Policy Frameworks for Urban Transportation Sustainability—Assessing California's Experience

… as seen by an academic, regulator, and policy wonk

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NRC Committee on Urban Sustainability
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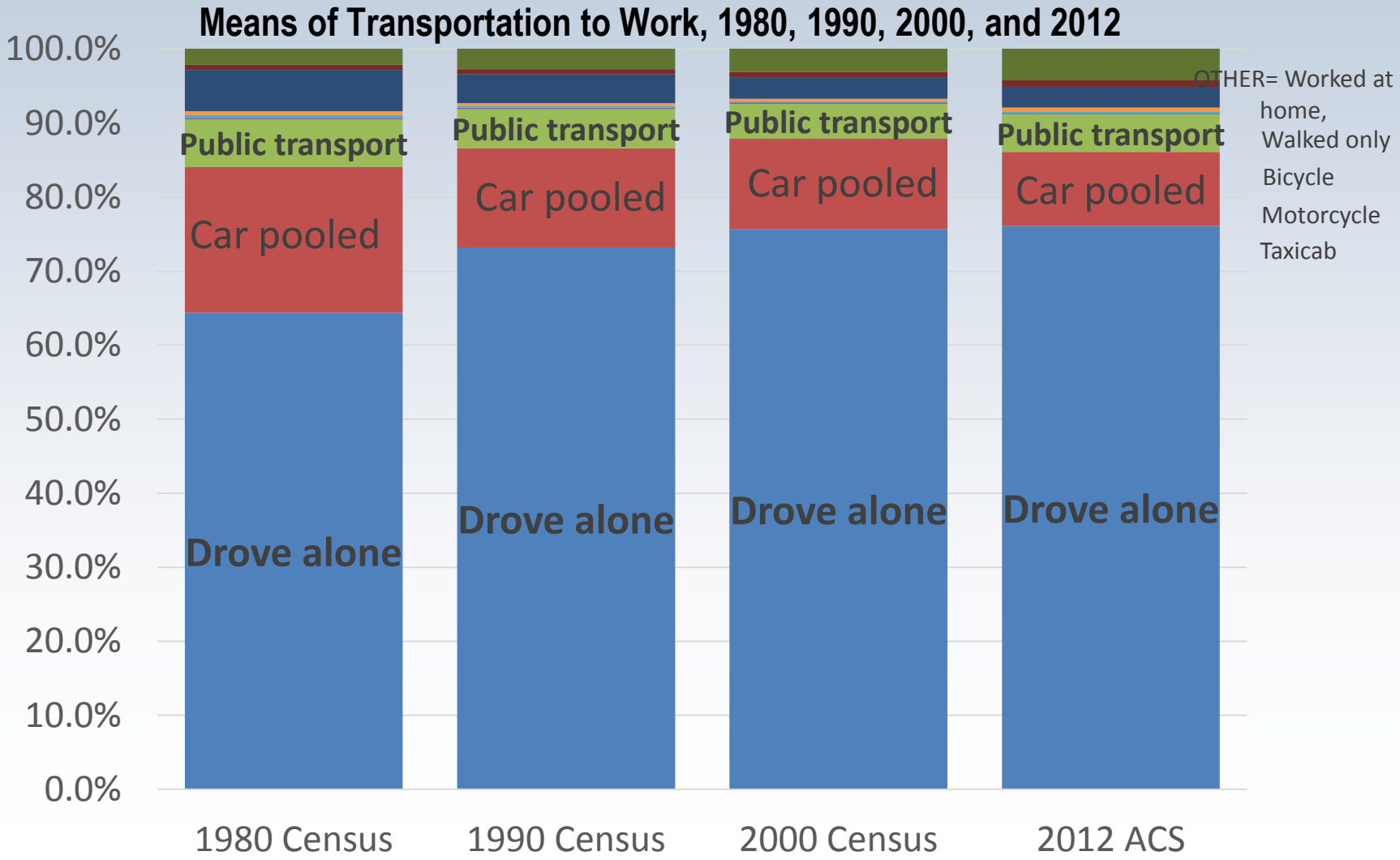
UCDAVIS UNIVERSITY OF CALIFORNIA

ITS UCDAVIS INSTITUTE OF TRANSPORTATION STUDIES

Today's US Transportation System is a Monoculture

(Pioneered in LA)

Buses/rail = 3% of Passenger miles (~5% of trips)



Car-Centric Monoculture is Extraordinarily Expensive and Resource-Intensive (USA)

- Road Infrastructure Cost
  - Over $100 billion/yr
  - Plus other infrastructure costs to support sprawl
- Personal Cost
  - $9000/year to own and operate a car
  - Total = $1+ trillion/yr
- Oil
  - 70% of oil consumption
  - $300-$500 billion/yr
- Climate Change
  - 1/3 of GHGs
- Air Pollution
  - Half of urban air pollution

Successes and Failures in Transportation

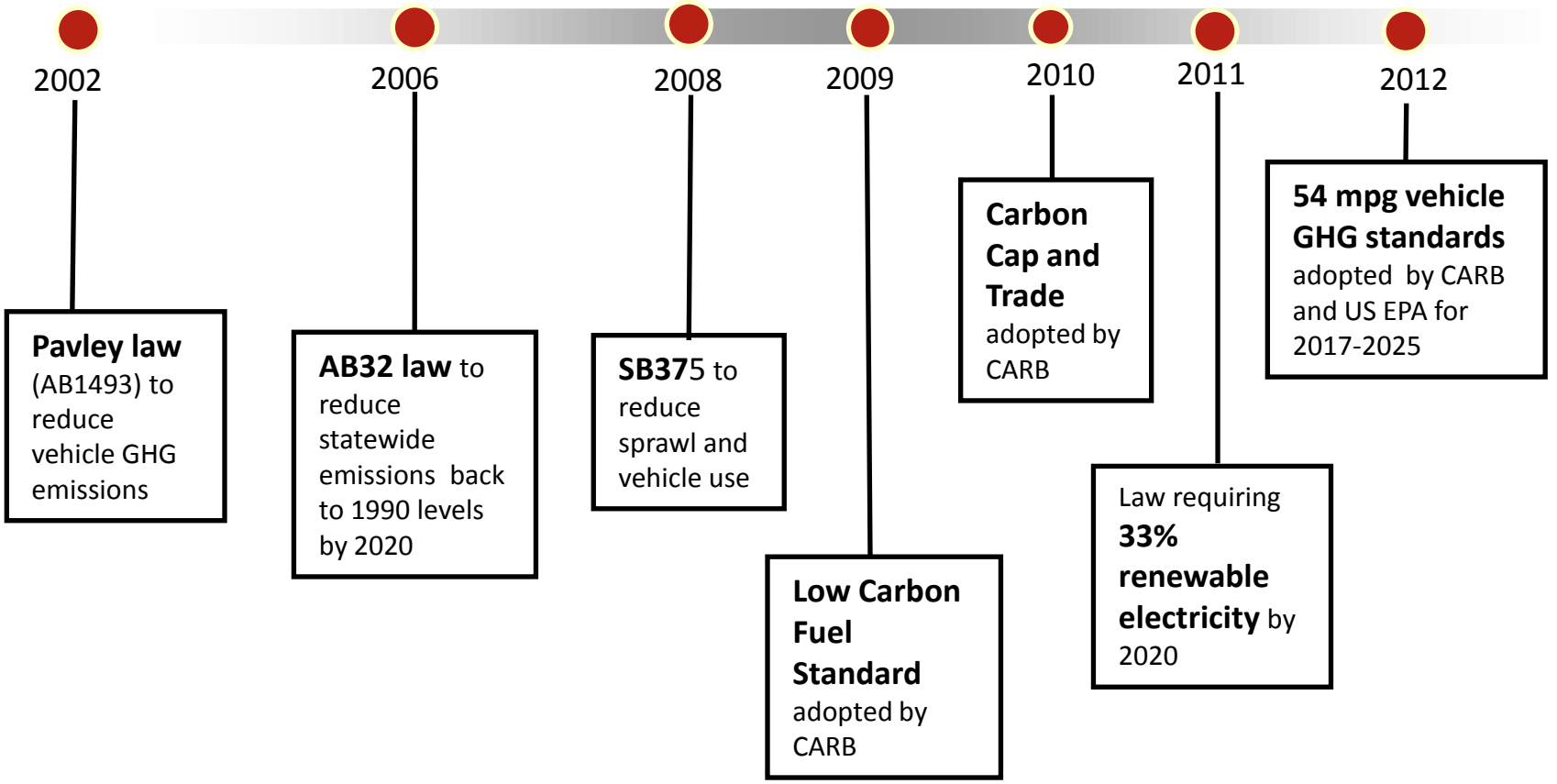
Huge Successes (technology) (a la Marty Wachs)

- Conventional air pollutants reduced 99% in new cars and trucks (since 1960s)
- Fuel efficiency of cars improving fast (~4%/year improvement)

Slow (or No) Progress

- Vehicle use per capita is flat (was +2-4%/yr until 2000)
- Land use sprawl continues (but slowing)
- Transition to advanced low-carbon vehicles is slow (battery electric, plug-in hybrid, and fuel cell electric)
- Freight energy use/GHG emissions slowly increasing

Key California GHG Laws and Regulations



"We can not solve our problems with the same thinking [and institutions and research] we used when we created them."

- Albert Einstein

California's Comprehensive Program to Reduce GHG Emissions from Transportation

VEHICLES

- **GHG light duty vehicle stds**
- GHG requirements for trucks (mostly to improve aerodynamics)
  - California/Feds adopting GHG/fuel efficiency standards for heavy trucks
- ZEV mandate (light duty)
- $ for vehicles (ZEVs) (Feds + California)

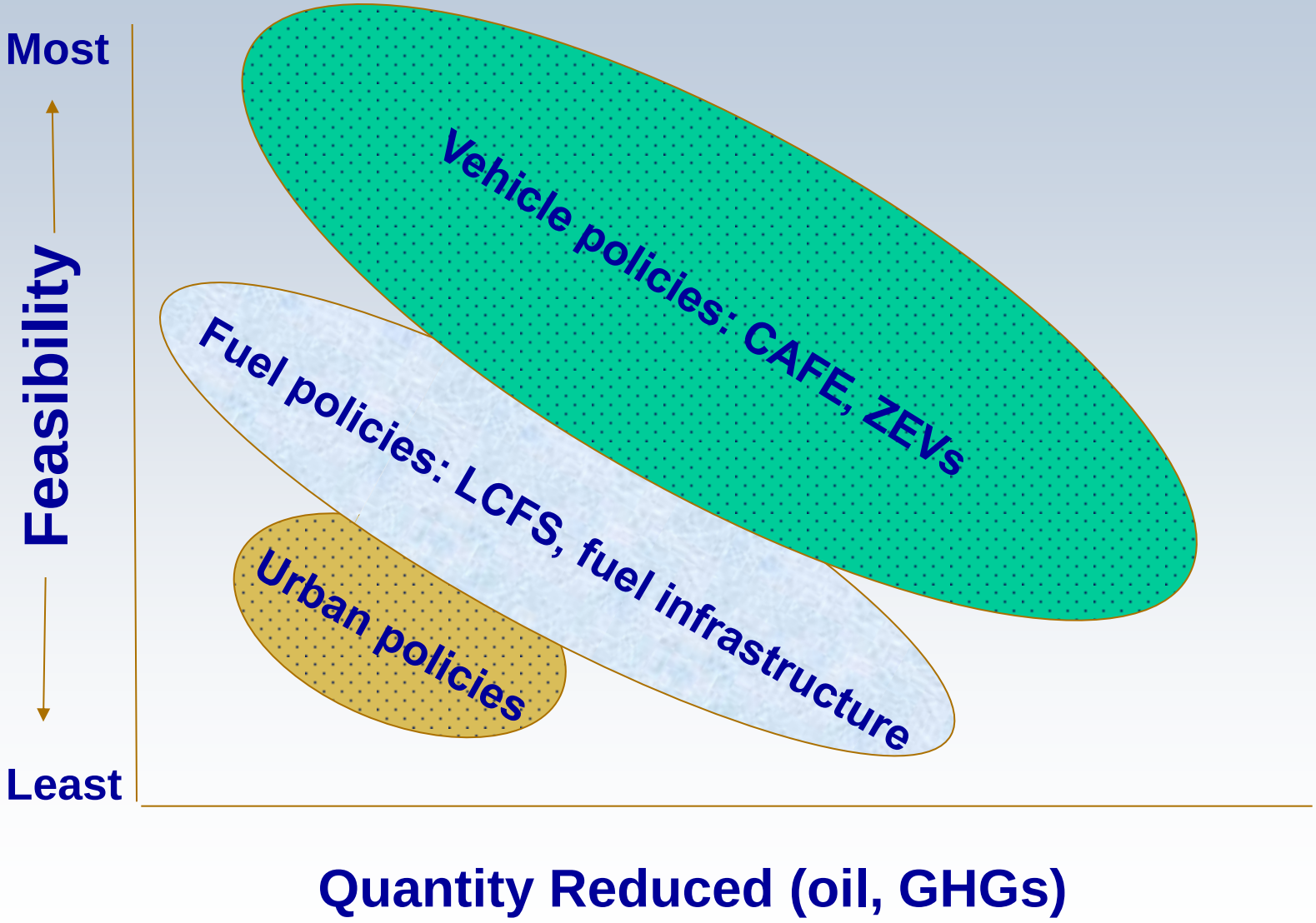
FUELS

- **Low carbon fuel standard req't for oil companies** (plus federal renewable fuel standard)
- Funding for EV chargers and hydrogen stations
- Carbon cap and trade for transport fuels (and refineries)
- 33% renewable electricity stds for utilities

Mobility, Land Use

- **Reduce VMT and sprawl (SB375)**
- Sustainable freight initiative

Political, Economic, and Technological Opportunities for Oil & GHG Reductions in Transport



Why Gov't Initiative is Needed … and why prices are not enough

A Long List of Market "Failures" (and "Conditions")

- **Environmental and energy externalities**
- **Principal agent problem** (rental cars, truck trailers, leased vehicles, cars for legislators/execs)
- **Network externality**. Complementary products requiring large *non-recoverable* investments and investments that cannot be made by individual consumers—such as when different vehicles or different infrastructures are required (H2, bike paths for biking, new mobility services, etc)
- **Technology lock-in**
- **Market power** (cartels, oligopolies, etc)
- **High entry barriers in auto industry**
- **R&D under-investment** due to:
  - industry diffusion (trucks, many products)
  - R&D spillovers. When R&D findings cannot be fully captured (leading to under-investment in R&D)
  - Learning-by-doing spillovers where mfg savings not fully captured
- **Consumer cognition** (eg, buying cars), resulting in under-investment in efficiency (related to information and loss-aversion)
- **Volatile oil prices** create uncertainty which leads to under-investment in alternatives

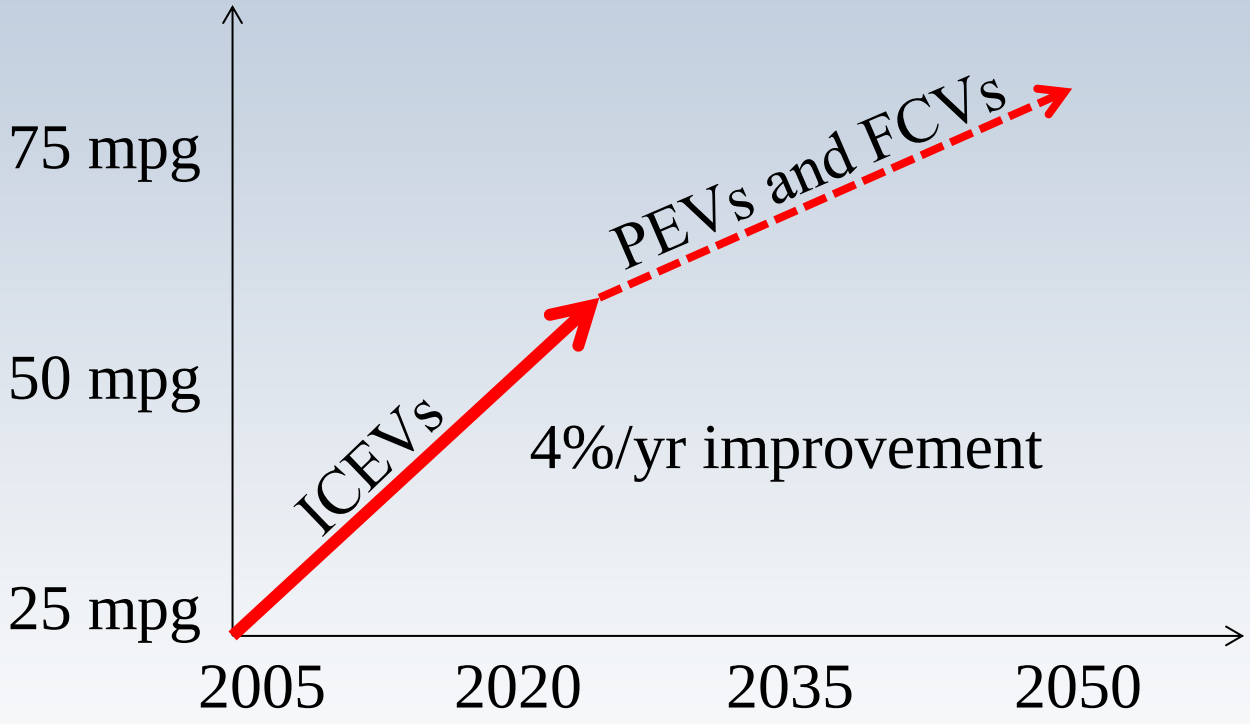
How to Create Transport Systems That Are Cheaper, Better, and More Sustainable?

- Less expensive
- Less resource intensive
- Less carbon intensive
- More accessible

➢ ***Two Transportation Revolutions Underway***

Revolution 1a: Auto Industry on Path to 80% Reduction

(assuming policies continue and consumers don't resist)



Revolution #1b: Vehicle Electrification ….

engaging policy, automakers *and* consumers!

Nissan Leaf
Battery electric

Tesla Model S
Battery electric

Chevy Volt
Plug-in hybrid

Toyota Mirai
Hydrogen fuel cell

"Examine how federal, state and local agency efforts and partnerships can complement/leverage the efforts of key stakeholders"

California ZEV Action Plan

Leadership from top with array of executive orders, "Action Plans," Governor summits, regulations, incentive programs, etc

2013 Action Plan

Progress to date
Benefits of ZEVs
Challenges to ZEV expansion
Structure of the 2013 ZEV Action Plan
Goal 1: Complete needed infrastructure and planning
    Specific actions for goal 1
Goal 2: Expand consumer awareness and demand
    Specific actions for goal 2
Goal 3: Transform fleets
    Specific actions for goal 3
Goal 4: Grow jobs and investment in the private sector
    Specific actions for goal 4
Conclusion

Revolution #2: Sharing Rides and Vehicles

… engaging policy, industry, *and* consumers!

"Silicon Valley" transformed how we communicate, do research, buy books, listen to music, and find a date ….

What is it doing for transportation?

Breakthrough: Uber/Lyft (partly at expense of Taxis)

How to stimulate innovation while protecting consumers and public interest

Need new policy framework that eases excessive regulation on taxis and imposes appropriate regulations on new services.

NEW MOBILITY OPTIONS

Dynamic Ridesharing

Smart Paratransit

Carsharing

Conventional Transit

NEVs

New Mobility Services Could Capture over 30% of Passenger Travel

- ✓ Unable to drive
  - Elderly and young; physical disabilities
- ✓ Prefer not to drive
  - Drinking alcohol
  - Deteriorating driving skills (esp nighttime)
- ✓ Emergencies
  - Car breakdown or car unavailable
- ✓ Save money
  - Carpool to work, school, events
  - Access to conventional transit
- ✓ Use travel time productively

Large Potential Public Benefits of New Mobility Services

- Less vehicle use
  - Result of transforming fixed costs into variable costs
- Improved access by mobility disadvantaged (elderly, handicapped, suburban/rural poor)
  - Perhaps subsidized by gov't?

Key Strategy: How to Reduce Car Use?

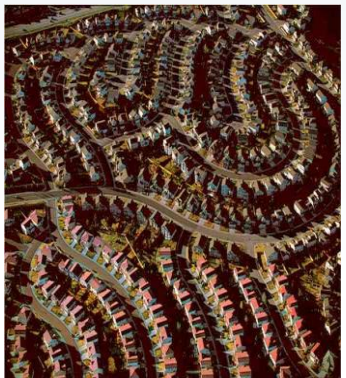
Politically Incorrect Facts (US and California)

- HOV lanes failed
- Demand management policies failed
- Conventional transit performs poorly (except serving dense downtowns)
  - High cost (60% of metro transport budgets for <10% of trips)
  - Similar GHG/PMT to cars

"Examine how federal, state and local agency efforts and partnerships can complement/leverage the efforts of key stakeholders"

California's SB 375 Model (Sustainable Communities Act of 2008)

- Requires reductions in GHGs associated with passenger vehicle use via changes in land use, transit, and pricing
- Established GHG targets for major cities (Sept 2010):
  - **2020: 6-8% reduction/capita (mostly VMT)**
  - **2035: 13-16% reduction/capita (mostly VMT)**
- **GHG is single performance metric for 375, but many co-benefits**
  - **Effective because most strategies to reduce GHGs are same strategies used to create more sustainable cities**



SB375 Sustainable Communities Act of 2008

- …. But weak incentives
- Why good policy?
  - Provides performance-based mechanism for funding cities
  - Empowers local governments to do good planning and investment
  - Policies to reduce GHGs generate large co-benefits such as reduced infrastructure costs, healthy communities

NRC Committee*: "The commonalities, strengths, and gaps in knowledge among rating systems that assess the sustainability of metropolitan regions"*

- **GHG emissions/capita is robust metric (SB 375)**

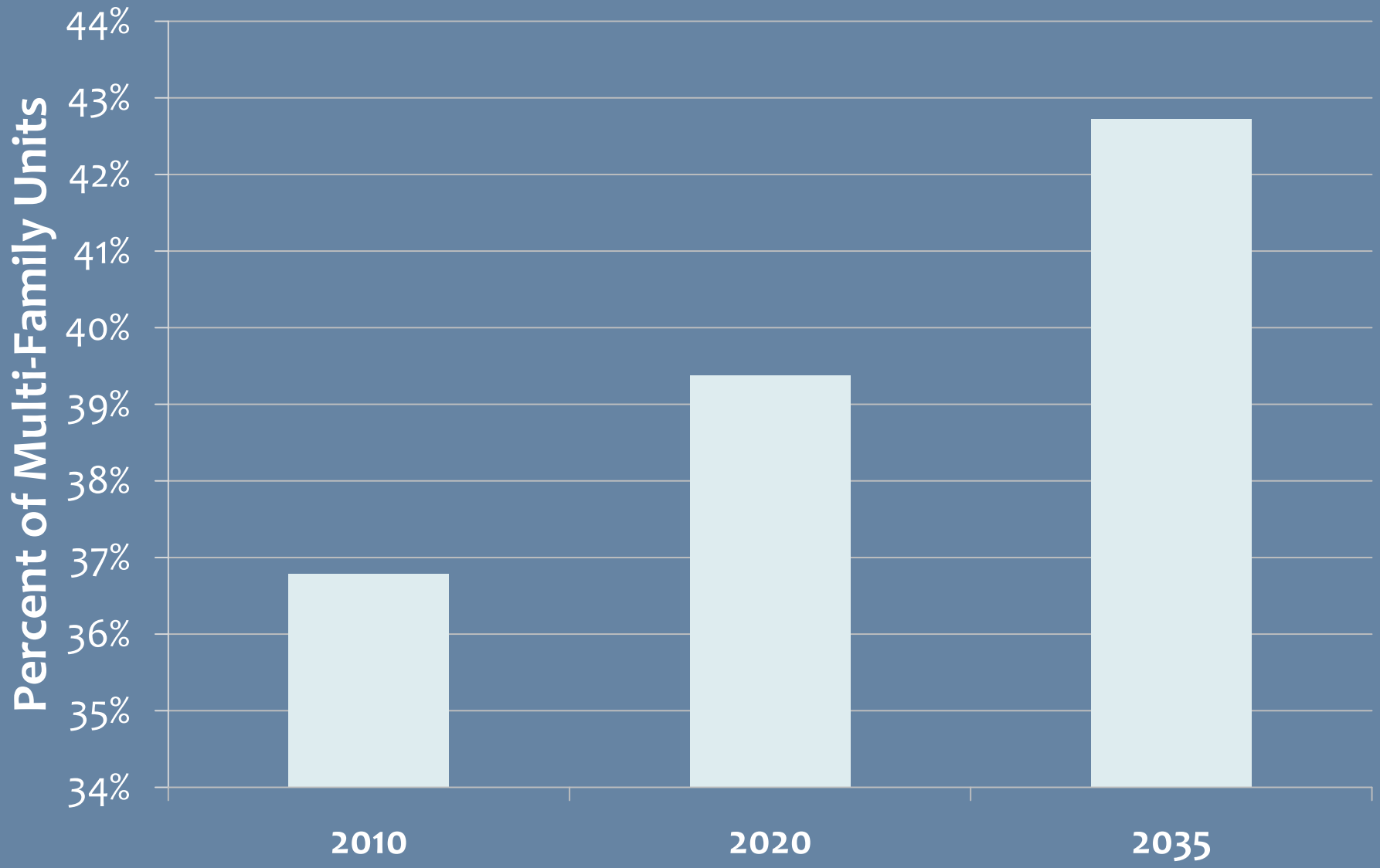
Model for rest of country?

SF Bay Area "SB 375" Case Study

- Project 16% reduction in per capita GHG emissions by 2035 (more than half through VMT reduction)

MULTI-FAMILY HOUSING

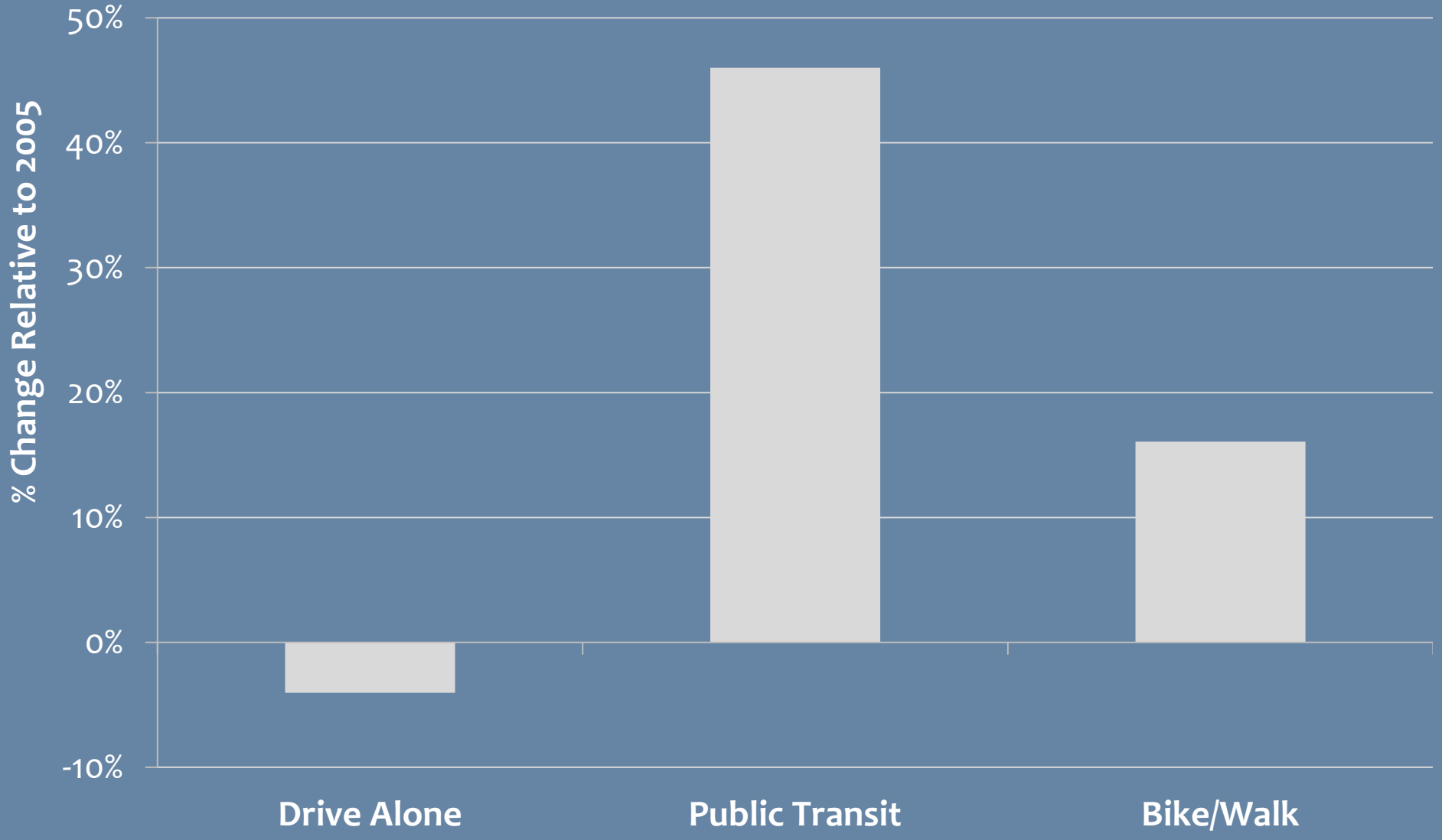
Increasing share of multi-family units.



SF Bay Area SCS Plan, 2014

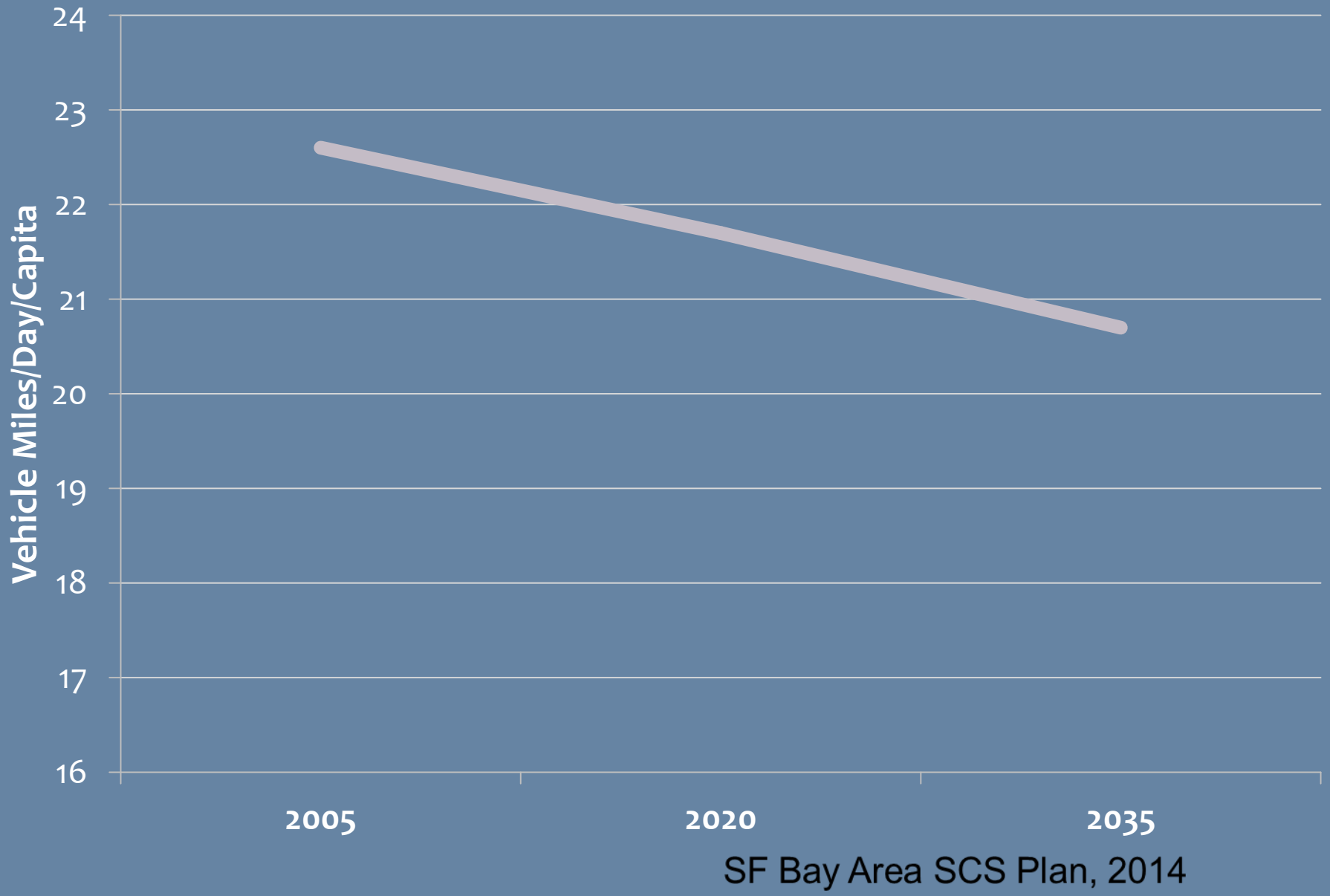
PERCENT CHANGE IN MODE SHARE

By 2040, there are fewer drive-alone trips and more trips taken by biking, walking, and transit.



PER CAPITA VEHICLE MILES TRAVELED

Per capita VMT decreases.



SF Bay Area SCS Plan, 2014

Another Successful Model of Urban Sustainability

West Village at UC Davis

- Largest Net Zero Energy Community in US
- Collaboration of university and private sector
- Commercial venture—no subsidies
  - Off-the-shelf technology
  - Focus on smart design, energy efficiency, and solar energy

Solution Needed for Freight Transport

More Challenging than Passenger Transport

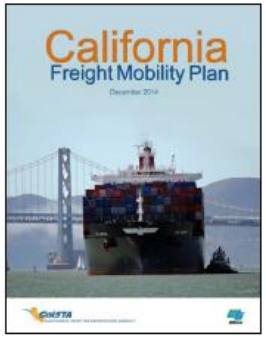
- Logistics sprawl
- Many players
- Intertwined in economy

CALIFORNIA
SUSTAINABLE FREIGHT INITIATIVE

Update on Sustainable Freight Strategy
Pathways to Zero

April 23, 2015

California Environmental Protection Agency
Air Resources Board



CALIFORNIA GOVERNOR'S OFFICE OF BUSINESS AND ECONOMIC DEVELOPMENT

California
Sustainable Freight Strategy

How to integrate science, technology, and research to support sustainability?

Large Role for Universities!

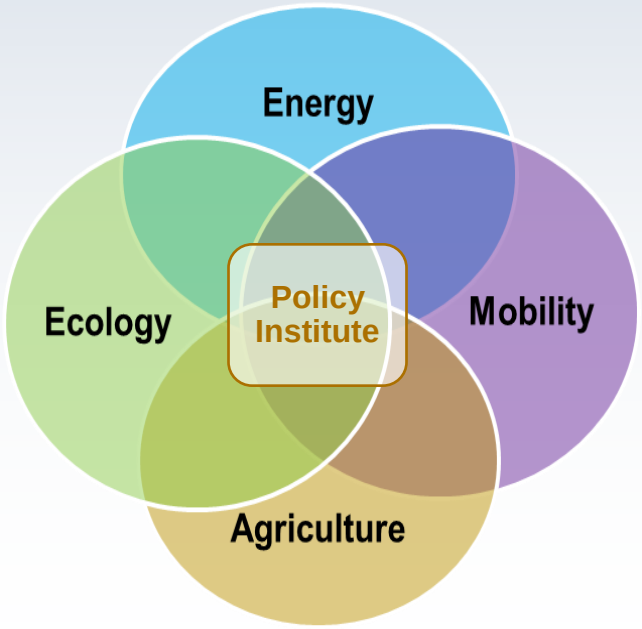
UC Davis Model:
Policy Institute for Energy, Environment and the Economy

Mission:

Leverage world-class university expertise and engage directly with decision-makers to deliver credible, relevant and timely information and analysis to inform better energy and environmental policy

Approach:

- Direct Engagement
- Leveraging Research to Inform Policy
- Integrating Across Disciplines
- Training Leaders



Concluding Remarks From a Frustrated Policy Wonk

- Technology fixes are much easier than behavioral
- Universities can play a strong helping role
- SB375 policy framework is compelling for passenger travel and perhaps freight also
- GHG/capita is a good metric/performance standard for sustainability
- Lots of good sustainability examples (West Village, etc) but theories, paradigms, and model frameworks tend to be very sensitive to local institutions and circumstances
- Your committee assignment/task is superhuman

California Showing the Way to the Promised Land?!

Thank You