

Induced Travel 101 (with a focus on driving)

Susan Handy

December 7, 2023

The Congestion Obsession



A long history of concern for congestion

HISTORY, PLANNING AND POLICY

Congestion as a cultural construct

The 'congestion evil' in Boston in the 1890s and 1920s

Asha Weinstein San José State University

The residents of 1890s Boston complained about traffic congestion endlessly and in flamboyant language. In 1893 the city's surveying department complained about Boston's 'stupendous' congestion problem,¹ and the same year Mayor Nathan Matthews referred in a speech to the 'evils of congestion'.² A *Boston Globe* article the following year claimed that 'the hundreds of thousands of citizens of Boston and vicinity [are] clamoring for and demanding relief from the congestion in the business district of the city'.³

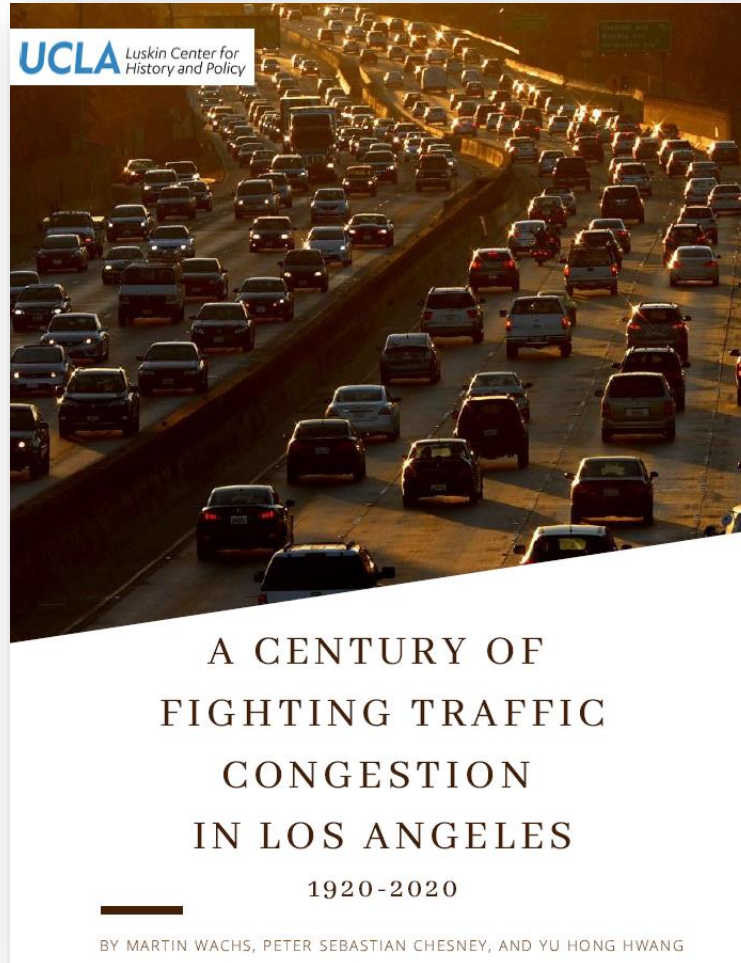
Looking forward thirty years in time to the 1920s, concern about congestion persisted unabated. In 1922 the Boston City Planning Board warned that congestion was 'strangling' the city,⁴ and a 1925 editorial in the *Boston Herald* described street traffic conditions as 'approximating the impossible'.⁵ The Chamber of Commerce, which routinely used alarmist language about congestion in its magazine *Current Affairs*, gave visual form to all this worry about congestion, printing a cartoon portraying the city as a child sick in bed with 'Boston's traffic problem', a reference to the city's traffic congestion (Figure 1). And in addition to merely complaining about traffic congestion, Bostonians in both eras also spent a great deal of money and effort trying to

Congestion as a cultural construct



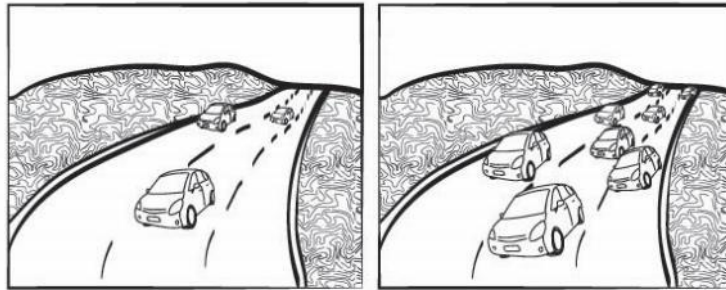
Figure 1 A cartoon from the Boston Chamber of Commerce. Source: 'City planning and street traffic notes', *Current Affairs*, 14 December 1925, p. 9

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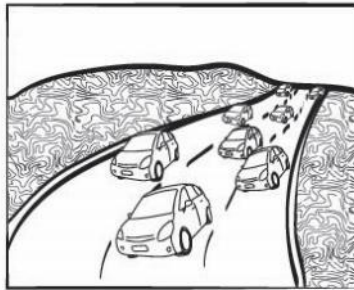


"Slow traffic scared officials in Greater Los Angeles regularly for a century. They seemed to think congestion might stop the city's proverbial heart. They were anxious that economic growth might cease and visitors might not return to the city recalling an awful experience."

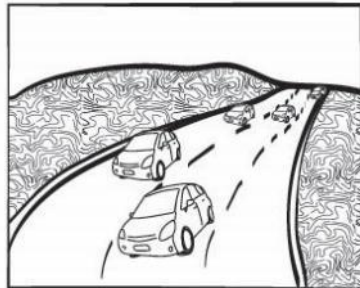
Level of Service



LOS A



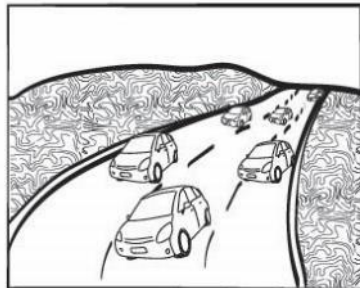
LOS D



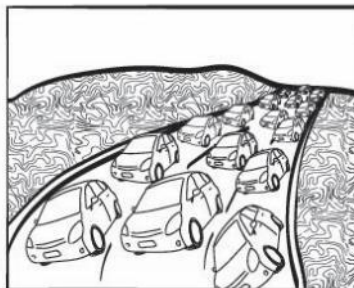
LOS B



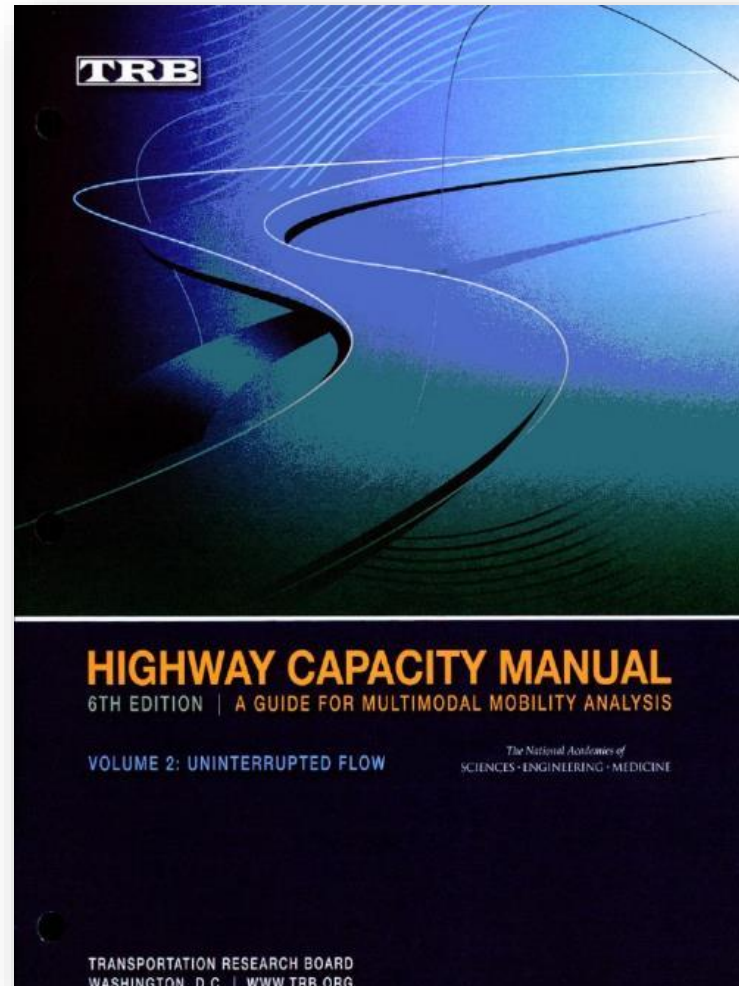
LOS E



LOS C



LOS F



$$\text{LOS} = f(\text{volume} / \text{capacity})$$

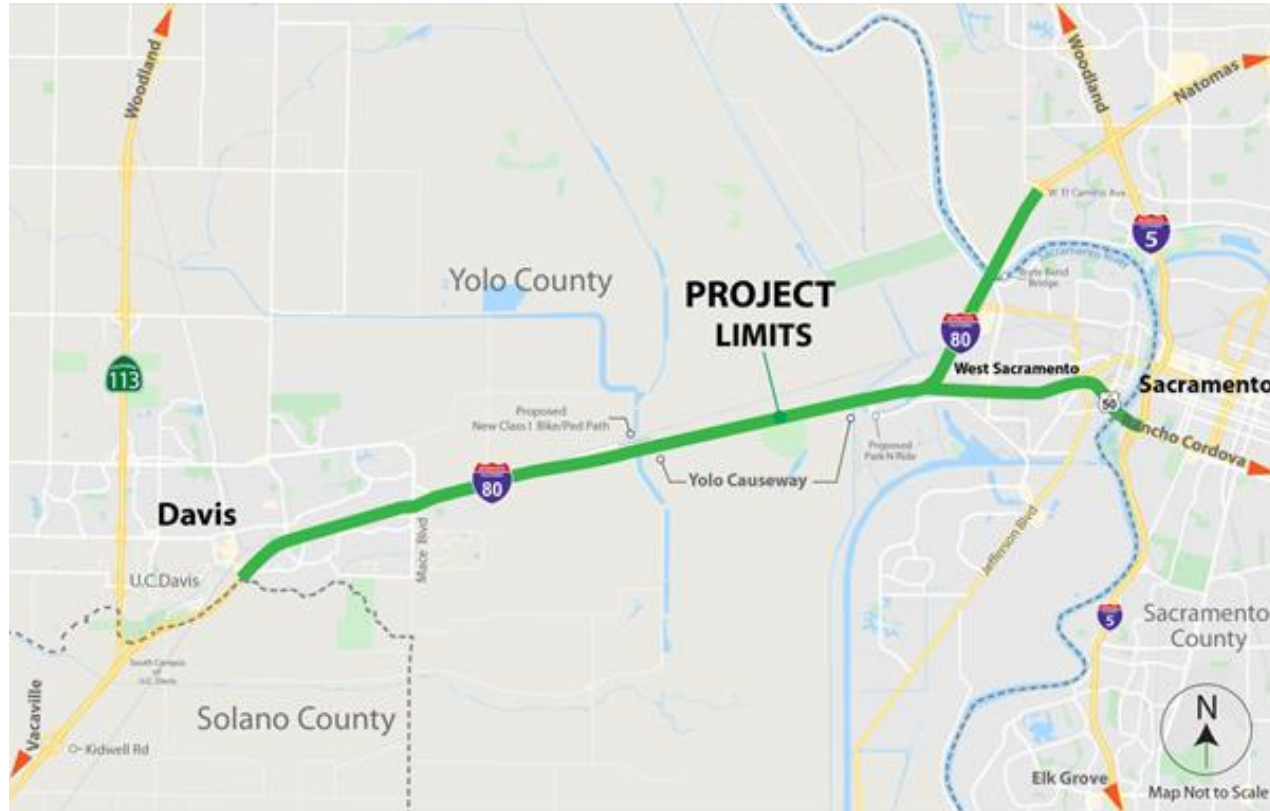
Congestion = f (volume/capacity)



YOLO 80 CORRIDOR IMPROVEMENT PROJECT



I-80 Purpose and Need



Purpose: The purpose of the proposed project is to:

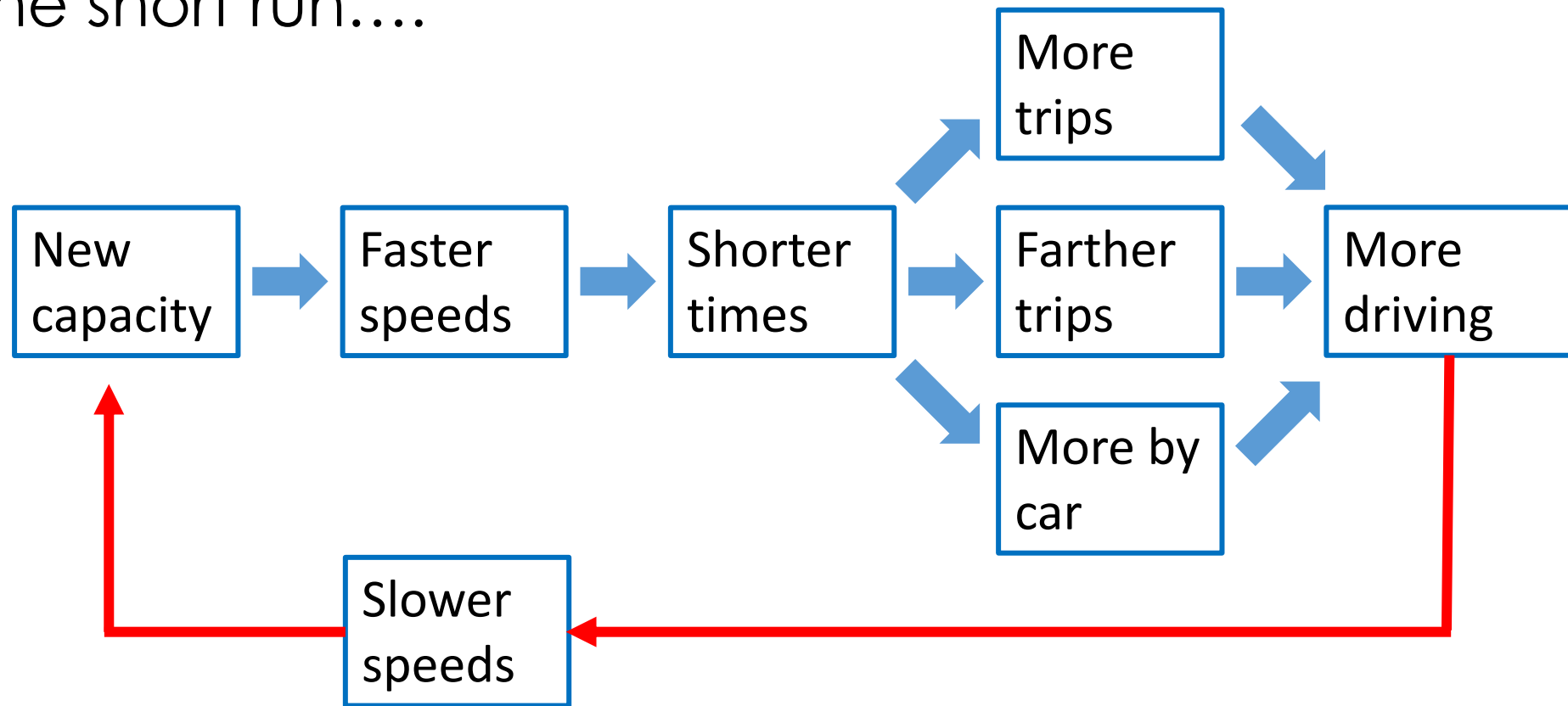
- Ease congestion and improve overall person throughput¹.
- Improve freeway operation on the mainline, ramps, and at system interchanges.
- Support reliable transport of goods and services throughout the region.
- Improve modality² and travel time reliability.
- Provide expedited traveler information and monitoring systems.

Need: The proposed project is needed for the following reasons:

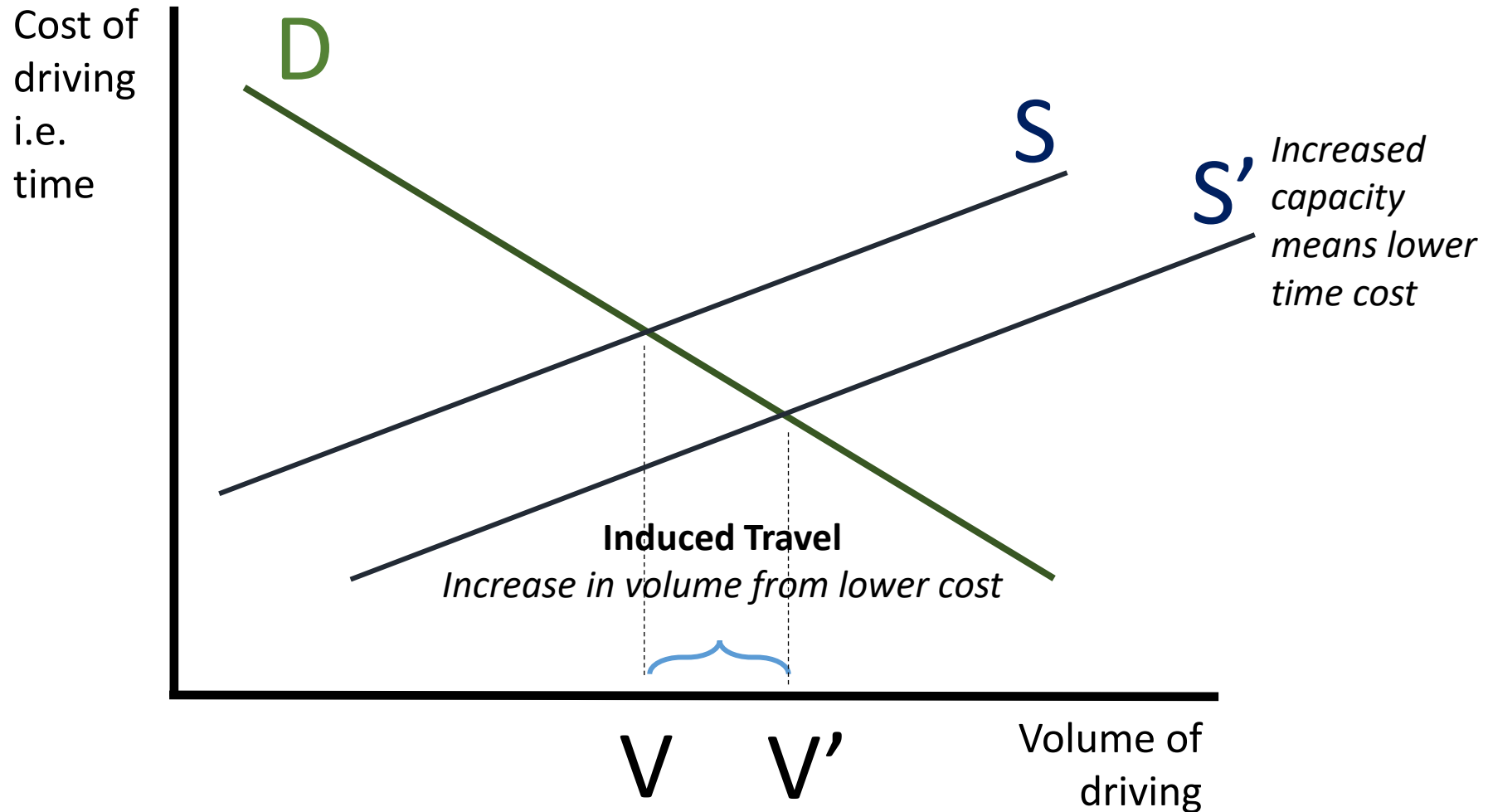
- Recurring congestion during the AM and PM peak periods exceeds current design capacity limiting person throughput.
- Operational inefficiencies lead to the formation of bottlenecks due to short weaving and merging areas as well as lane drops.
- Inefficient movement of goods and services impedes regional and interstate economic sustainability.
- The corridor users rely heavily on single occupancy vehicles, with limited multi-modal options such as transit, carpool, bicycle, and pedestrian facilities resulting in unreliable travel times.
- Lack of real time traveler information and coordinated traffic communication systems impedes timely response to roadway incidents resulting in secondary collisions and increased non-recurring congestion.

What happens when we add capacity?

In the short run....

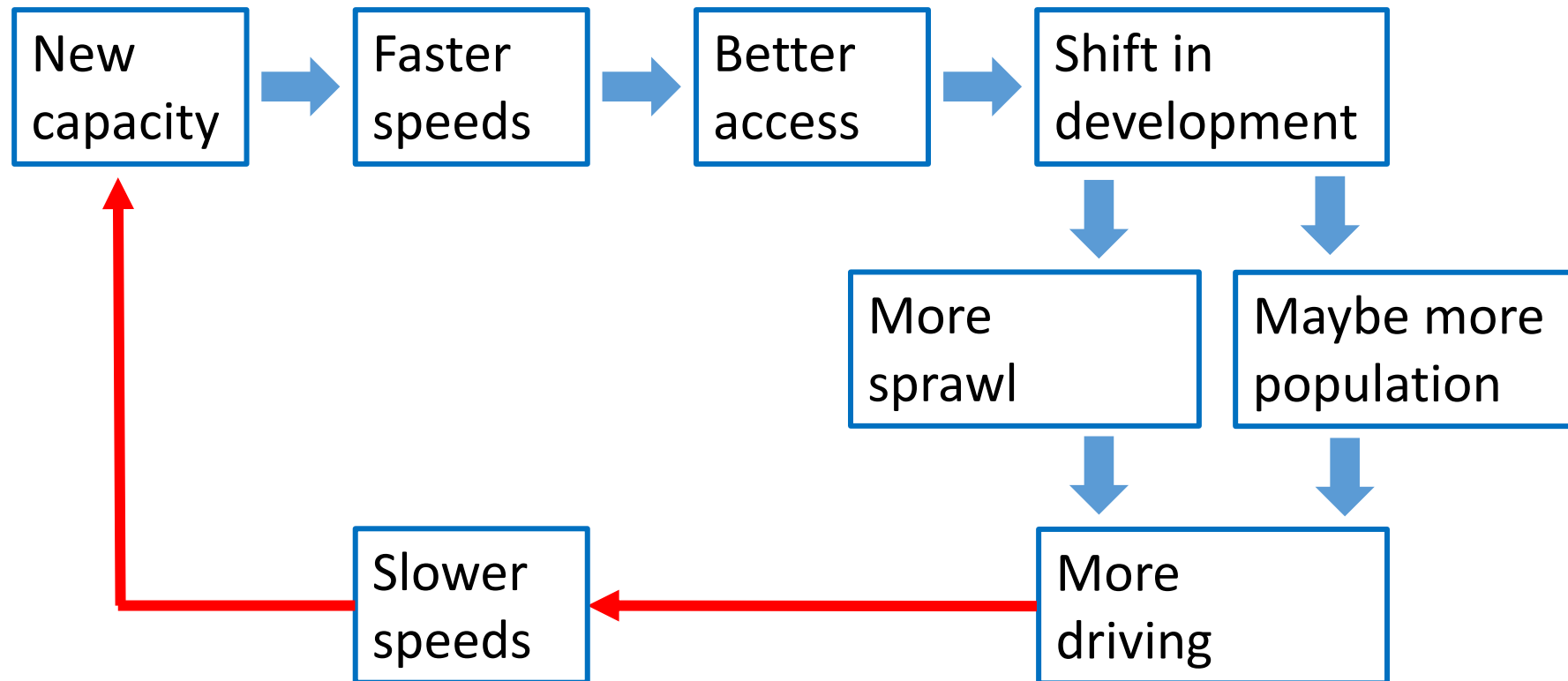


Induced Driving – short run

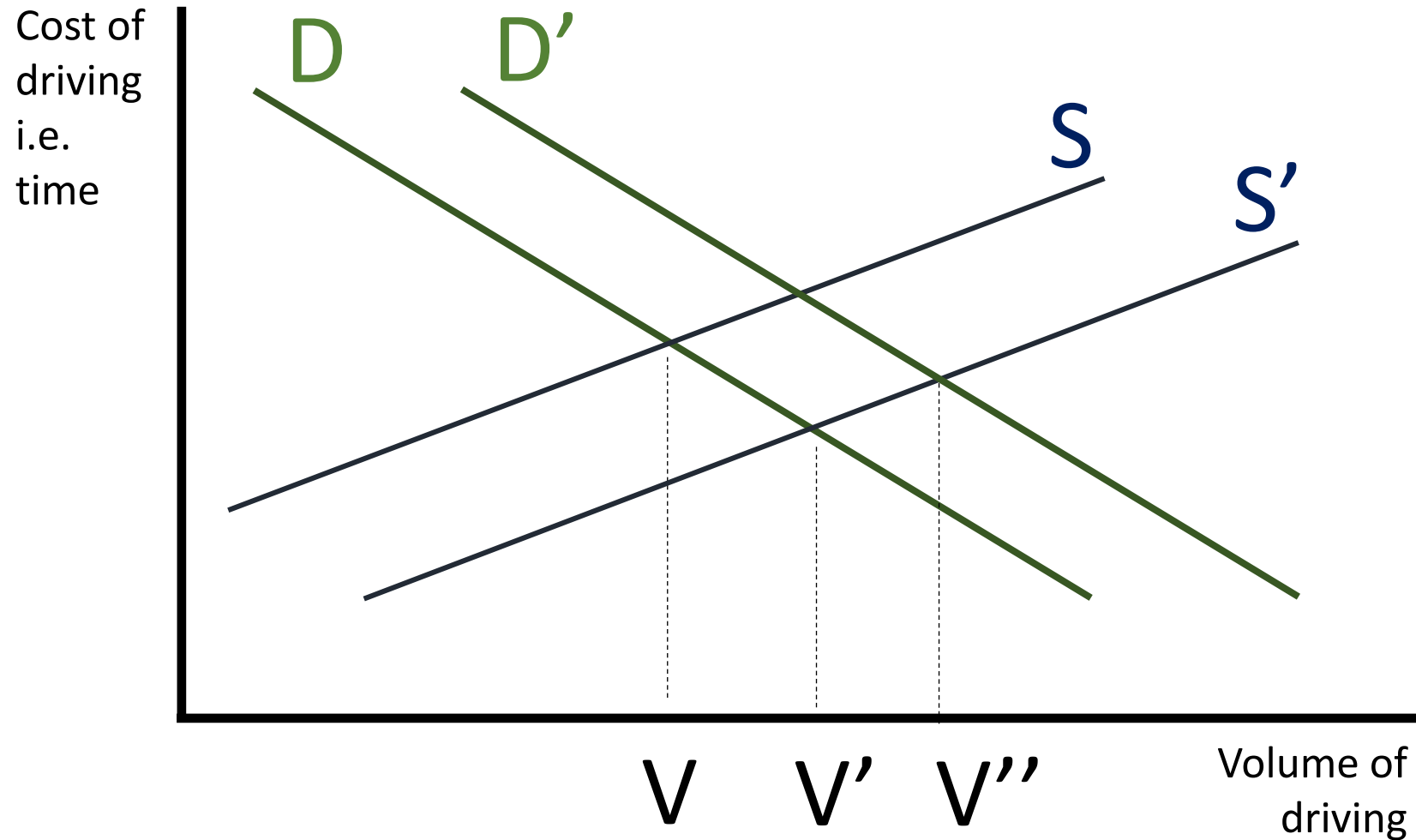


But what happens when we add capacity?

In the long run....



Induced Driving – long run



Increasing Highway Capacity Unlikely to Relieve Traffic Congestion

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Issue

Reducing traffic congestion is often proposed as a solution for improving fuel efficiency and reducing greenhouse gas (GHG) emissions. Traffic congestion has traditionally been addressed by adding additional roadway capacity via constructing entirely new roadways, adding additional lanes to existing roadways, or upgrading existing highways to controlled-access freeways. Numerous studies have examined the effectiveness of this approach and consistently show that adding capacity to roadways fails to alleviate congestion for long because it actually increases vehicle miles traveled (VMT).

An increase in VMT attributable to increases in roadway capacity where congestion is present is called “induced travel”. The basic economic principles of supply and demand explain this phenomenon: adding capacity decreases travel time, in effect lowering the “price” of driving; and when prices go down, the quantity of driving goes up.¹ Induced travel counteracts the effectiveness of capacity expansion as a strategy for alleviating traffic congestion and offsets in part or in whole reductions in GHG emissions that would result from reduced congestion.

Key Research Findings

The quality of the evidence linking highway capacity expansion to increased VMT is high. All studies reviewed used time-series data and sophisticated econometric techniques to estimate the effect of increased capacity on congestion and VMT. All studies also controlled for other factors that might also affect VMT, including population growth, increases in income, other demographic factors, and changes in transit service.²

Increased roadway capacity induces additional VMT in the short-run and even more VMT in the long-run. A capacity expansion of 10% is likely to increase VMT by 3% to 6% in the short-run and 6% to 10% in the long-run. Increased capacity can lead to increased VMT in the short-run in several ways: if people shift from other modes to driving, if drivers make longer trips (by choosing longer routes and/or more distant destinations), or if drivers make more frequent trips.^{3,4,5} Longer-term effects may also occur if households and businesses move to more distant locations or if development patterns become more dispersed in response to the capacity increase. One study concludes that the full impact of capacity expansion on VMT materializes within five years⁶ and another concludes that the full effect takes as long as 10 years.⁷

Capacity expansion leads to a net increase in VMT, not simply a shifting of VMT from one road to another. Some argue that increased capacity does not generate new VMT but rather that drivers simply shift from slower and more congested roads to the new or newly expanded roadway. Evidence does not support this argument. One study found “no conclusive evidence that increases in state highway lane-miles have affected traffic on other roads”⁸ while a more recent study concluded that “increasing lane kilometers for one type of road diverts little traffic from other types of roads”.⁹

Increases in GHG emissions attributable to capacity expansion are substantial. One study predicted that the growth in VMT attributable to increased lane miles would produce an additional 43 million metric tons of CO₂ emissions in 2012 nationwide.¹⁰

“A capacity expansion of 10% is likely to increase vehicle-miles-travelled by 3% to 6% in the short-run and 6% to 10% in the long-run.”

Congestion = f (volume/capacity)

No ▲

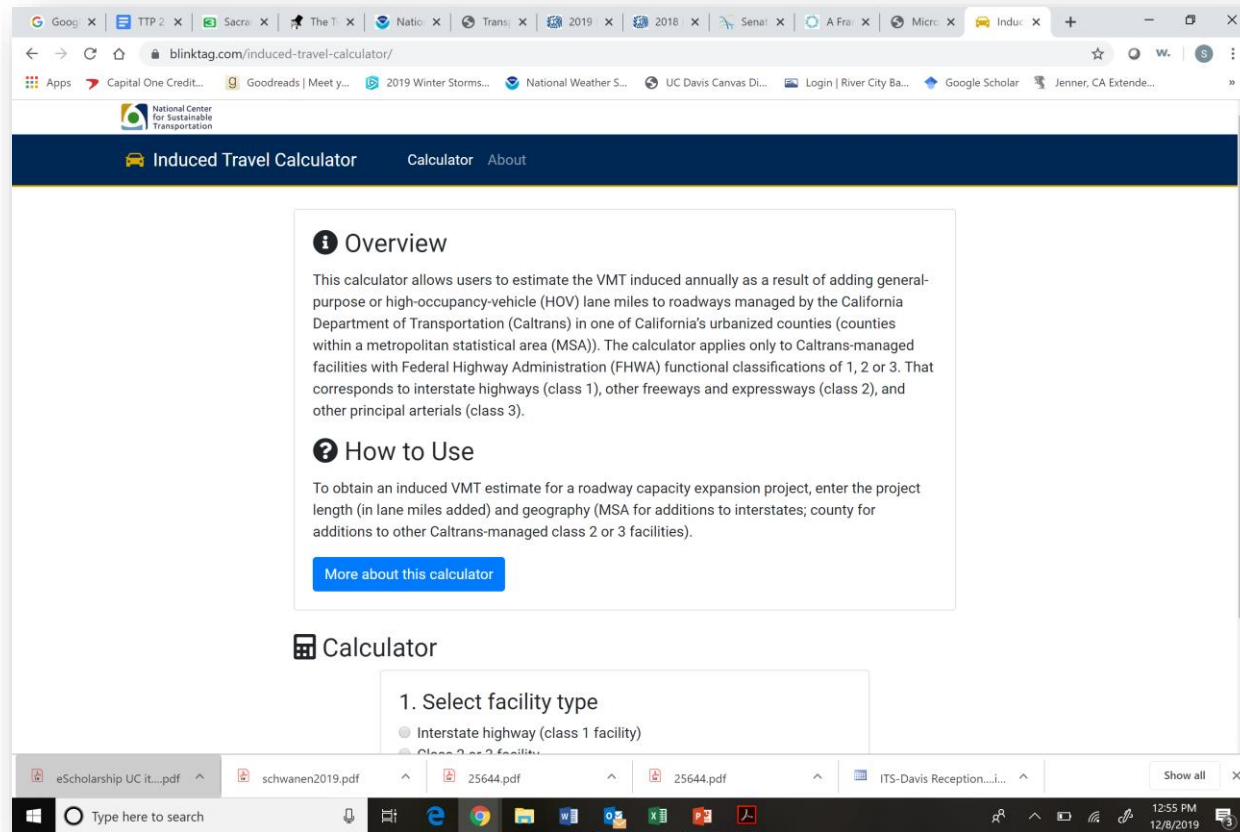


YOLO 80 CORRIDOR IMPROVEMENT PROJECT



Induced Travel Calculator

Volker, Lee, and Handy, 2018-2021 now with support from Caltrans



“This calculator allows users to estimate the VMT induced annually as a result of adding general-purpose or high-occupancy-vehicle (HOV) lane miles to roadways managed by the California Department of Transportation (Caltrans) in one of California’s urbanized counties (counties within a metropolitan statistical area (MSA)). ”

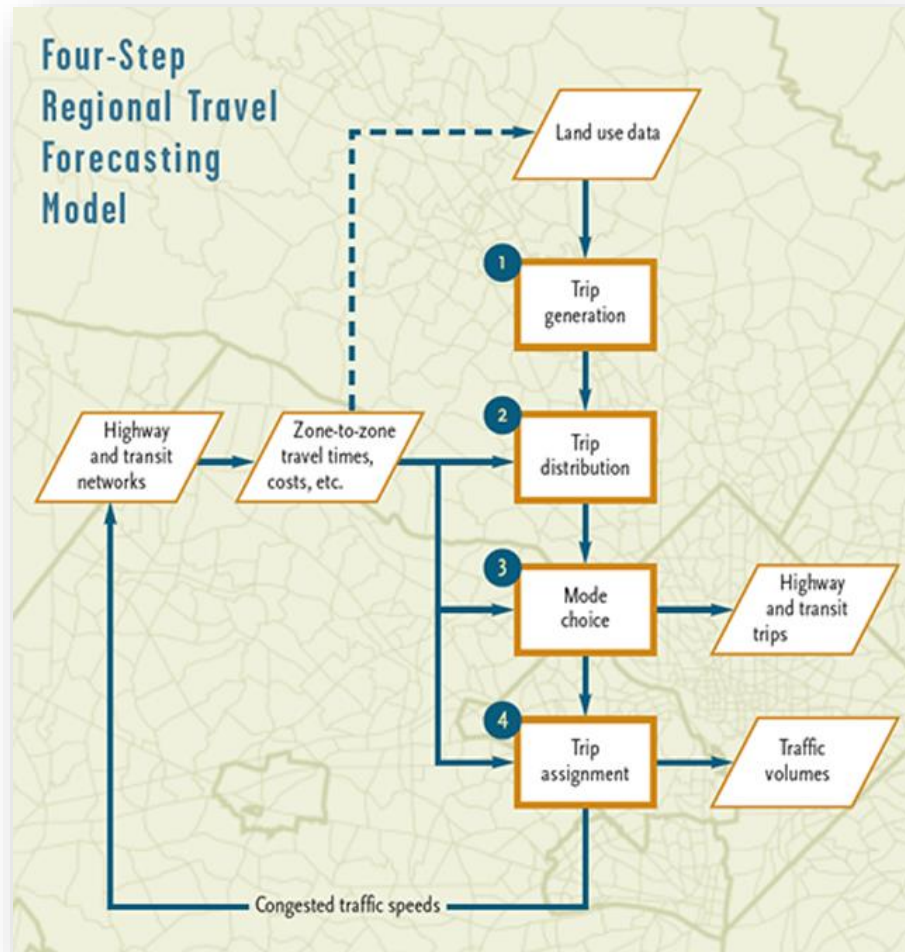
<https://travelcalculator.ncst.ucdavis.edu/>

Underestimation of induced VMT in the environmental review process

Volker, J., A. Lee, and S. Handy. 2020. Induced Vehicle Travel in the Environmental Review Process. *Transportation Research Record*, 2674: 468-479.

Project	Additional lane miles	Calculator estimate of additional VMT/year	EIR estimate of additional VMT/year
Interstate 405 HOV Widening Sepulveda Pass, Los Angeles County	10.2	87.8 million	n/a
US Highway 101 HOV Widening Marin-Sonoma Narrows	32.2	129.1 million	11.5 million (peak hour)
State Route 1 HOV Lanes Santa Cruz County	17.8	57.4 million	7.9 million
State Route 210 Mixed-Flow Lane San Bernardino County	16.4	34.3 million	25.1 million
State Route 99 Six-Lane Project South Stockton, San Joaquin County	7.2	14.4 million	n/a

Travel Demand Forecasting Models



Models generally lack feedback loops between estimated travel speeds and:

- Mode choice: what mode?
- Trip distribution: what destinations?
- Trip generation: how many trips?
- Land use: how many people and jobs are located where?

Congestion = f (volume/capacity)



Webinar: Faster Freeways – Exploring the Potential of Pricing

Learn how Bay Area freeway travel, transit and safety could be improved in 2035. Share your feedback on potential pricing strategies and community reinvestment priorities.



What works? Depends on the goal...

Goal	Strategies
Reduce Congestion	Pricing
Provide Alternatives	Land use mix Network connectivity Transit, bike, ped
Reduce VMT	All of the above!

What about “managed” lanes?

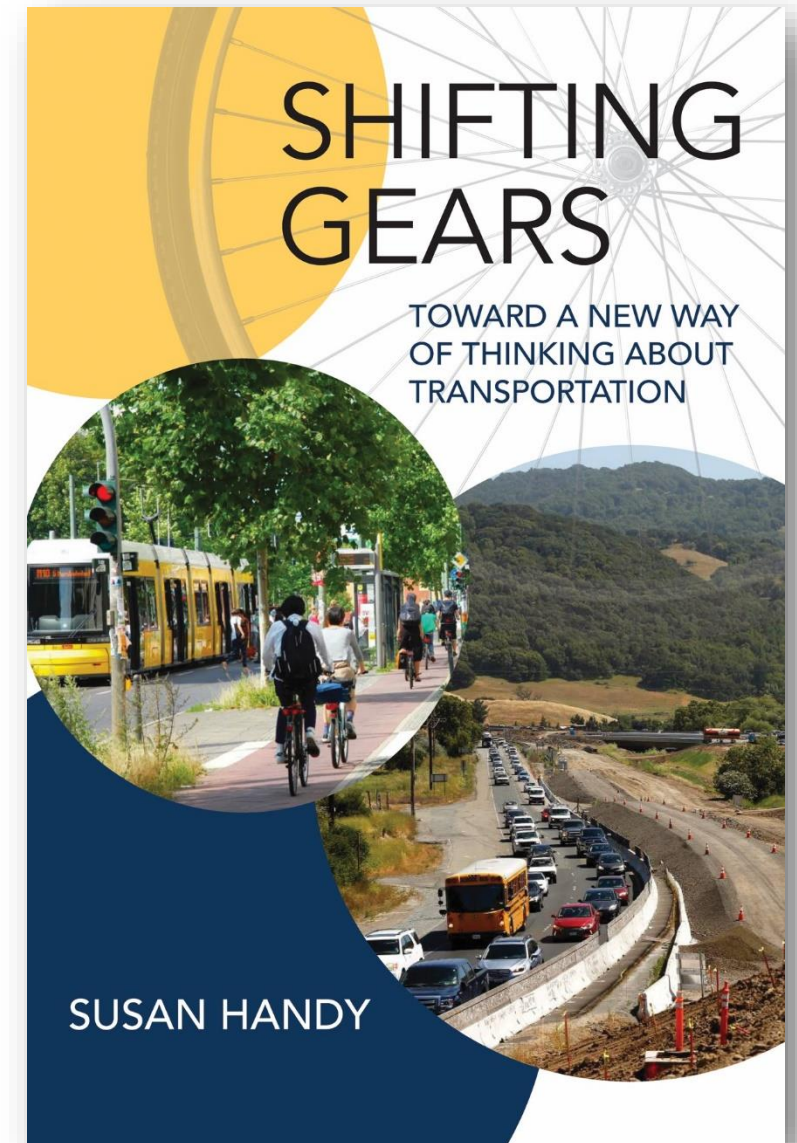


“Overall, the available empirical evidence suggests that new HOV and HOT lanes might have similar induced travel effects as general-purpose lane expansions. Furthermore, because HOT lanes allow more vehicles than HOV lanes... they would logically have at least as large induced travel effects as HOV lanes. Pure toll lanes, on the other hand, could have lower elasticities.”

We need to shift to
a new way of thinking
about transportation

What are the real problems?

What are the best solutions?



Ideas at the core of the transport profession

Freedom	Cars give us freedom
Speed	Faster is better
Mobility	Congestion needs solving
Vehicles	Streets are for cars
Capacity	We need more of it
Hierarchy	Design to match function
Separation	Modes should not mix
Control	Drivers need rules
Technology	Segways solve everything

= Making it easier to drive



Alternatives to the traditional ideas

Freedom	Cars give us freedom	But do they really?	Justice
Speed	Faster is better	But slow can be good	Slow
Mobility	Congestion needs solving	But not with access	Accessibility
Vehicles	Streets are for cars	And for people	People
Capacity	We need more of it	Or maybe not	Demand
Hierarchy	Design to match function	And networks that link	Connectivity
Separation	Modes should not mix	Except when they should	Integration
Control	Drivers need rules	But not always	Chaos
Technology	Segways solve everything	Depending on us	Agency

*= Making it easier and
safer to not drive*

A paradigm shift in US transport planning?

The Old Way:

Make it easier to drive



The New Way:

Make it easier to NOT drive



Or the “throw everything at it” mentality?

Highway 101 Marin-Sonoma Narrows



Marin and Sonoma's SMART Train



Real progress comes when we...

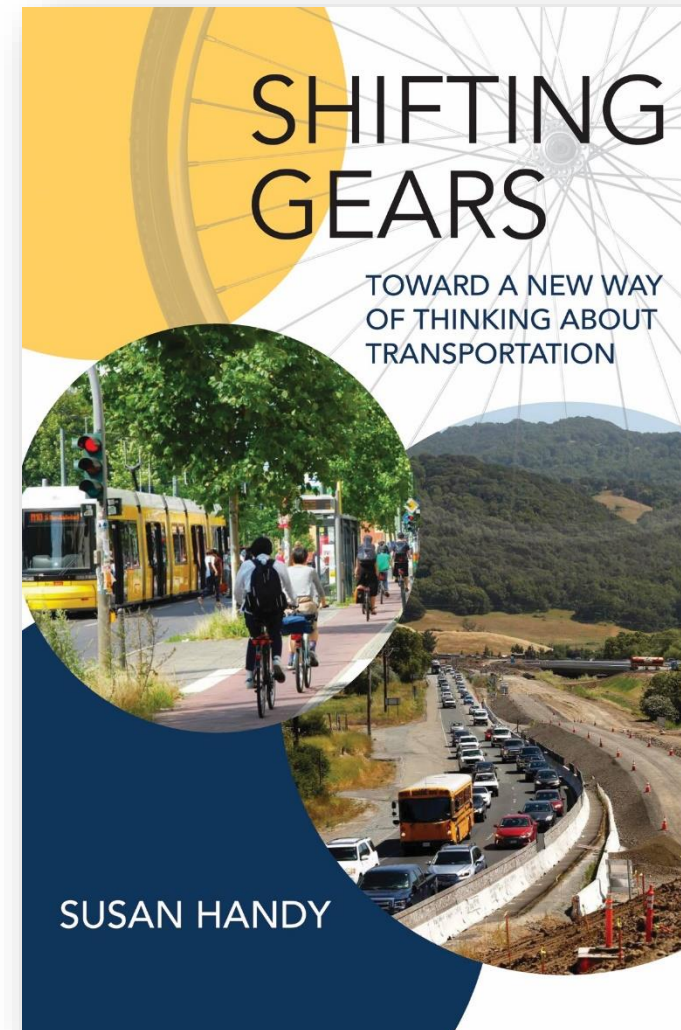
Get over the obsession with congestion, i.e. NOT mobility



Focus on providing alternatives, i.e. YES accessibility



Thank you!
Questions?
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The 4-Step Model

