Economics of Highway Spending and Traffic Congestion

Todd Litman
Victoria Transport Policy Institute

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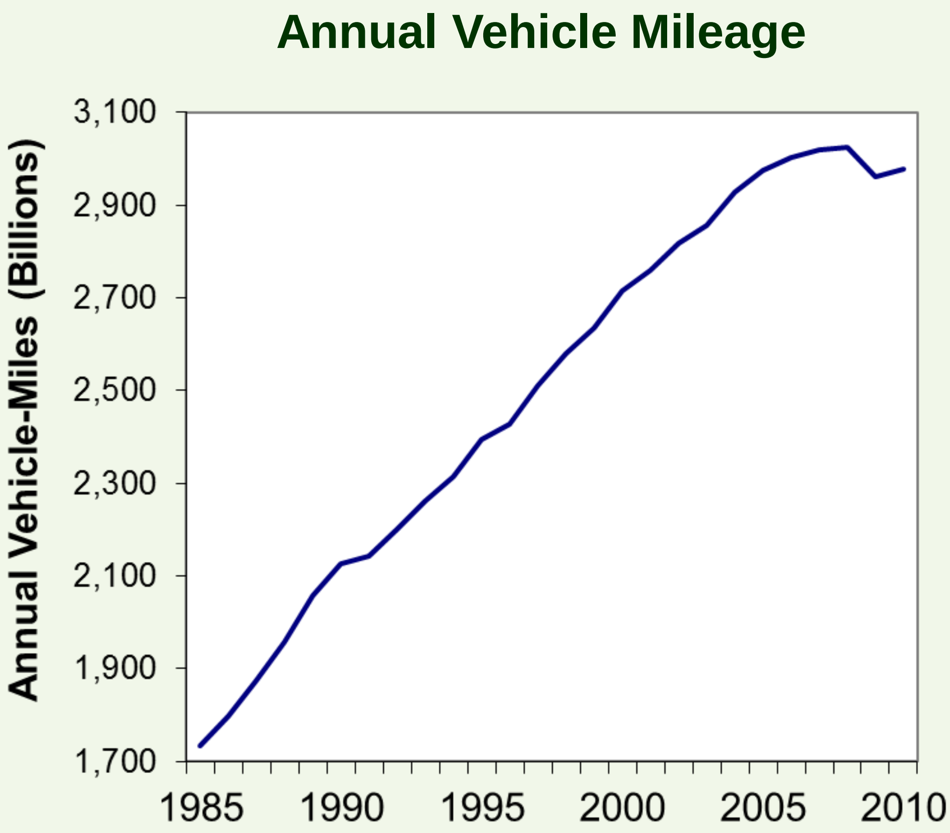
Motor Vehicle Travel is Peaking



Vehicle travel grew steadily during the Twentieth Century but stopped about 2003.

- Motor vehicle saturation.
- Aging population.
- Rising fuel prices.
- Increased urbanization.
- Increased traffic and parking congestion
- Improved transport options
- Changing consumer preferences
- Health Concerns
- Environmental concerns

"The Economist" 22 Sept. 2012

"Governments may find that changes in driving habits force them to rethink infrastructure. Most forecasting models that governments employ assume that driving will continue to increase indefinitely. Urban planning, in particular, has for half a century focused on cars.

If policymakers are confident that car use is waning they can focus on improving lives and infrastructure in areas already blighted by traffic rather than catering for future growth.

By improving alternatives to driving, city authorities can try to lock in the benefits of declining car use.

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The future of driving

Seeing the back of the car

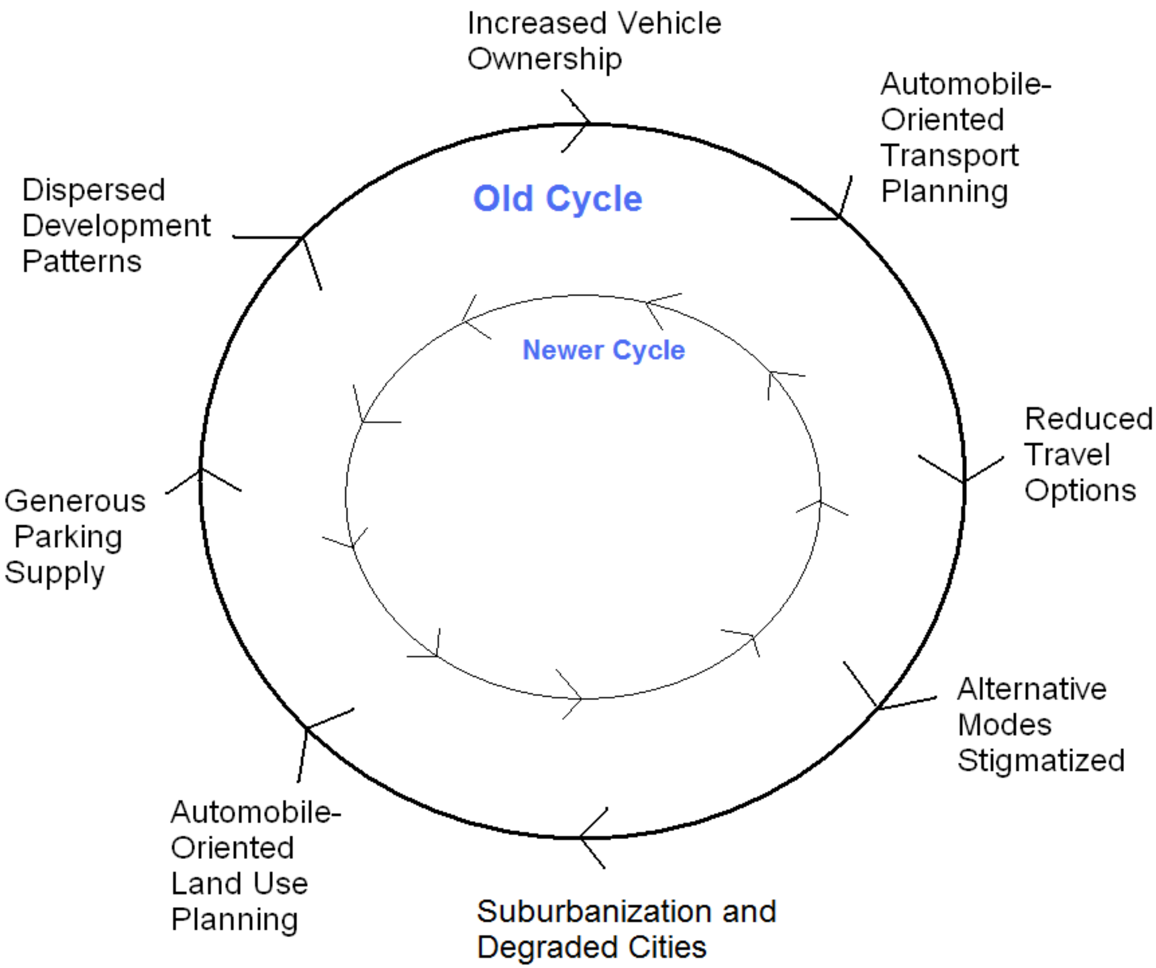
In the rich world, people seem to be driving less than they used to

Sep 22nd 2012 | from the print edition   Like 1.7k Tweet 371

Corbis

"I'LL love and protect this car until death do us part," says Toad, a 17-year-old loser whose life is briefly transformed by a "super fine" 1958 Chevy Impala in "American Graffiti". The film follows him, his friends and their vehicles through a late summer night in early 1960s California: cruising the main drag, racing on the back streets and necking in back seats of machines which embody not just speed, prosperity and freedom but also adulthood, status and sex.

Automobile Dependency and Sprawl



During the last century many transport and land use development practices tended to favor automobile dependency and sprawl. Many of these trends are now reversing, resulting in a new cycle of growing demand for multi-modal transportation systems and more compact communities.

Mobility Versus Accessibility

Mobility (physical movement)

- Favors faster modes and longer trips
- Ignores land use impacts
- Supports highway expansion and sprawl

Accessibility (ability to reach desired services and activities)

- Favors multi-modalism. Recognizes the roles of non-motorized and public transport.
- Recognizes land use impacts on accessibility
- Supports comprehensive, integrated planning and smart growth development

Defining "Efficiency"

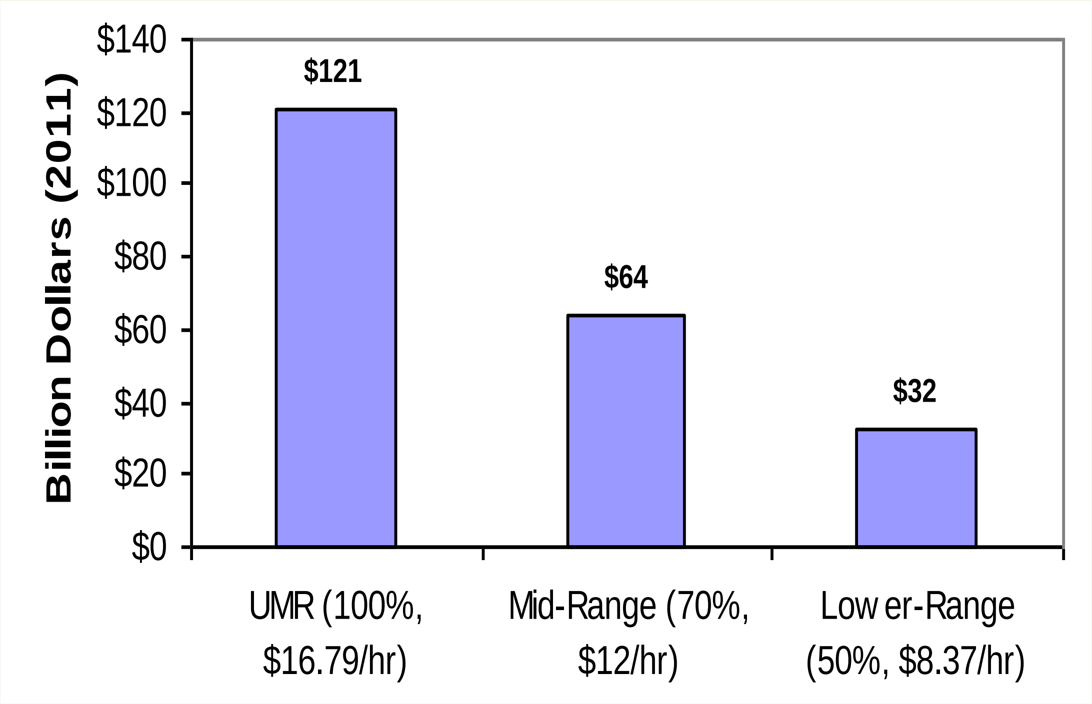
Perspective	Definition of "Efficiency"
Conventional	Vehicle traffic speed, minimal congestion delay
Traffic Network Analysis	Vehicle travel speed to destinations
Multi-Modal Planning	Personal travel comfort, speed and costs
Accessibility-Based Planning	Personal travel time and costs to reach services and activities
Economic Efficiency	System responds to consumer demands, favors higher-value trips and more resource efficient modes, and operates efficiently
Planning Efficiency	Planning is integrated between different modes, objectives and organizations to insure that individual short-term decisions support strategic, long-term goals

Congestion Costing Critique

Congestion Intensity (Travel Time Index)	Congestion Costs (Delay Hours Per Commuter)
1. Los Angeles-Long Beach-Santa Ana CA (1.37)	1. Los Angeles-Long Beach-Santa Ana CA (44.9)
2. New York-Newark NY-NJ-CT (1.33)	2. Washington DC-VA-MD (44.3)
3. Washington DC-VA-MD (1.32)	3. Houston TX (41.0)
4. Boston MA-NH-RI (1.28)	4. Atlanta GA (39.4)
5. Houston TX (1.26)	5. San Francisco-Oakland CA (37.7)
6. Philadelphia PA-NJ-DE-MD (1.26)	6. Dallas-Fort Worth-Arlington TX (36.6)
7. Seattle WA (1.26)	7. Miami FL (36.5)
8. Dallas-Fort Worth-Arlington TX (1.26)	8. Boston MA-NH-RI (36.3)
9. Chicago IL-IN (1.25)	9. Chicago IL-IN (36.2)
10. Miami FL (1.25)	10. Philadelphia PA-NJ-DE-MD (35.4)
11. Atlanta GA (1.24)	11. Detroit MI (33.6)
12. San Francisco-Oakland CA (1.22)	12. Seattle WA (33.4)
13. Detroit MI (1.18)	13. New York-Newark NY-NJ-CT (29.7)
14. San Diego CA (1.18)	14. San Diego CA (28.0)
15. Phoenix-Mesa AZ (1.18)	15. Phoenix-Mesa AZ (26.7)

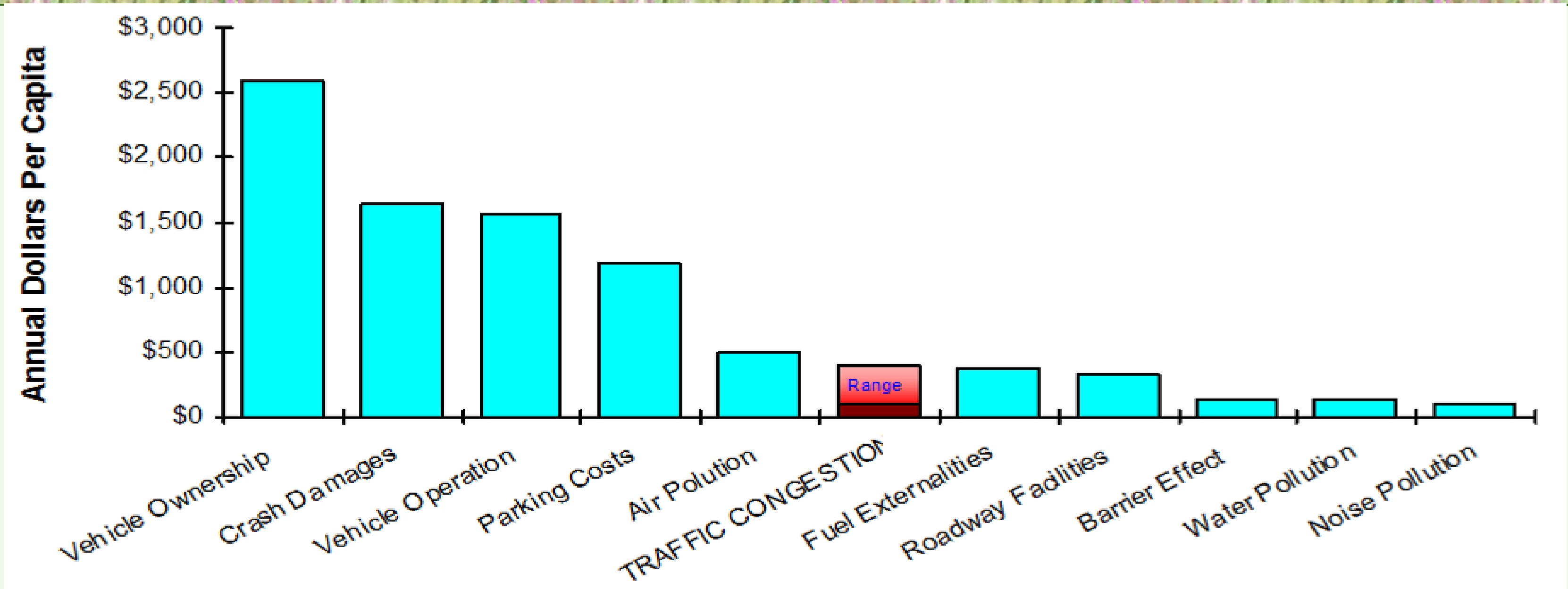
More compact urban regions (blue) tend to have more intense congestion but lower congestion costs than sprawled, auto-oriented regions (red). Rankings change depending on which indicator is used.

Congestion Cost Studies



The *Urban Mobility Report's* $121 billion cost estimate is based on higher baseline speeds and travel time unit costs than most experts recommend. The lower-range estimate in this graph is based on 50% of baseline speed and the U.S. Department of Transportation's lower travel time unit costs, reflecting reasonable lower-bound values.

Congestion Compared With Other Costs

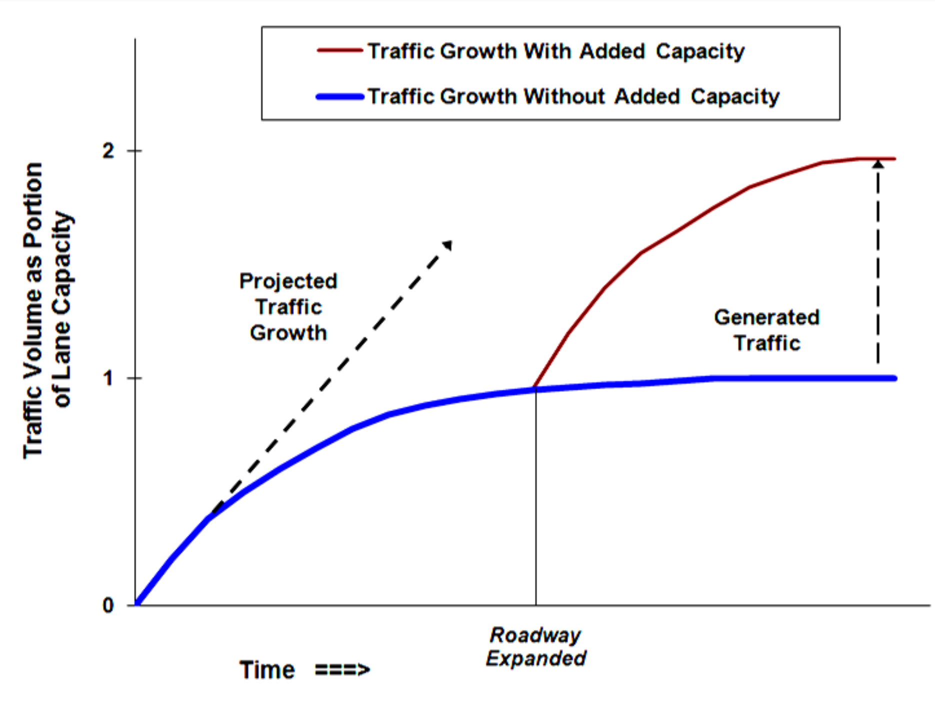


Congestion costs are estimated to range between $110 and $390 annually per capita, depending on assumptions. Even the highest estimate is moderate compared with other transport costs.

As a result, a strategy that reduces traffic congestion is worth far less if it increases vehicle costs, accidents, parking costs or pollution damages, and worth far more if it reduces these other costs by even small amounts.

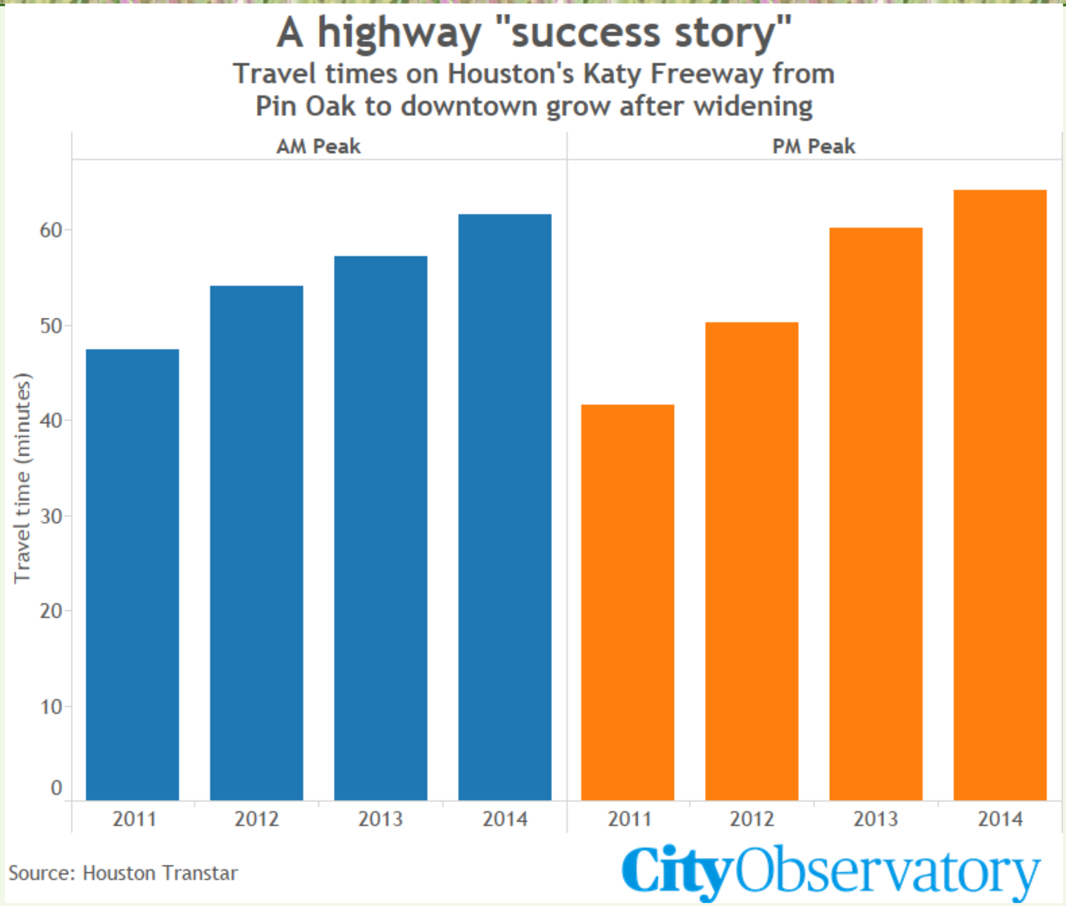
Generated Traffic

Urban traffic congestion tends to maintain a self-limiting equilibrium: traffic grows until congestion delays cause travellers to forego some potential peak-period vehicle trips. If road capacity is expanded, traffic increases until it reaches a new equilibrium. The additional peak-period vehicle traffic that results from roadway capacity expansion is called ***generated traffic***. The portion that consists of absolute increases in vehicle travel (as opposed to shifts in time and route) is called ***induced travel***.



Generated Traffic Example

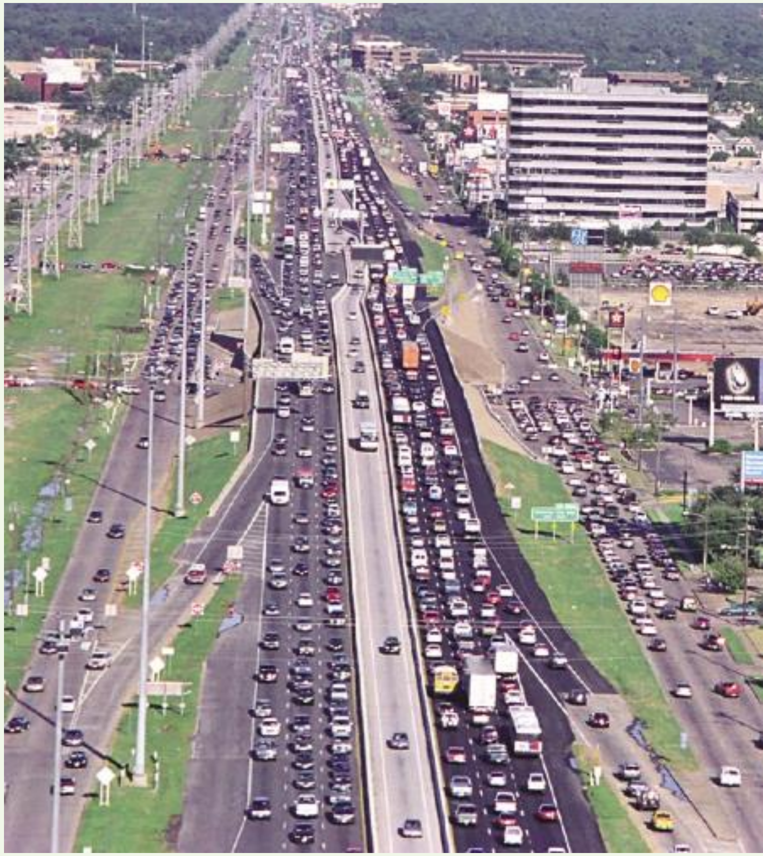
During the last decade Texas spent more than $2.8 billion into widening Houston's Katy Freeway into 23 total lanes, creating the world's widest freeway. After the project opened in 2009, rush hour travel times declined, but between 2011 and 2014 the commute times increased by 30-55%.



http://cityobservatory.org/reducing-congestion-katy-didnt

Generated Traffic Impacts

- Traffic congestion seldom becomes as severe as predicted by extrapolating past trends. As congestion increases it discourages further peak-period trips, maintaining equilibrium.
- Roadway expansion provides less long-term congestion reduction benefits than predicted if generated traffic is ignored.
- Induced vehicle travel increases various external costs including downstream congestion, parking costs, accident risk, and pollution emissions, reducing net benefits.
- Induced vehicle travel directly benefits the people who increase their vehicle travel, but these benefits tend to be modest because this consists of marginal-value vehicle mileage that users are most willing to forego if their costs increase.

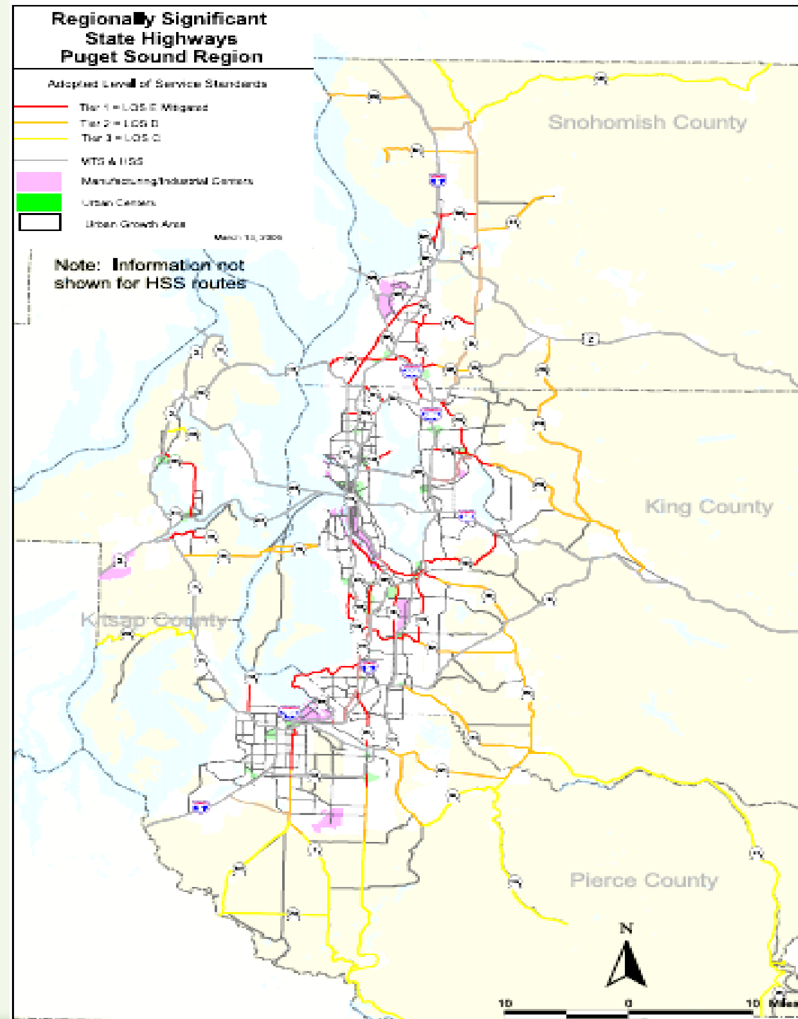


Katy Highway

Demand Model

Travel demand models predict how travel activity will respond to changes in the system.

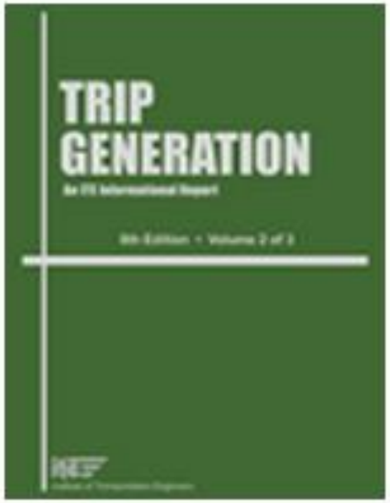
The are used to identify future problems, such as traffic congestion, and therefore justify solutions, such as roadway expansions.



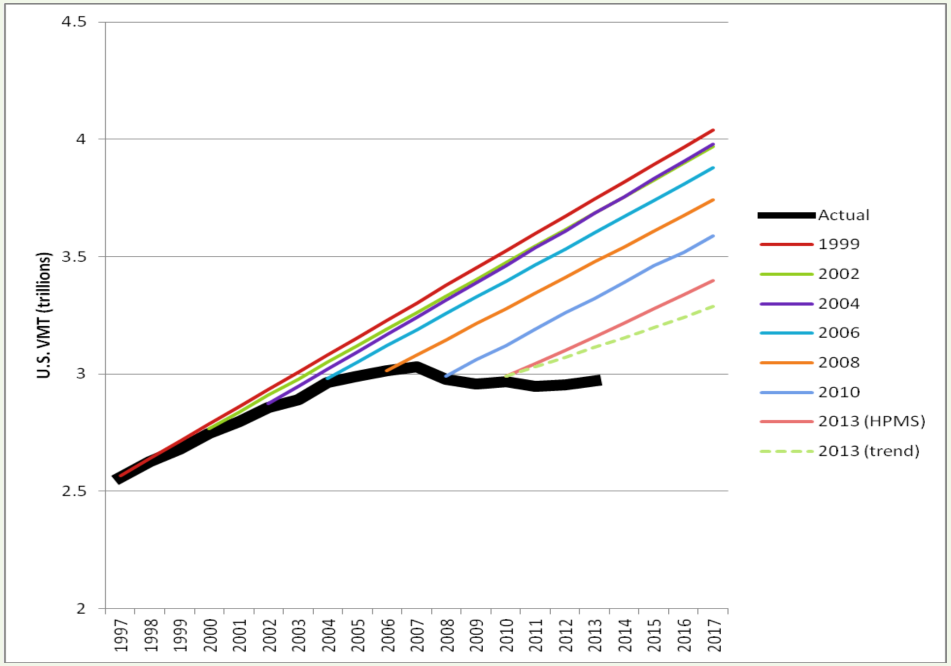
Trip and Parking Generation Models

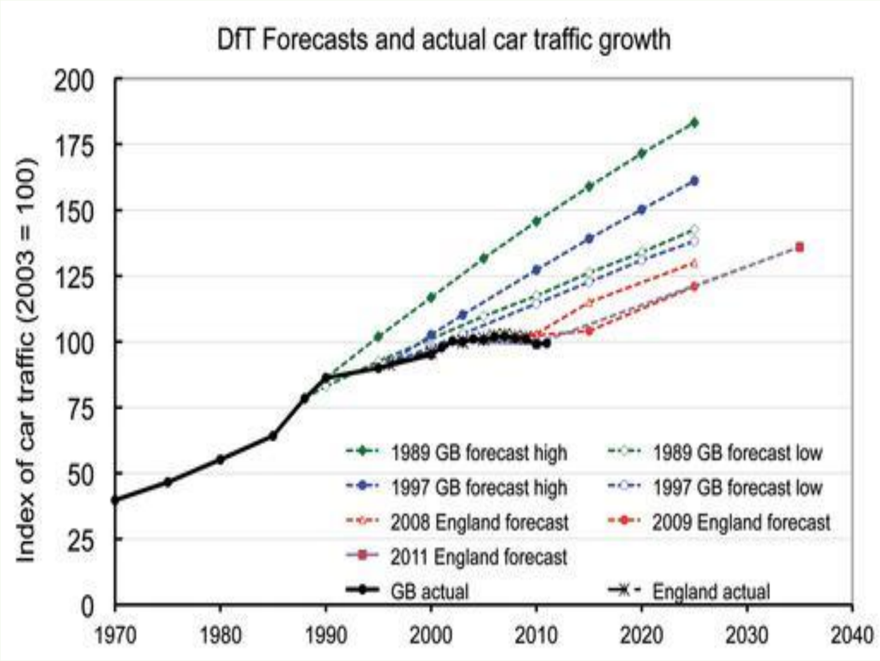
Transport and land use planning often uses simple demand models to predict the number of vehicle trips or the amount of parking "generated" by a development or area.

The results are used to determine whether roads should be expanded, and how much a particularly developer should contribute to such projects, and how many parking spaces are needed at a development.



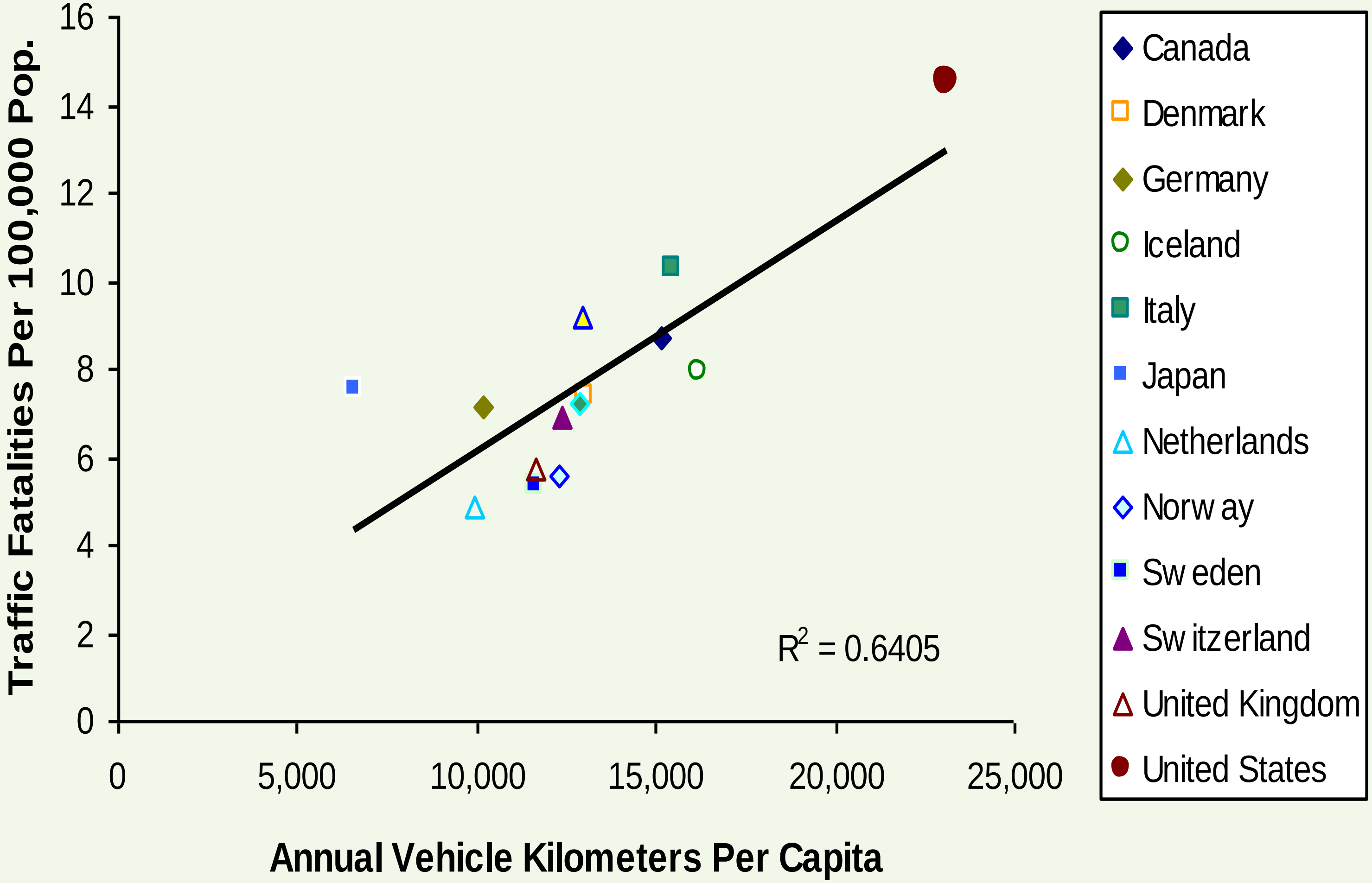
Forecasts Versus Actual Traffic



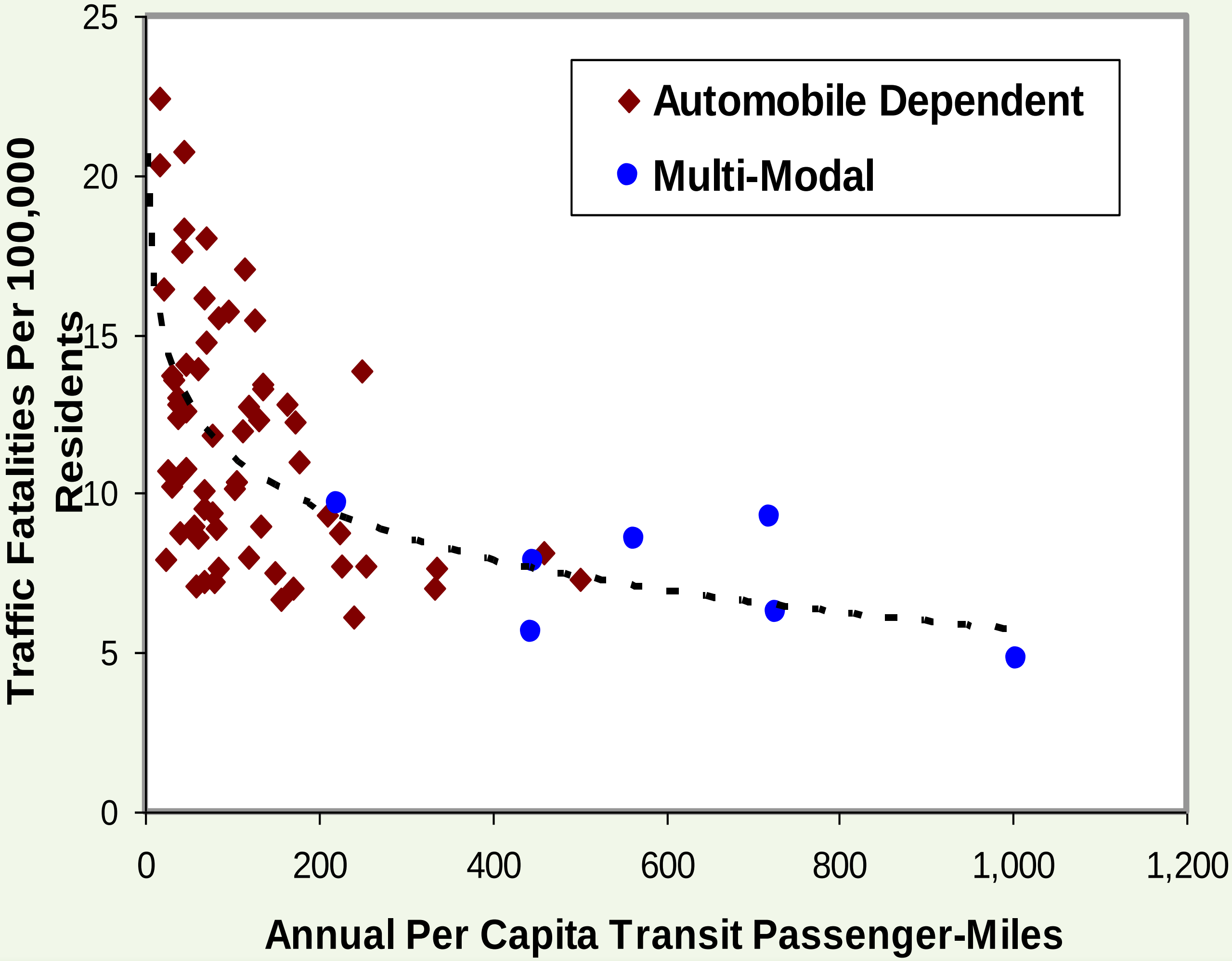


Recent U.S. (left) and British (right) travel forecasts have failed to predict actual travel activity. This reflects a failure in understanding travel demands.

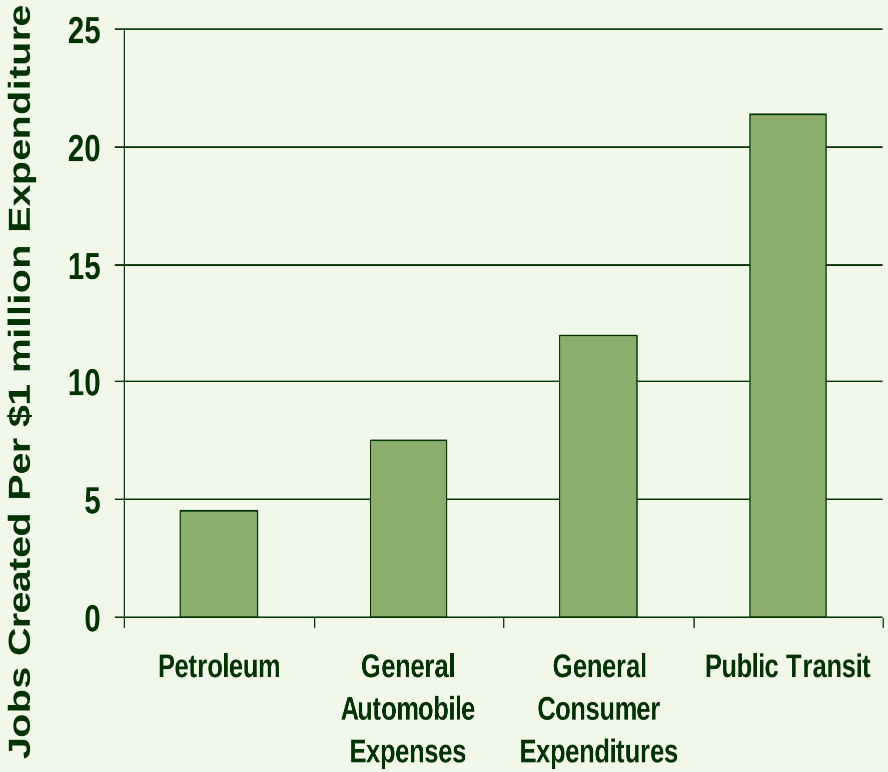
Vehicle Travel Vs. Traffic Deaths



Traffic Fatalities



Community Economic Impacts

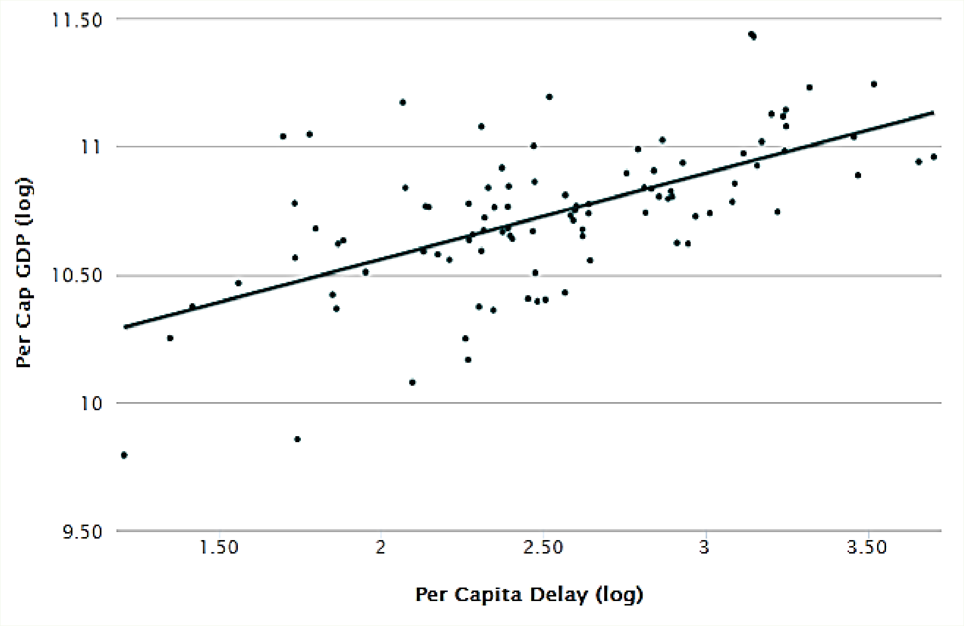


- Transport savings and efficiencies (congestion, parking, taxes) increases productivity and competitiveness.
- Reducing vehicle expenditures and expanding transit service increases regional employment and business activity.
- Agglomeration efficiencies.
- Supports strategic land use development objectives.
- Increases affordability, allowing businesses to attract employees in areas with high living costs.
- Changes in household expenditures on vehicles and fuel.

Economic Productivity Impacts

Per capita Gross Domestic Product (GDP) tends to increase with per capita traffic congestion delay.

Economic development and job creation are often cited as justifications for expanding the capacity of roadways. However, most studies of the impact of capacity expansion on development in a metropolitan region find no net increase in employment or other economic activity, though investments do influence where within a region development occurs



(Dumbough 2012)

Economic Efficiency

A basic economic principle is that prices (what users pay for a good) should equal the marginal cost of producing that good unless a subsidy is specifically justified.

Expanding urban roadways typically costs $0.50 to $2.00 per additional peak-period vehicle-mile accommodated; this is the economically efficient toll. Applying such tolls would generally eliminate the need for roadway widening.

As a result, efficiency requires applying congestion tolls on existing roadways, and only adding capacity when these tolls can fully finance expansions.

Social Equity Impacts

- The inequity of higher-occupant vehicle (bus, van and carpool) passengers being delayed by traffic congestion caused by lower-occupant vehicle passengers who require 10 to 100 times more road space, and therefore the equity justification for bus and HOV lanes.
- The inequity of reduced pedestrian and cycling safety and accessibility caused by wider roads, increased traffic speeds, reduced roadway connectivity and sprawled development (the “barrier effect”).
- The inequity of using general taxes to finance urban highway expansions, and therefore the equity of road tolls and other motorist user fees.
- The regressivity of congestion reduction strategies that favor automobile travel over more affordable modes (walking, cycling and public transport) and therefore forces lower-income households to own more vehicles than they can afford.
- The harm that automobile-dependent transport systems have on disadvantaged people.

Comparing Congestion Solutions

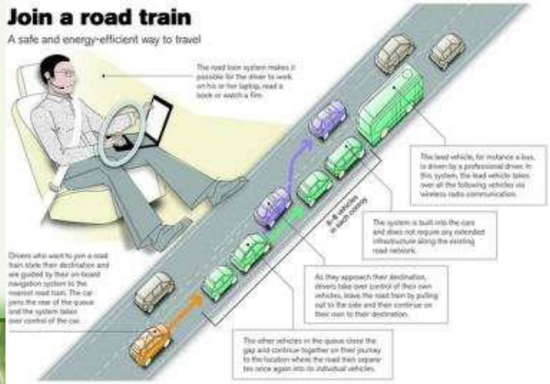
	Roadway Expansion	Improve Alternative Modes	Pricing Reforms	Smart Growth	TDM Programs
Congestion impacts	Reduces short-run congestion, but this declines over time due to generated traffic.	Reduces but does not eliminate congestion.	Can significantly reduce congestion.	May increase local congestion intensity but reduces per capita congestion costs.	Can reduce congestion delays and the costs to users of those delays
Additional costs and benefits	High costs. By inducing additional vehicle travel and sprawl it tends to increase indirect costs. Minimal co-benefits. Small energy savings and emission reductions.	Moderate to high costs. Numerous co-benefits. Parking savings, safety and health, improved access for non-drivers, user savings, energy conservation, emission reductions, etc.	Low to high implementation costs. Costs users, creates revenue (economic transfers). Numerous co-benefits: revenues, parking savings, safety, emission reductions, improved public health, etc.	Low to high costs. Numerous co-benefits including infrastructure savings, safety and health, user savings, energy savings, emission reductions, improved non-drivers mobility, etc.	Generally low to moderate implementation costs. Numerous co-benefits.
Consideration in traffic modeling	Models often exaggerate benefits by underestimating generated traffic and induced travel	Models often underestimate the congestion reduction benefits of high quality space-efficient modes	Varies. Can generally evaluate congestion pricing but are less accurate for other reforms such as parking pricing	Models often underestimate smart growth's ability to reduce vehicle travel and congestion	Sometimes considered
Consideration in current planning	Commonly considered and funded	Sometimes considered, particularly in large cities	Sometimes considered but seldom implemented	Not generally considered a congestion reduction strategy	Sometimes considered, particularly in large cities

Bad Congestion Solutions

- ***Expand unpriced urban roadways.*** They may reduce congestion in the short-run, but this tends to fill with latent demand, resulting in more total vehicle travel and sprawl, and associated costs.

- ***Half-width commuter vehicles.*** Under optimal conditions they can double the maximum number of vehicles per highway lane, but tend to increase vehicle ownership, residential parking and accident costs.

- ***Platooning self-driving vehicles.*** Although this may increase capacity of some roadways, it requires dedicated lanes that may only be used by newer vehicles with this feature.



Optimal Congestion Solutions

- Improve space-efficient transport options (walking, cycling, public transit, ridesharing and telecommuting), particularly on congested urban corridors.
- On congested roadways, favor space-efficient modes with HOV and bus-lanes, and public transit priority measures.
- Apply congestion pricing, priced to reduce traffic volumes to optimal levels (level-of-service C or D).
- Implement other transport pricing reforms to the degree politically feasible, including revenue generating tolls, efficient parking pricing, fuel price increases, and distance-based insurance and registration fees.
- Implement commute trip reduction and mobility management marketing programs, particularly in conjunction with improvements to space-efficient modes.
- Only expand urban roadways if, after all of the previous strategies are implemented, congestion problems are significant and peak-period toll revenues would finance all associated costs, which tests users' willingness-to-pay for the additional capacity.

Motorist Benefits

A more diverse and efficient transport system is no more “anti-car” than a healthy diet is anti-food. Motorists have every reason to support alternative modes and efficient pricing because they:

- Reduce traffic and parking congestion.
- Improve safety.
- Reduce chauffeuring burdens.
- Provide mobility options that may be needed in the future due to disability, vehicle failures or other problems.
- Improve driving conditions more quickly than roadway expansion.

Conclusions

- Traffic congestion is a moderate transportation cost overall, larger than some but smaller than others. Congestion reduction strategies are not cost effective if they increase vehicle, parking, accident or pollution costs, but are far more beneficial if they reduce these other costs.
- Conventional evaluation practices tend to exaggerate congestion costs and roadway expansion benefits. More comprehensive evaluation tends to reduce the justification for roadway expansion and increase support for high quality transit, efficient transport pricing, Smart Growth development policies, and other TDM strategies.
- Many current policies and planning practices result in economically-excessive automobile travel and sprawl, which is inefficient and unfair.
- These strategies are not “anti-car.” Motorists can benefit overall from congestion reduction strategies that create more diverse and efficient transport systems.

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