exceeded growth in supply in recent decades. One reason demand so often outstrips supply is that vehicle miles traveled (VMT) have been growing much faster than the nation's road supply for decades. We no longer build roads the way we used to, but we drive more than ever—in Los Angeles and across the nation. Figure 1 provides an aggregate view of this trend, comparing growth in road lane miles, population, the economy as measured by gross domestic product (GDP), and VMT in the US since 1970. Over this period, the supply of lane miles has been relatively stagnant, while growth in VMT has far exceeded growth in the population and in fact tracks quite closely with GDP.

Transportation revenue shortfalls preclude "building our way out of congestion." Looking at the data in Figure 1, one might conclude that investing more in road capacity would be a sensible response to the rapid growth in travel. But even setting aside concerns related to climate change, energy security, and sprawl, we simply do not have the available resources to significantly expand capacity. Federal and state gas taxes provide the lion's share of highway and transit funding in the United States. These are typically levied on a cents-per-gallon basis and are not indexed to either inflation or improved fuel economy. The California gas tax was last raised in 1994, and Congress has not increased the federal gas tax since 1993. As a result, we now collect far less real revenue per mile of vehicle travel than in years past.

FIGURE 1

Growth in lane miles, population, GDP and VMT for the United States since 1970

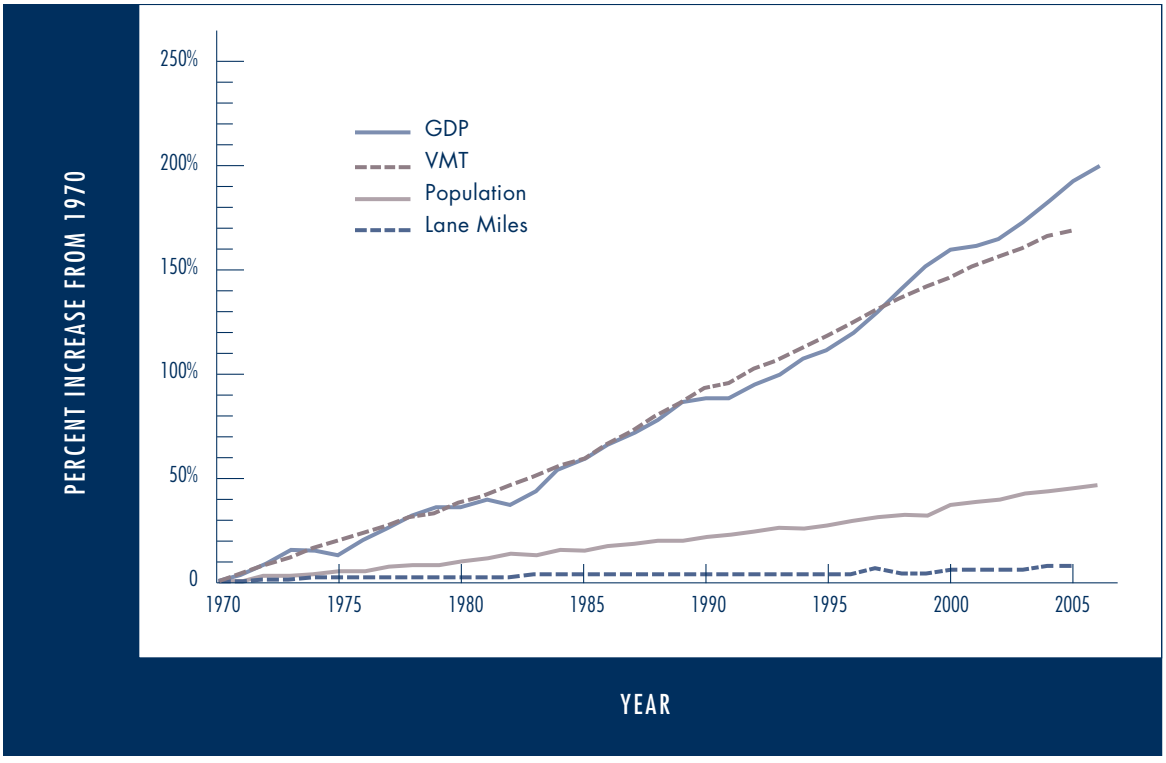


FIGURE 2

Combined effects of inflation and fuel economy improvements on real California gas tax revenues per mile of travel

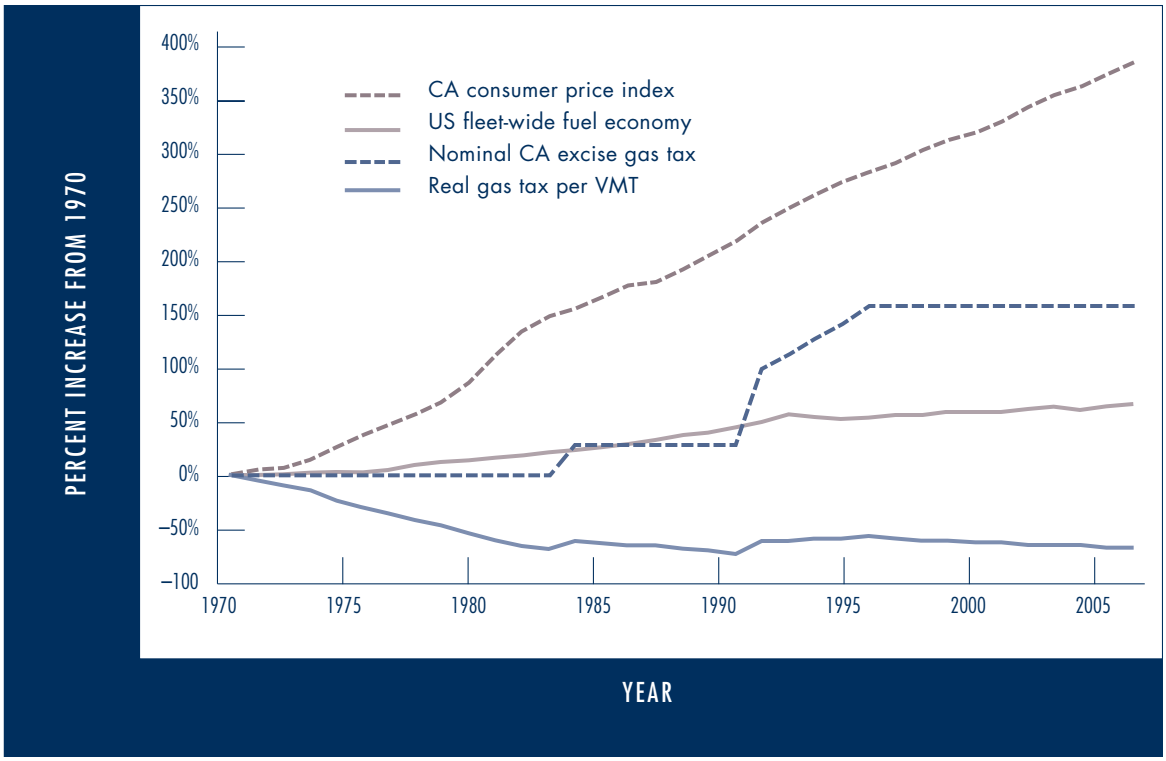


Figure 2 illustrates the steady erosion in the value of the California excise gas tax over the past four decades. In 1970, California's gas tax was 7 cents per gallon. Since then, it has been increased several times and now stands at 18 cents per gallon—a nominal increase of about 160 percent. Yet over the same period, the Consumer Price Index has increased about 400 percent, while average vehicle fuel economy has increased by about 65 percent. Taking all of these factors into consideration, the California excise gas tax currently nets about two-thirds less real revenue per mile of travel than in 1970. In short, the gas tax no longer buys what it used to, and this severely restricts our ability to build new roads. (Note that California also charges sales taxes on gasoline; though intended to fund transit, this revenue source has often been diverted to the state's general fund to cover budgetary shortfalls.)

Few congestion-reduction strategies remain effective over the longer term. Even if we had the money to build new roads, we would have to contend with the fact that most strategies for reducing congestion—including road-building—become less effective over time. The gradual erosion of congestion improvements comes from a phenomenon called "triple convergence." In short, when traffic conditions on a roadway improve in the peak hours, additional travelers tend to converge on the new capacity from (1) other times of travel, (2) other routes of travel, or (3) other modes of travel, slowly eroding the initial benefits from reduced peak-hour congestion. This phenomenon applies broadly; it may occur, for instance, in response to the development of new lane capacity, a new subway line that lures some drivers out of their cars, or ridesharing programs that increase the number of travelers in each vehicle. Any measure that improves traffic flow during the peak hours also attracts additional drivers to take advantage of the improved conditions. While such strategies may promote greater aggregate mobility, their ability to relieve peak-hour congestion in the busiest areas and corridors will be short-lived.

Failure to charge the full costs associated with automotive travel inflates the demand for driving. If it is not possible to build our way out of congestion, it becomes necessary to focus on demand. One reason why the significant growth in VMT in recent decades has been relatively unconstrained is that driving, from an economic perspective, is under-priced. While driving creates environmental and social costs, such as harmful emissions and additional congestion delays for others, we are not as individual motorists forced to confront these costs; rather, they are passed along to society at large. Because driving is under-priced, we tend to overuse road space; that is, we make many trips for which total costs (including external costs passed on to others) exceed total benefits. In theoretical terms, this overuse reduces social welfare. In practical terms, it leads to greater traffic congestion, poorer air quality, and increased greenhouse gas emissions.

Pricing strategies not only reduce the demand for driving, but are also the only strategies that can produce sustainable reductions in traffic congestion. The only anti-congestion measures that can overcome the effects of triple convergence involve the use of pricing: charging more to drive and/or park in the busiest areas or corridors during peak hours. Pricing forces drivers to confront (internalize) the aforementioned externalities associated with automotive travel. Drivers, when faced with these extra costs, are motivated to change their travel behavior in ways that will reduce overuse of road capacity. The reason triple convergence does not undermine pricing strategies is that the same peak-hour charges that encourage some to change their travel patterns also deter others from converging on the freed capacity. Pricing strategies can help raise revenue as well, and by preventing congestion they facilitate more efficient use of existing capacity.

Even small changes in driving can lead to large changes in congestion. The relationship between the number of vehicles and their travel speed is non-linear. When only a few cars

are on the road, more can be added without having much effect on travel speed. When the road is already crowded, on the other hand, adding only a few more cars can trigger congestion, significantly reducing travel speed and the number of vehicles that can pass in a given time period. Conversely, when a road is already congested—as many in Los Angeles are—reducing the number of cars by even a small amount can often produce much larger reductions in congestion delays. Encouragingly, this implies that demand-side strategies need only stimulate modest changes in travel behavior to achieve significant results.

What Makes LA Traffic So Severe?

To further inform the development of suitable strategies to reduce congestion in Los Angeles, we took a closer look at some of the underlying factors that contribute to the region's congestion. What is it about Los Angeles, specifically, that leads to the most severe congestion in the nation, and what implications does this have for the types of strategies that might offer the greatest prospects for reducing congestion?

Common Misconceptions

There is an inherent appeal in simple explanations, but traffic is a complex matter. Many of the most obvious hypotheses for the severity of congestion in Los Angeles therefore prove to be either inaccurate or incomplete.

Excessive per-capita driving is not the problem. Los Angeles and car culture are closely associated in popular discourse, with the relationship between Southern Californians and their cars often described as a love affair. Yet among the 14 largest metropolitan regions in the country, Los Angeles ranks just fifth in per-capita VMT, fifth in per-capita auto ownership,

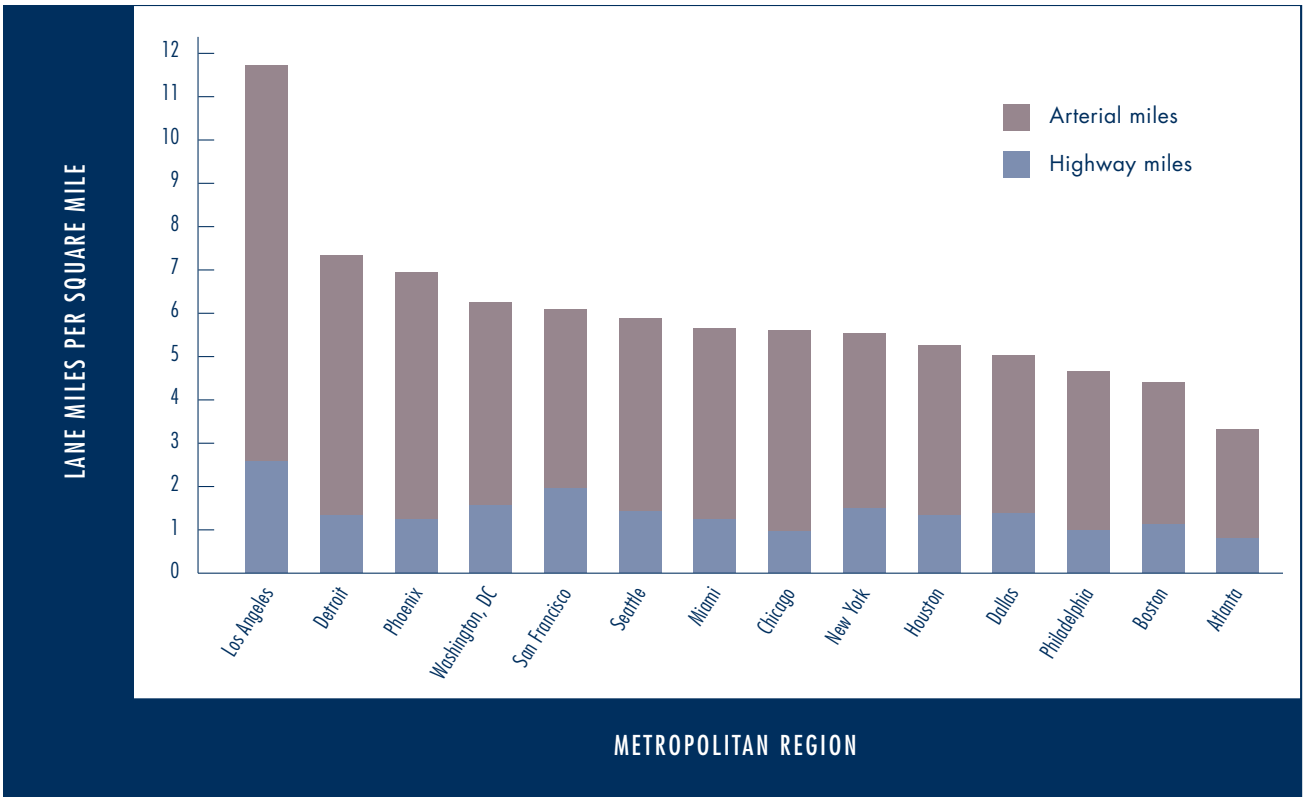


FIGURE 3

Lane mile supply in major metropolitan regions in 2007

and ninth in the percentage of employees who drive to work alone.

Inadequate road capacity is not the problem. Figure 3 shows that Los Angeles has by far the densest road network among the nation's 14 largest metropolitan areas, providing over 50 percent more lane miles per square mile than Detroit, its nearest competitor. Even when framed in terms of lane miles per capita, Los Angeles still ranks eighth among the 14 largest metropolitan regions. Moreover, transportation agencies in the LA region have implemented sophisticated programs such as ramp metering and synchronized traffic signals to operate the road system efficiently.

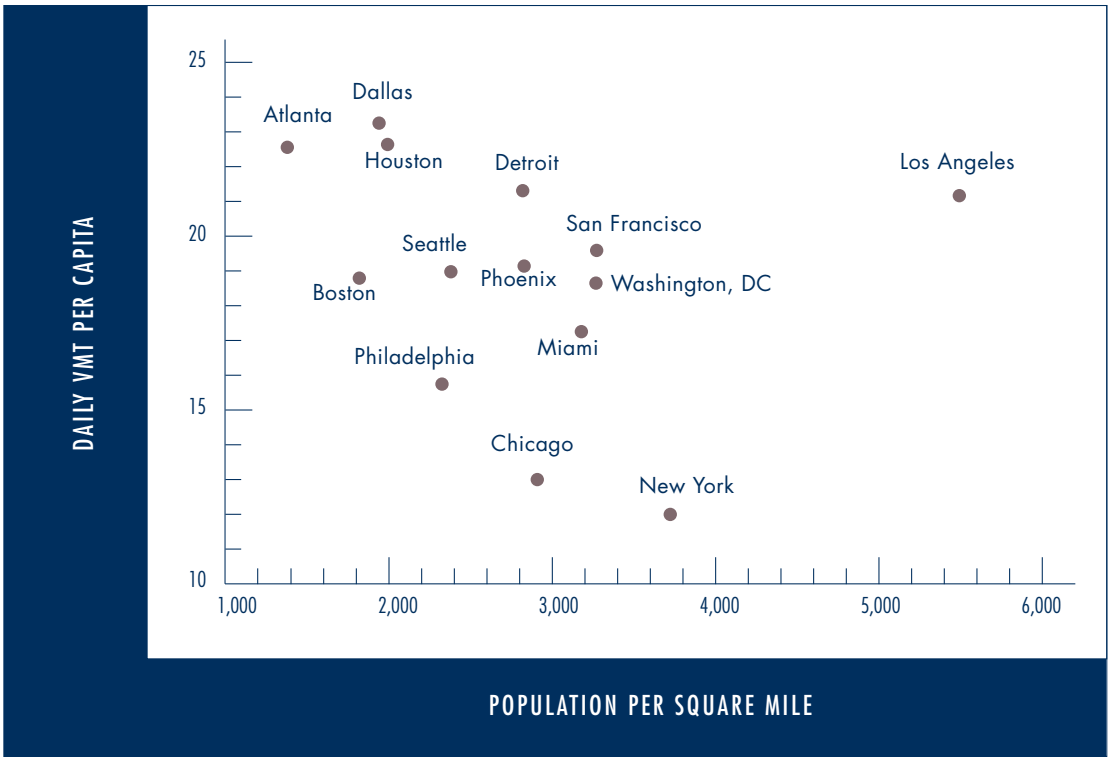
Lack of transit service is not the problem. Los Angeles has an extensive transit system in comparison to many other urban areas. Of the 14 largest metropolitan regions, Los Angeles ranks second in total bus service miles, first in bus service miles per square mile, third in bus service miles per capita, fifth in total rail transit track miles (including commuter rail, light rail, and subways), seventh in rail transit track miles per square mile, and seventh in rail transit track miles per capita.

High Regional Population Density Is a Key Contributor to Congestion in Los Angeles

The possible explanations above are inaccurate or incomplete because they fail to take into consideration the region's high population density. Despite its reputation for sprawl, Los Angeles is quite densely populated at the regional scale. While downtown Los Angeles isn't as dense as, say, Manhattan or downtown Chicago, the suburbs surrounding Los Angeles are much denser than the suburbs surrounding other major cites. As a result, Los Angeles is the densest metropolitan area in the country.

FIGURE 4

Population density vs. daily per-capita VMT in major metropolitan areas in 2007



As density increases, individuals tend to drive less on a per-capita basis. Trip origins and destinations are closer together, leading to shorter car trips, and people can rely on alternatives such as walking, biking, or transit for a larger share of trips. Yet this reduction in per-capita driving can be overwhelmed by the fact that many more drivers are competing for the same road space, thus intensifying traffic congestion. The net effect is that greater population density tends to exacerbate congestion—think downtown Manhattan—and Los Angeles is very dense.

High population density can also combine with other factors to make congestion worse. We mentioned earlier that Los Angeles residents do not drive more than residents of other large areas. It turns out, however, that they drive a lot on a per-capita basis considering the region's density; in other words, Angelenos do not seem to curtail their driving as much as one might expect in response to higher density. Figure 5 compares regional population density with daily per-capita VMT for the country's largest 14 metropolitan regions.

Looking across the different regions shown in the figure, there is a fairly consistent relationship in which per-capita VMT declines with regional density. Los Angeles is clearly an outlier. The only other large metropolitan regions in the country with higher per-capita VMT (Atlanta, Dallas, Houston, and Detroit) are all much less dense than Los Angeles. For regions in which the level of density approaches that of Los Angeles (San Francisco, Washington and New York), per-capita VMT is much lower. We thus see a confluence of three density-related factors that in combination help to explain the severity of congestion in Los Angeles: (1) congestion is likely to rise with increased population density; (2) Los Angeles is much denser than its peers at the regional level; and (3) Los Angeles exhibits a surprisingly high level of per-capita VMT relative to its density.