Measuring, Analyzing, and Identifying Small-Area Vehicle Miles Traveled Reduction

Contract No. 20RD006

Final Presentation

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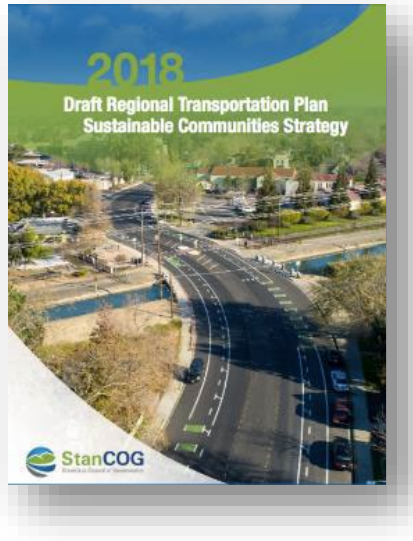
SB 375

Targets for per capita GHG emissions reduction from cars and trucks for metropolitan areas, by reducing vehicle-miles-traveled (VMT)

Metropolitan Planning Organizations (MPOs) must prepare Sustainable Communities Strategies (SCSs) with Regional Transportation Plans (RTPs)

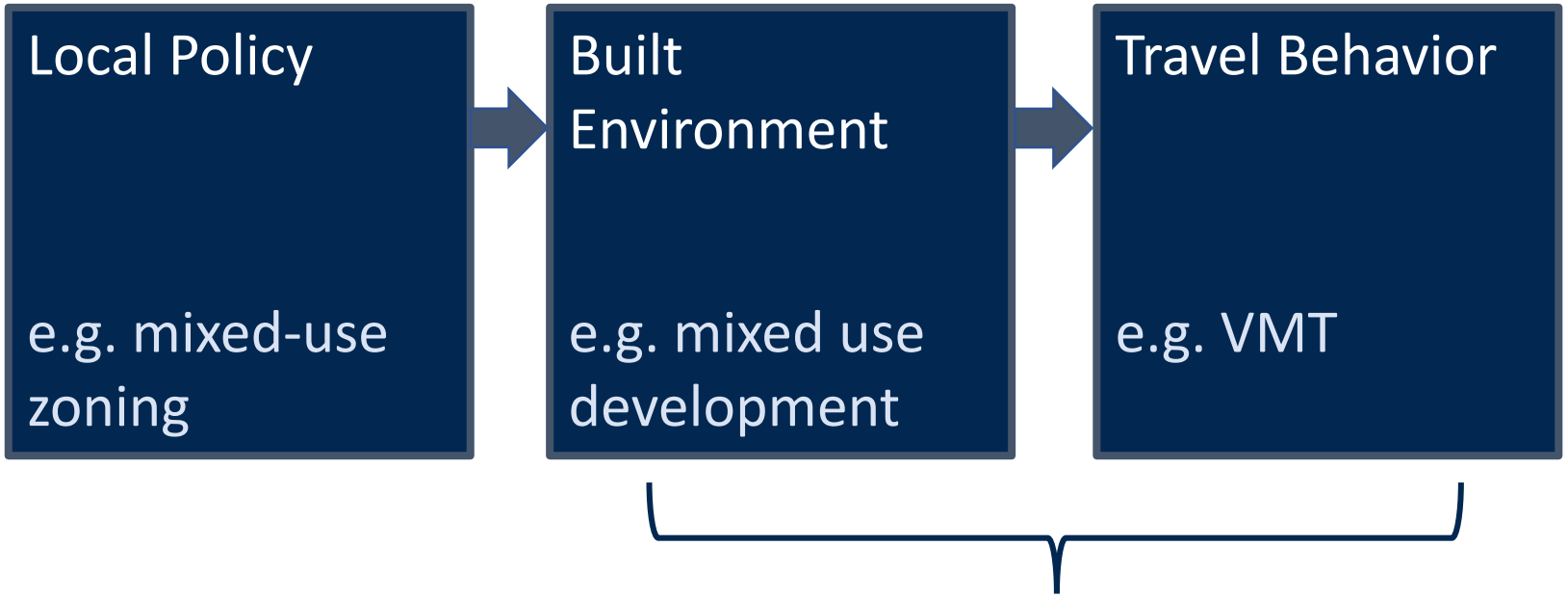
	2020	2035
Sacramento	-7%	-19%
Bay Area	-10%	-19%
LA region	-8%	-19%
San Diego	-15%	-19%



Underlying Assumptions

Changes in the built environment will lead to changes in travel behavior.

Local policies can bring about changes in the built environment.



Lots of evidence but it is mostly cross-sectional!

Cross-sectional versus longitudinal

- Cross-sectional research: Are *differences* in the built environment associated with *differences* in travel behavior at a given point in time?
  - Requires data at only one point in time.
  - Establishes association but not causality.

- Longitudinal research: Are *changes* in the built environment associated with *changes* in travel behavior over time?
  - Requires data at two or more points in time.
  - Provides stronger evidence of causality.

Project Goals

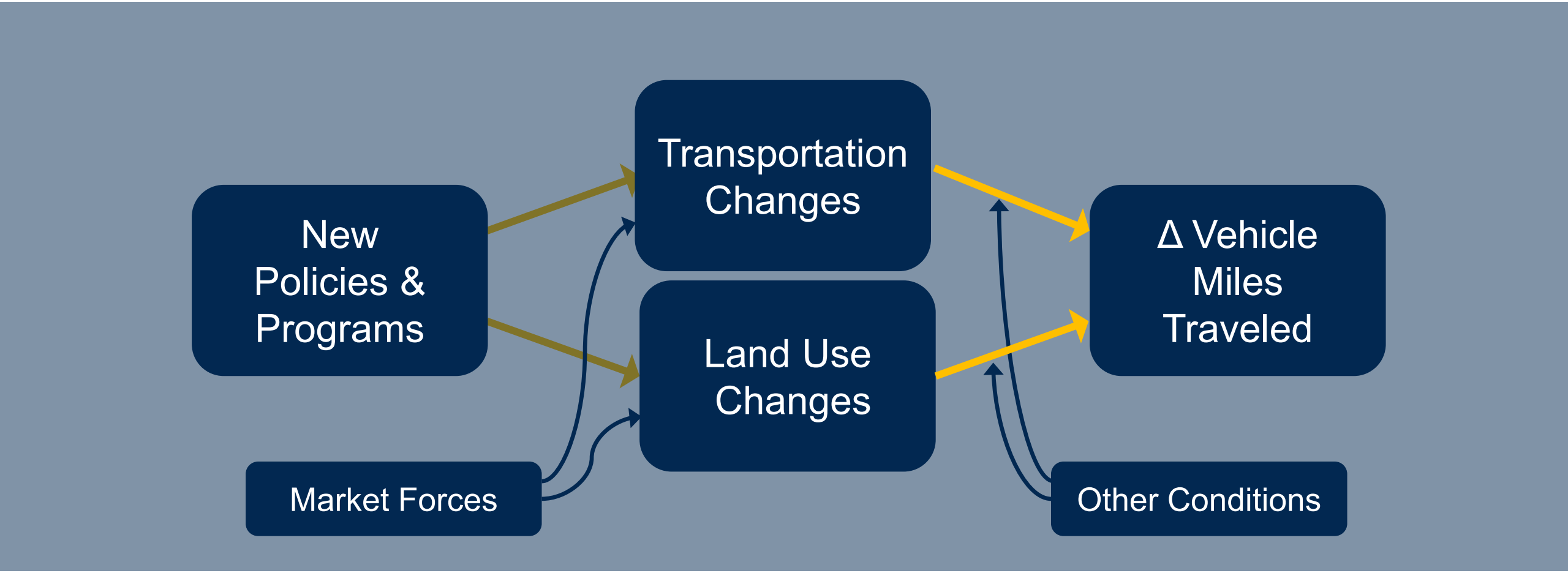
Document changes in travel behavior resulting from changes in land-use patterns and the transportation system in specific case study areas.

Use a case study approach to explore a limited number of cases in a longitudinal and holistic way, rather than test associations statistically.

Conduct, in essence, a “natural experiment” in two parts:

1. Did local policy changes contribute to “on-the-ground” changes in the built environment?
2. Did on-the-ground changes contribute to changes in travel behavior, specifically VMT reductions?

Conceptual Model



Timing Considerations

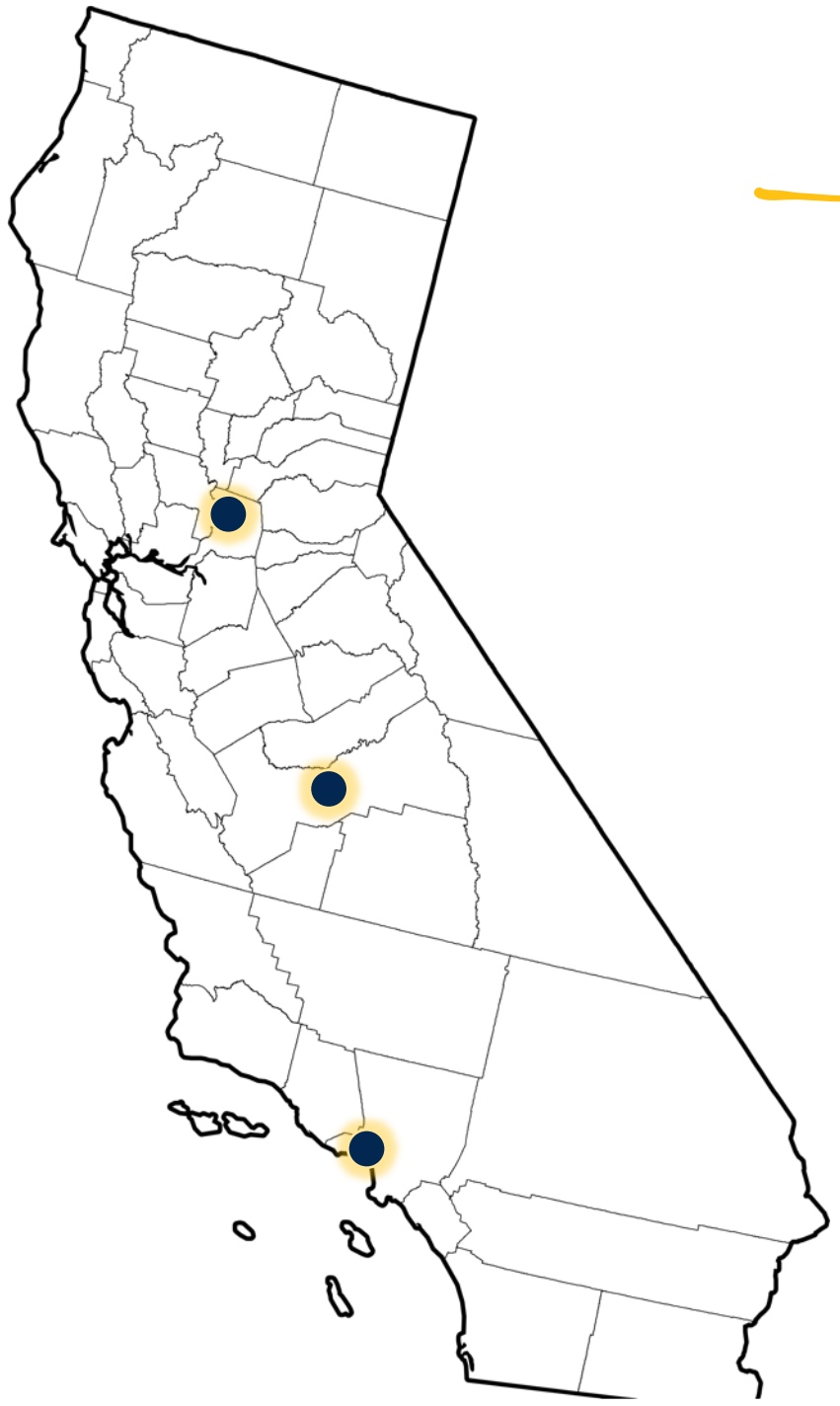
- Retrospective rather than prospective study
- Lag between policies and “on the ground changes”
- Lag between “on the ground changes” and changes in travel behavior
- Lag between changes in travel behavior and availability of data showing changes in travel behavior
- COVID-19 pandemic impact on travel behavior

Study period roughly 2000 to 2019
Changes are on-going

Other Challenges

- Policies happen in bundles: connections between specific policies and specific changes to the built environment are difficult to isolate.
- Built environment changes happen in bundles: connections between specific changes to the built environment are difficult to isolate.
  - A set of built environment changes is likely to have synergistic effects.
- Data on travel behavior for small areas is limited in quantity and quality.

Case studies are an important complement to large-sample quantitative studies



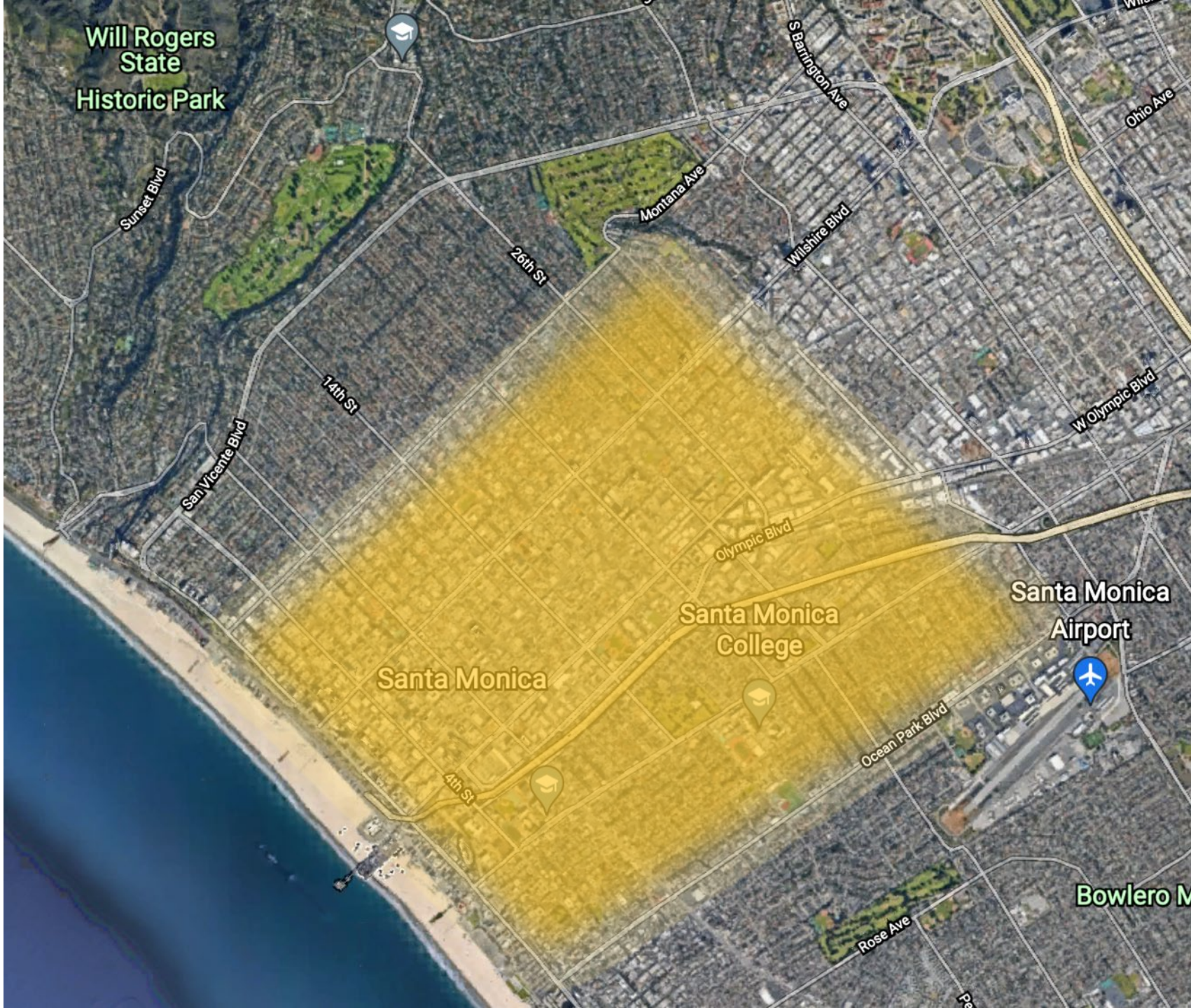
Case Study Areas

- Central Sacramento
- Downtown Fresno
- Downtown Santa Monica

Historical similarities physically
Economic differences over time
Policy differences recently

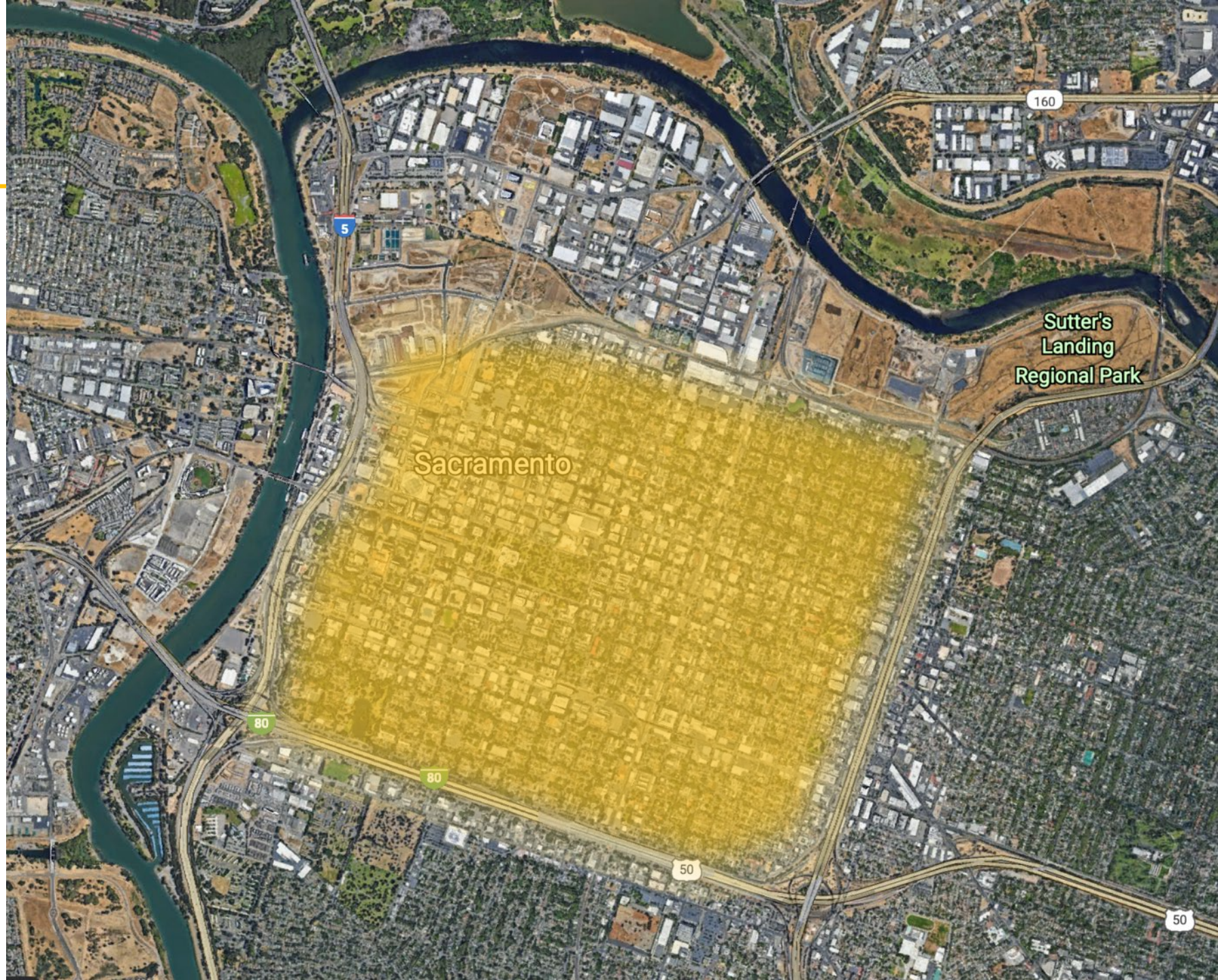
Santa Monica

5 square miles bounded by Montana Avenue, Centinela Avenue, Ocean Park Boulevard, Pacific Ocean



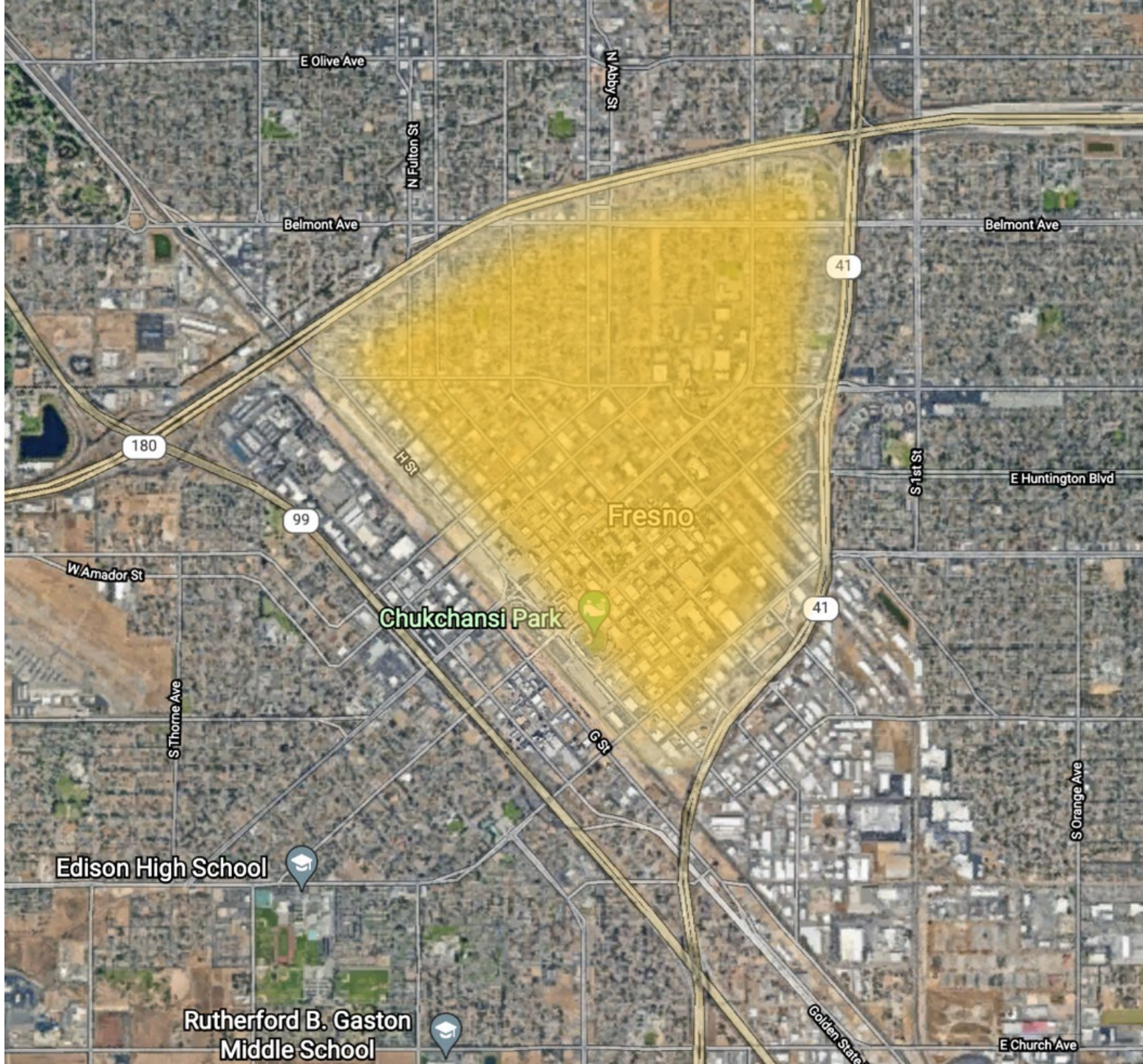
Sacramento

3.5 square mile bounded by I-5, Highways 50 and 99, Union Pacific tracks



Fresno

2 square miles bounded by railroad tracks, Highway 180, Highway 41



Part 1: What Changed and Why

Data Sources

- General plans, specific plans, transportation plans
- Other public documents
- Newspaper and other media articles
- Interviews with local planners
- Google street view archives
- American Community Survey
- Site visits

Santa Monica: Key Policies

00s

Sustainable City Plans

- Sets goals for mode share, VMT, infrastructure, etc.

2010

Land Use & Circulation Element (LUCE)

- Integrates land use & transportation
- Allows higher-density, mixed-use infill & TOD, sets ambitious transportation goals

2011

Bicycle Action Plan

- Creates priority bicycle network, bike share policy, programs201

2015

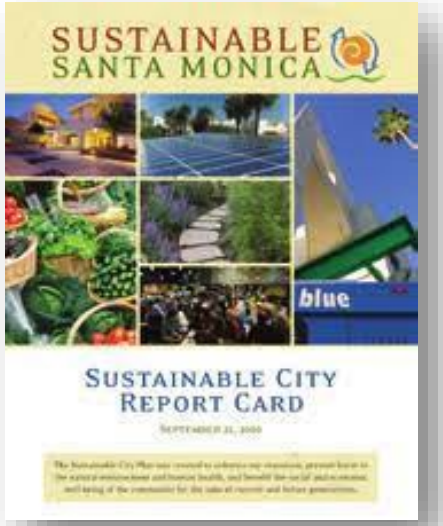
Zoning Code Update

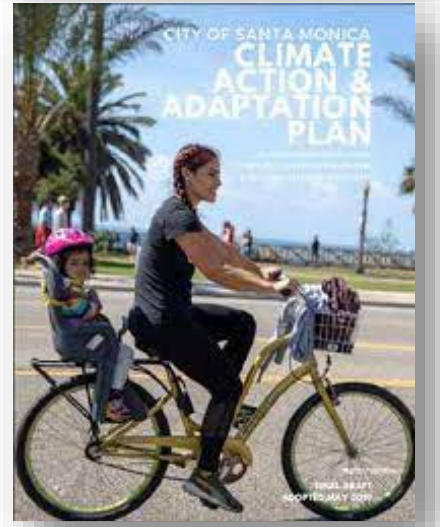
- Aligns zoning code with LUCE
- Streamlines 100% affordable housing

2017

Downtown Community Plan

- Creates tiered development approval process, height and density bonuses for affordable housing
- Parking reform





Santa Monica: On-the-Ground Changes

2007

Infill since 2007

- 1000+ housing units
- 100 affordable units
- 1.6 M sq ft commercial

2011

Ocean Park Boulevard 'complete green street' opens

2014

Pico Branch Library opens

2015

City launches Breeze Bike Share

Colorado Esplanade opens

2016

Expo light rail stations open in Santa Monica

- 26th Street/Bergamot
- 17th Street/Santa Monica College
- Downtown Santa Monica

2017

Scooters and e-bikeshare arrive

- City launches 16-month shared mobility pilot

Santa Monica Housing Units

	2010	2015	2019	2010-15	2010-19
Case Study Tracts	29,636	30,491	30,857	+3%	+4%
City of Santa Monica	50,015	50,934	51,124	+2%	+2%
Los Angeles County	3,425,736	3,476,718	3,542,800	+1%	+3%

Source: ACS 5-Year Estimates, Table B25001

Housing units increased faster in the case study area

Santa Monica Median Income

	2010	2015	2019	2010-15	2010-19
Case Study Tracts	$62,648	$72,000	$91,648	15%	46%
City of Santa Monica	$68,842	$76,580	$96,570	11%	40%
Los Angeles County	$55,476	$56,196	$68,044	1%	23%

Source: ACS 5-Year Estimates, Tables S1901, S2503

Incomes increased faster in the case study area.
Incomes were lower in the case study area than the city but higher than the county.

Sacramento: Key Policies

2009

2030 General Plan

- Sets a vision for smart growth & infill

2012

Zoning Code Parking Update

- Reforms off-street parking standards in central city

2015

2035 General Plan & Central Community Plan

- Directs the city to actively support and facilitate infill and development around LRT

2018

Grid 3.0 & Bicycle Master Plan

- Maximizes road use efficiency
- Creates policy, programs, infrastructure priorities

2018

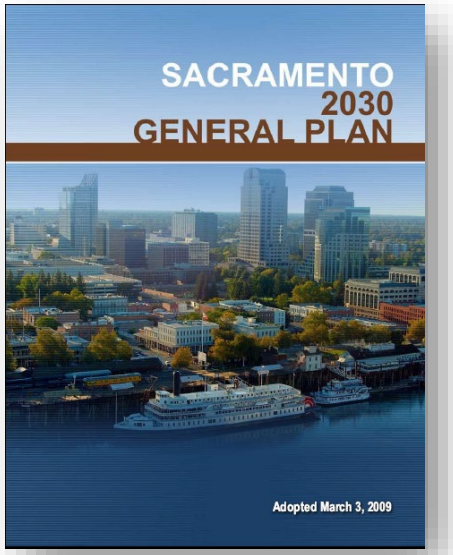
Central City Specific Plan

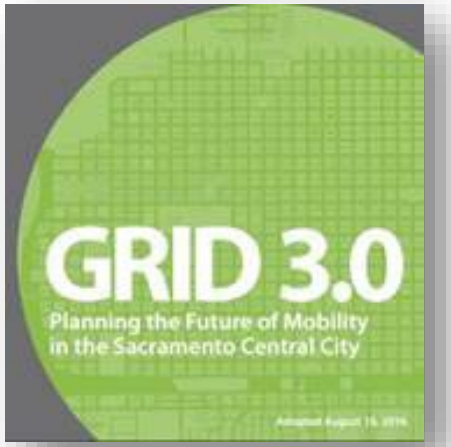
- Guides development of 10,000 new housing units in next 10 years

2018

TOD Ordinance

- Prohibits auto-centric land uses within 1/2 miles of light rail stations





Sacramento: On-the-Ground Changes

2009

I5 Bike/Ped Bridge

- City converts R St Viaduct over I5 to bike/ pedestrian bridge

2012

R Street Corridor

- City completes first phase of streetscaping

2018

JUMP bikes arrive

2019

GIG Car Share launches

Residential & Mixed-Use Development

- 2000+ housing units

2011 to 2018

Golden1 Center & Downtown Commons Opens

- Arena + 1.5 M sq ft retail, restaurant, hotel, office

2016

Downtown Bikeways

- City constructs 30 blocks of protected bikeways

2018

Sacramento Housing Units

	2010	2015	2019	2010-15	2010-19
Case Study Tracts	20,129	20,593	21,003	+2%	+4%
City of Sacramento	191,000	193,298	196,652	+1%	+3%
Sacramento County	551,985	560,271	570,752	+2%	+3%

Source: ACS 5-Year Estimates, Table B25001

Housing units increased faster in the case study area

Sacramento Median Income

	2010	2015	2019	2010-15	2010-19
Case Study Tracts	$35,447	$39,580	$54,113	12%	53%
City of Sacramento	$50,267	$50,739	$62,335	1%	24%
Sacramento County	$56,439	$55,987	$67,151	-1%	19%

Source: ACS 5-Year Estimates, Tables S1901, S2503

Incomes increased faster in the case study area.
Incomes were lower in the case study area than the city and the county.

Fresno: Key Policies

2002

Transit Long Range Master Plan

- Plans to restructure transit network and introduce bus rapid transit

2003

Downtown Vision Plan

- An advisory report of the Downtown Improvement Group

2008

Bus Rapid Transit Master Plan

- BRT Implementation Plan and Proposed BRT Network

2009

Fresno Green Handbook

- Streamlines and incentivizes infill development

2016

Fulton Corridor Specific Plan

- A vision for “the renaissance” of Downtown”
- Guides development of 6,300 residential units, 5 million sq ft of commercial, 18,000 jobs in Downtown Fresno

2016

Downtown Neighborhoods Community Plan

- Policies and actions to guide rejuvenation of Downtown neighborhoods
- Establishes Downtown "as the heart of Fresno"

2016

Downtown Development Code

- Implements the visions of the Fulton Corridor Specific Plan & Downtown Neighborhoods Community Plan
- Form-based code for Downtown core

Fresno: On-the-Ground Changes

2002

Chukchansi Park

- City-owned baseball stadium for Fresno Grizzlies opens
- Used for other events

2008

Infill Housing Development

- 600+ units built Downtown between 2008 and 2016

2016

Fulton Street Reconstruction

- City breaks ground to reintroduce traffic to pedestrian-only Fulton Mall

2018

FAX launches BRT Q line

- 15.7-mile route along Blackstone/Ventura/Kings Canyon corridor
- 10-minute headways at peak

Fresno Housing Units

	2010	2015	2019	2010-15	2010-19
Case Study Tracts	3,810	3,961	4,318	+4%	+13%
City of Fresno	169,066	174,593	178,831	+3%	+6%
Fresno County	310,219	321,955	331,142	+4%	+7%

Source: ACS 5-Year Estimates, Table B25001

Housing units increased faster in the case study area

Fresno Median Income

	2010	2015	2019	2010-15	2010-19
Case Study Tracts	$24,805	$18,509	$25,497	-25%	3%
City of Fresno	$43,124	$41,531	$50,432	-4%	17%
Fresno County	$46,430	$45,233	$53,969	-3%	16%

Source: ACS 5-Year Estimates, Tables S1901, S2503

Incomes increased more slowly in the case study area.
Incomes were lower in the case study area than the city and the county.

Part 2: Analyzing Travel Data

Data Sources

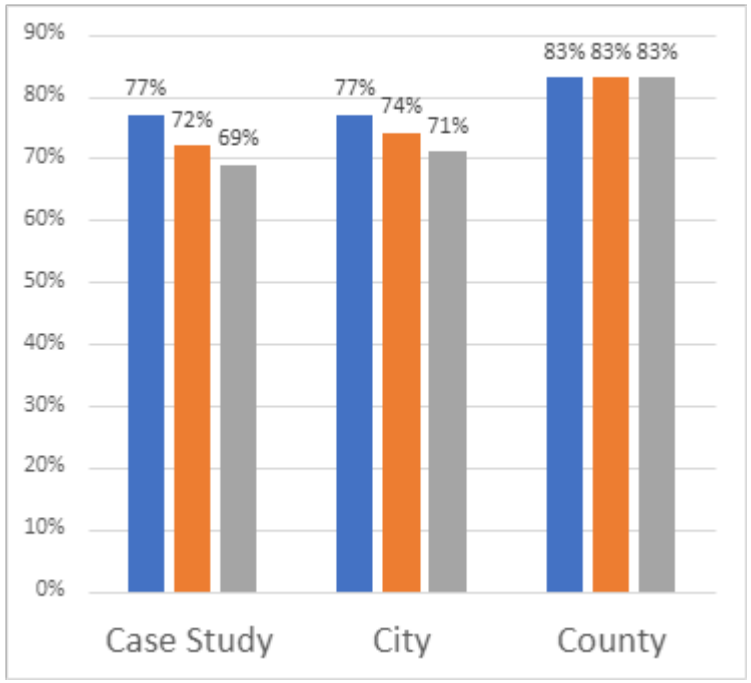
- Multiple years for all three case studies
  - American Community Survey
  - California and National Household Travel Surveys
- City-specific data sources
  - Regional household travel surveys for Sacramento
  - Specialized surveys
  - Counts

ACS Analysis for 2010, 2015, 2019

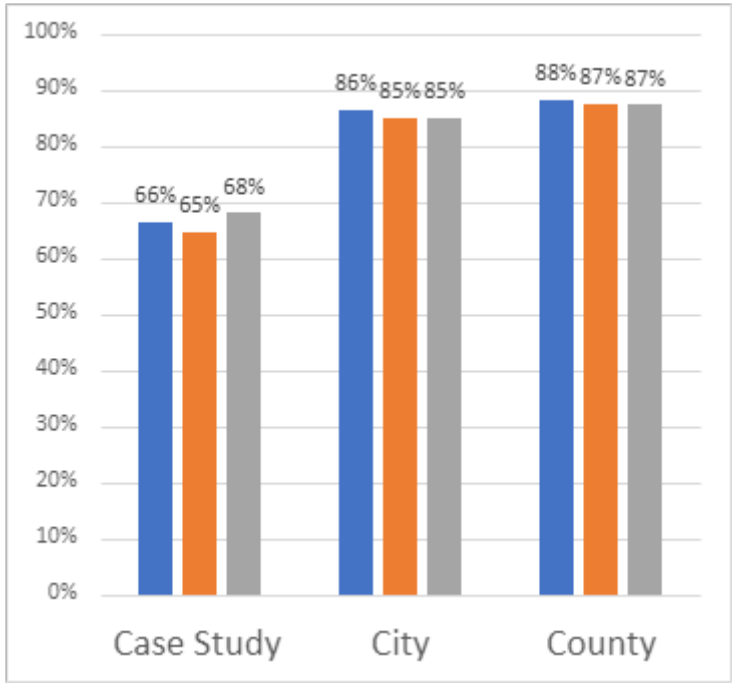
- For case study district, city, and county
- Data on usual commute mode
- Data on household auto ownership
- 5-year estimates analyzed because of small areas

ACS Drive to work mode share

Santa Monica



Sacramento



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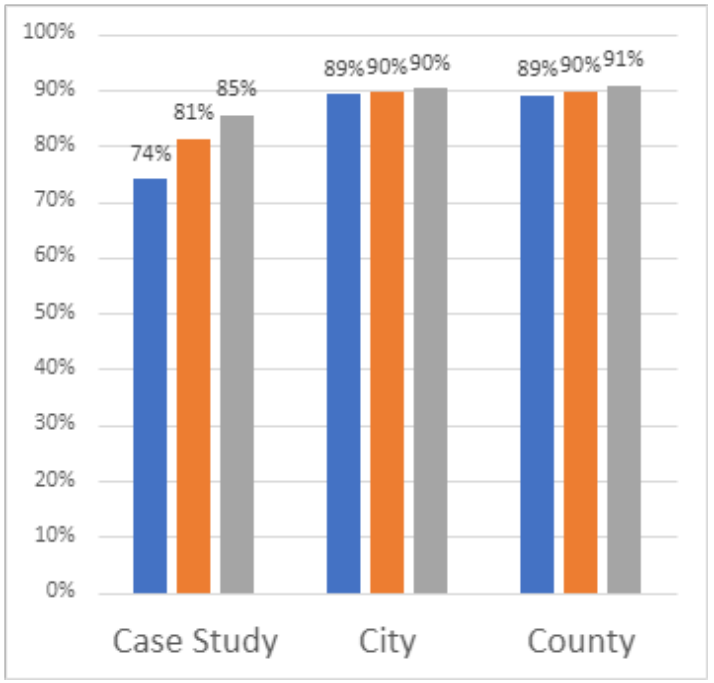
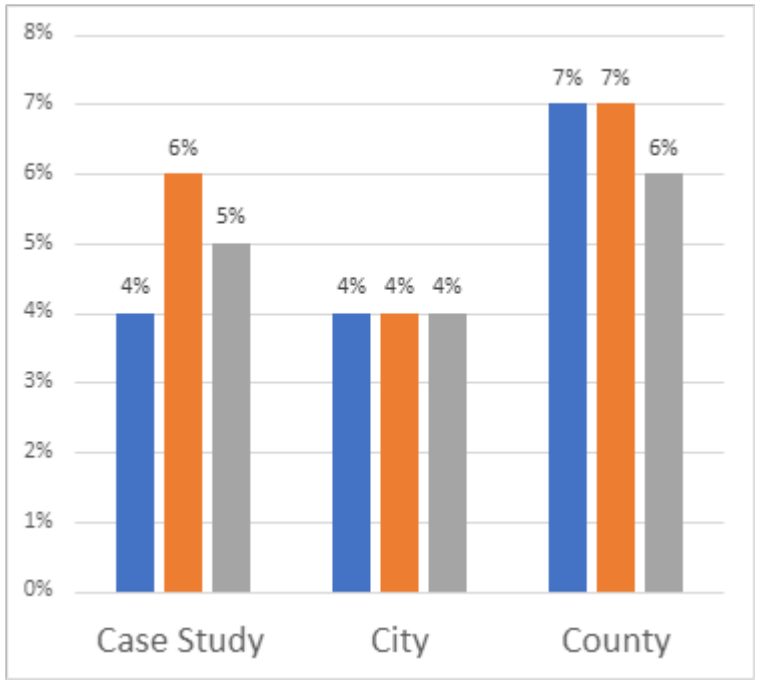


Trend is downward for Santa Monica, stable for Sacramento, up for Fresno
Shares are lower in case study areas than in surrounding areas.

ACS Transit to work mode share

Santa Monica



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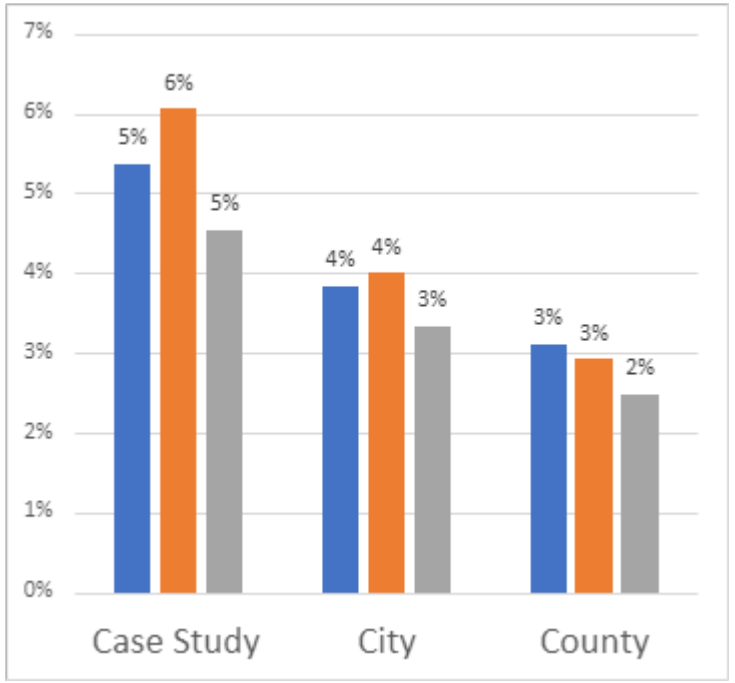

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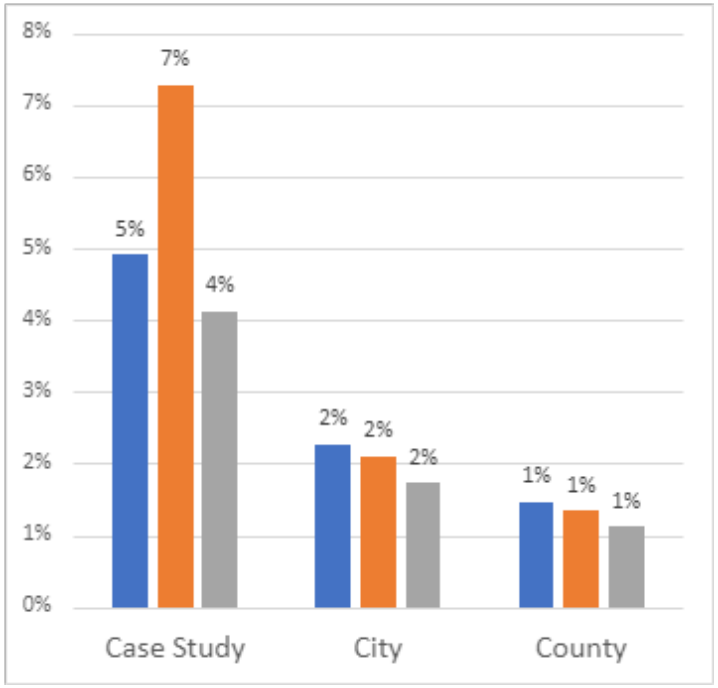
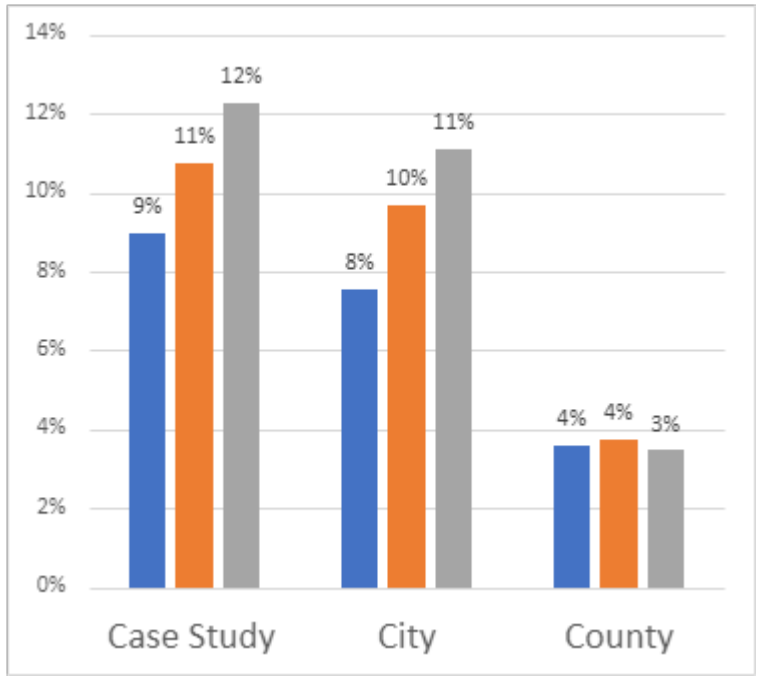


2010 2015 2019

Up in Santa Monica but down in Sacramento and Fresno
Higher in Sacramento and Fresno case studies than in surrounding areas

ACS Walk to work mode share

Santa Monica



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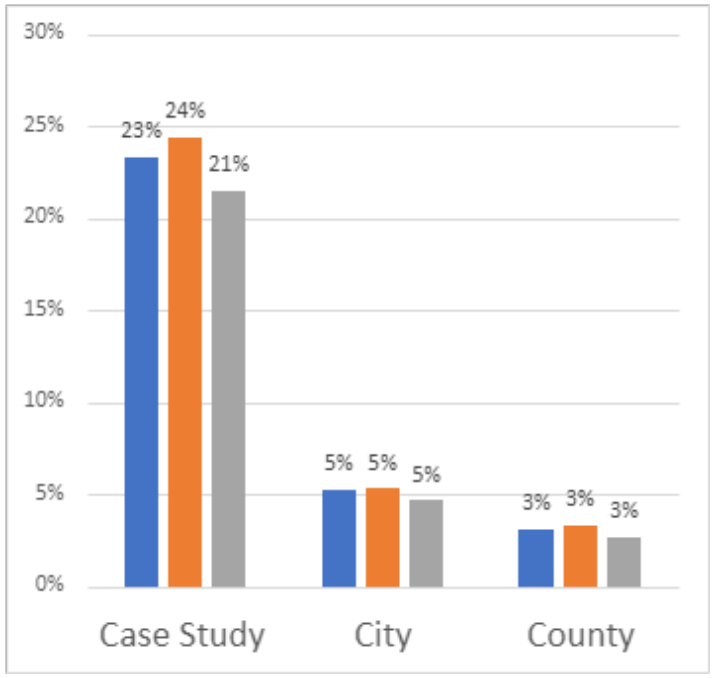
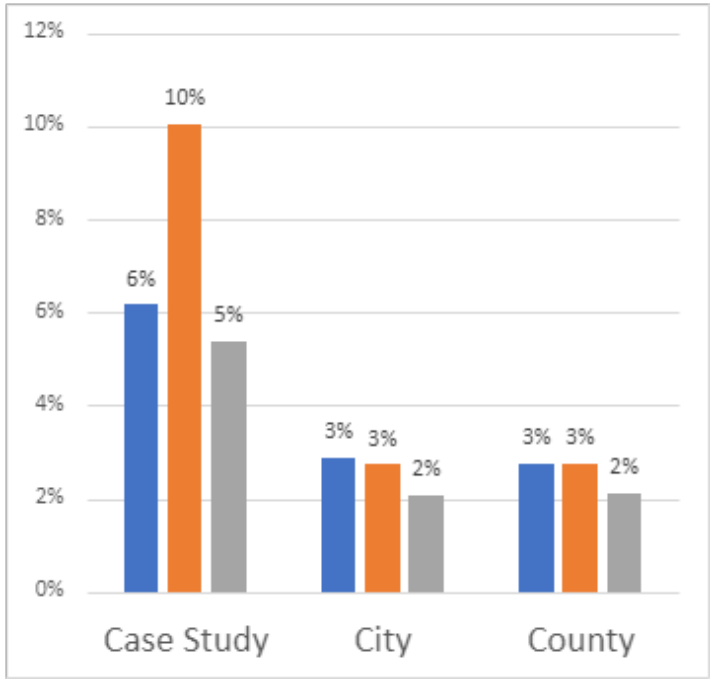


Fresno



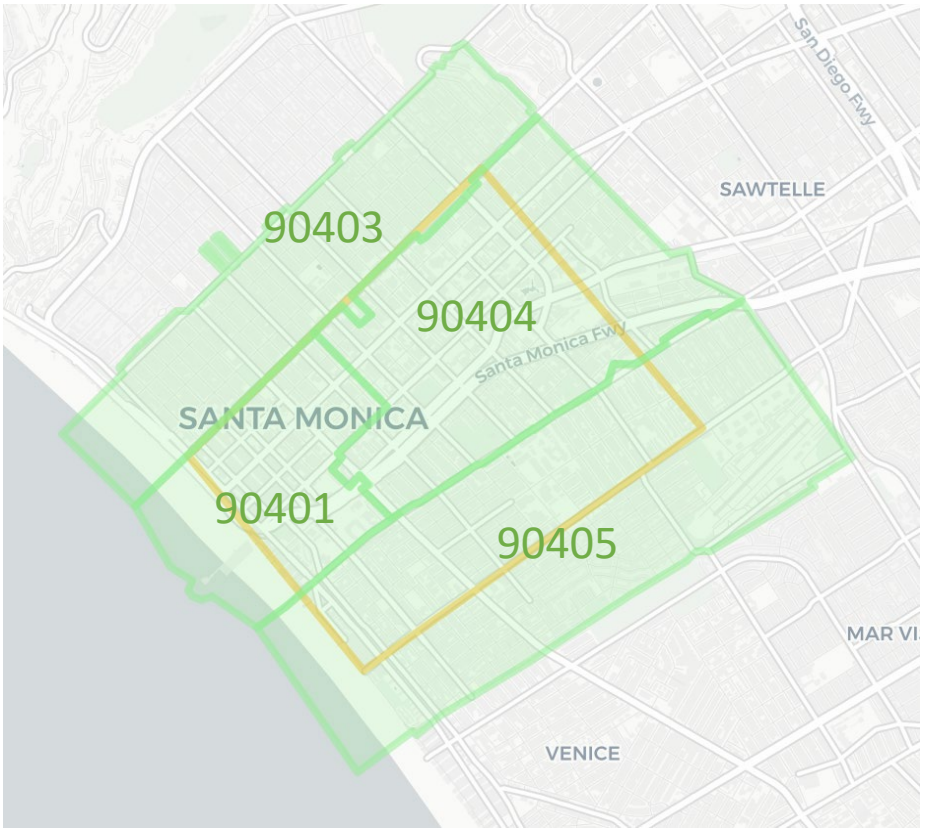
2010 2015 2019

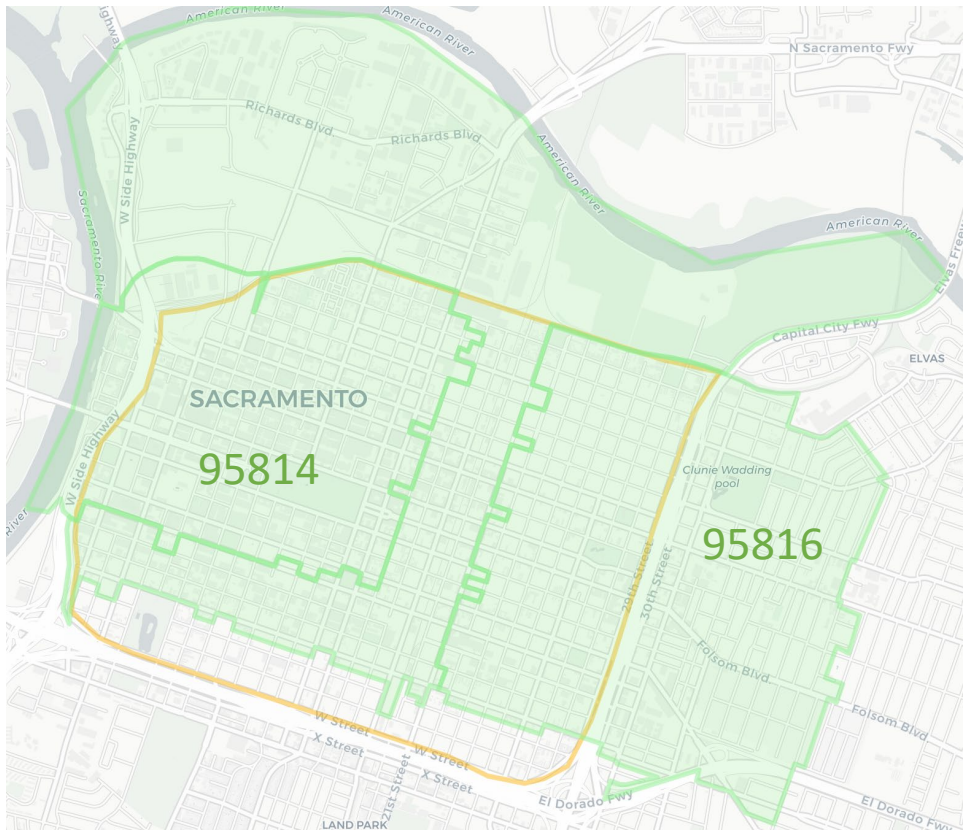
Trend is up for Santa Monica, down a bit for Sacramento and Fresno.
Share is higher in case studies than in surrounding areas.

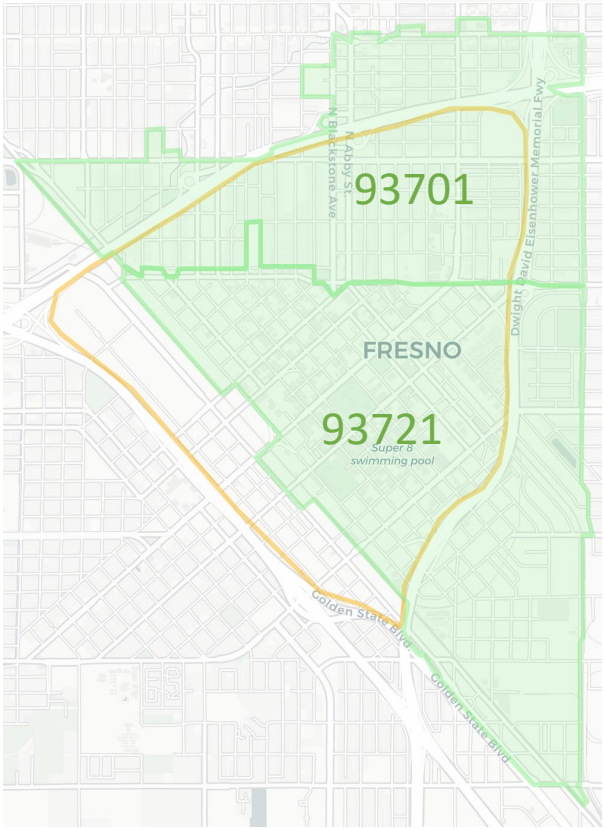
NHTS/CHTS Analysis for 2001, 2009, 2012, 2017

- For case study district and city
- Data on auto ownership for households
- Data on VMT for residents living in district
- Data on mode share for:
  - Residents living in district
  - Trips ending in district
  - Trips starting in district
  - Internal trips
- Differences in survey methods add uncertainty

Case Study Area Zip Codes







Legend
Study Area
Travel Survey Zip Code Area

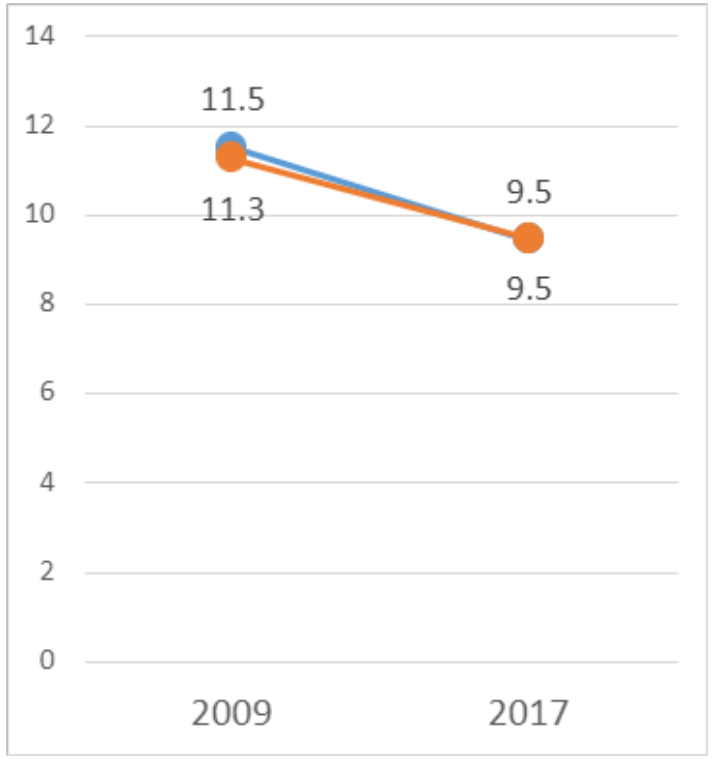
Household Travel Surveys – Sample Sizes

Year	Survey	California	Santa Monica CS	Sacra-mento CS	Fresno CS
2001	California Household Travel Survey	17,040	8	20	9
2009	National Household Travel Survey	21,225	15	18	5
2012	California Household Travel Survey	42,426	75	31	18
2017	National Household Travel Survey	26,112	30	103	10

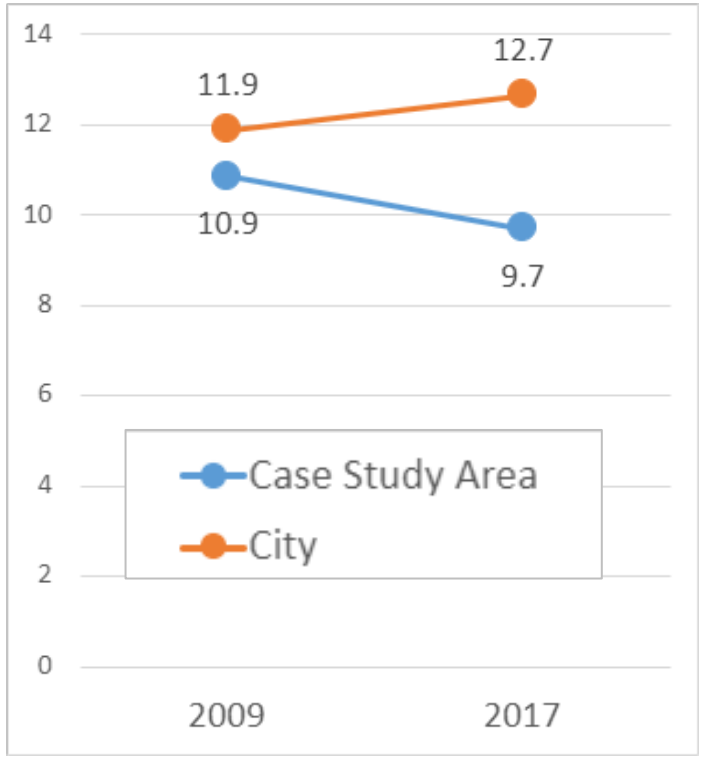
Sample sizes for trips are larger

NHTS Median VMT per HH member

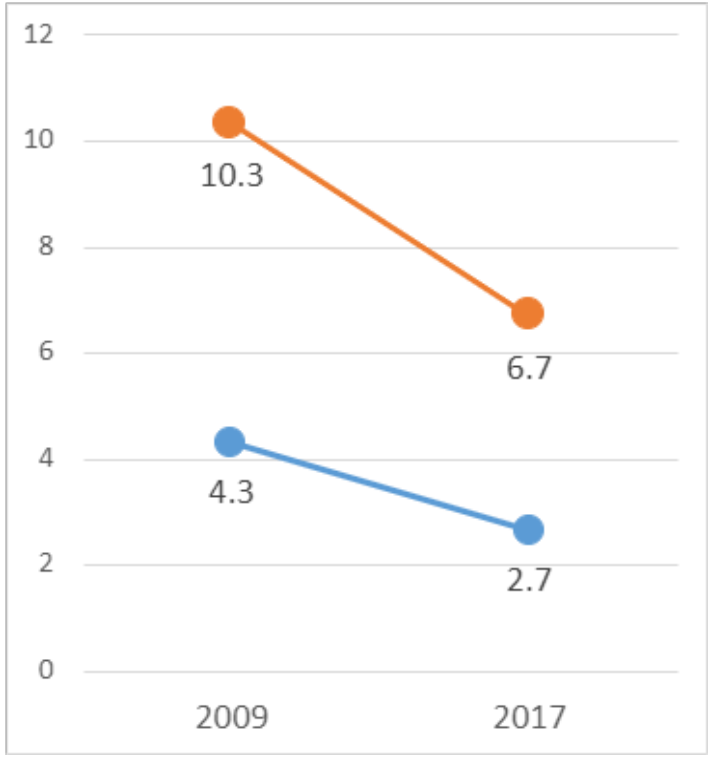
Santa Monica



Sacramento



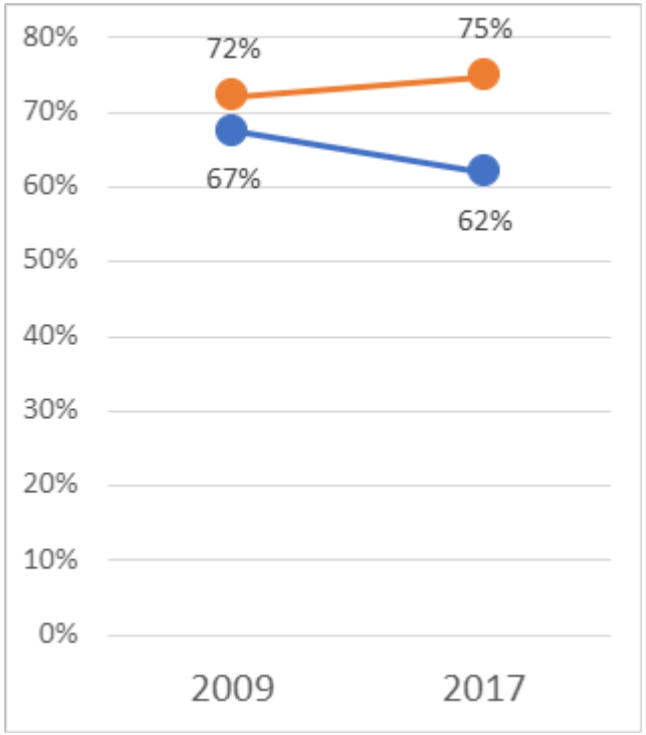
Fresno



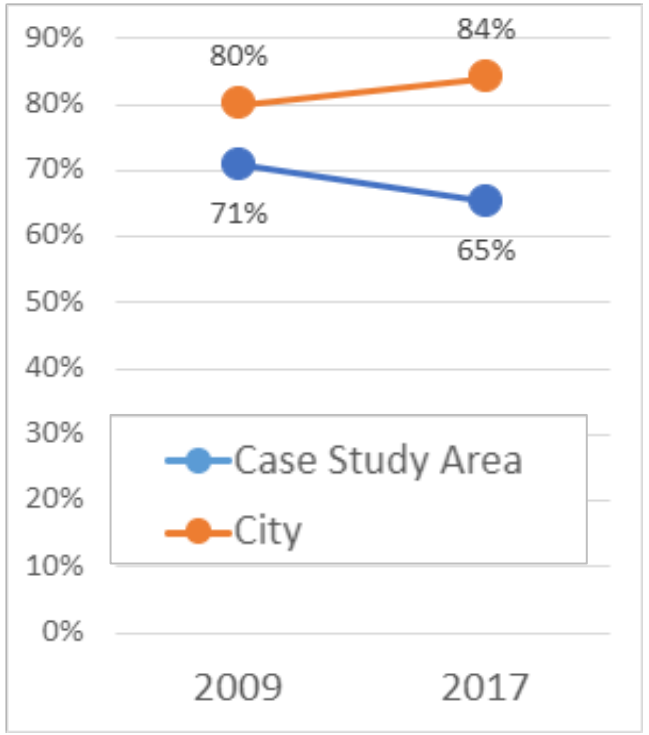
2010 to 2017 is downward but not necessarily more than for the city as a whole

NHTS Auto Share for Trips by Residents

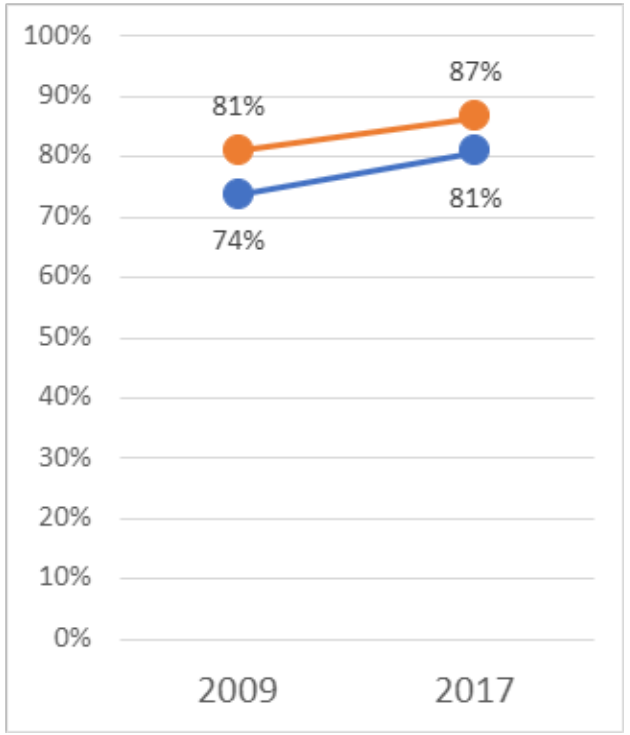
Santa Monica



Sacramento



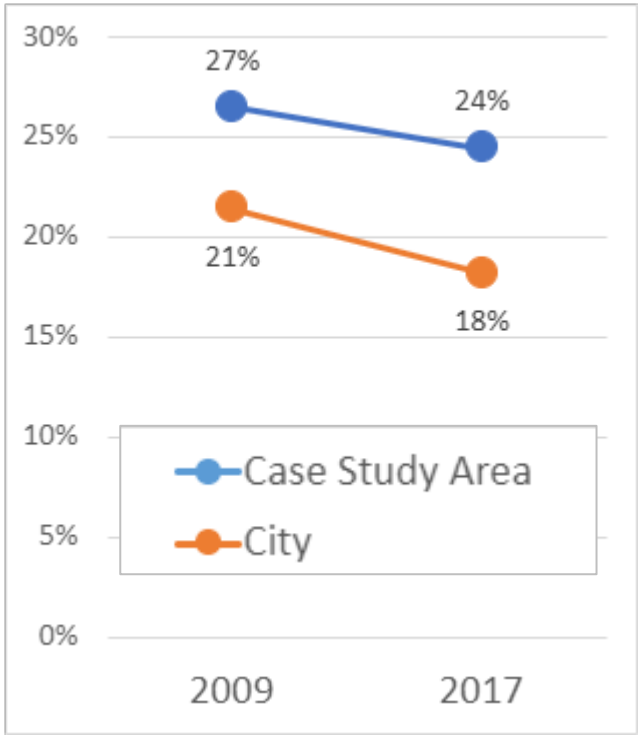
Fresno



Auto shares down for Santa Monica and Sacramento but up for Fresno
Auto shares are lower in the case study areas than the cities

NHTS Walk Share for Trips by Residents

Santa Monica



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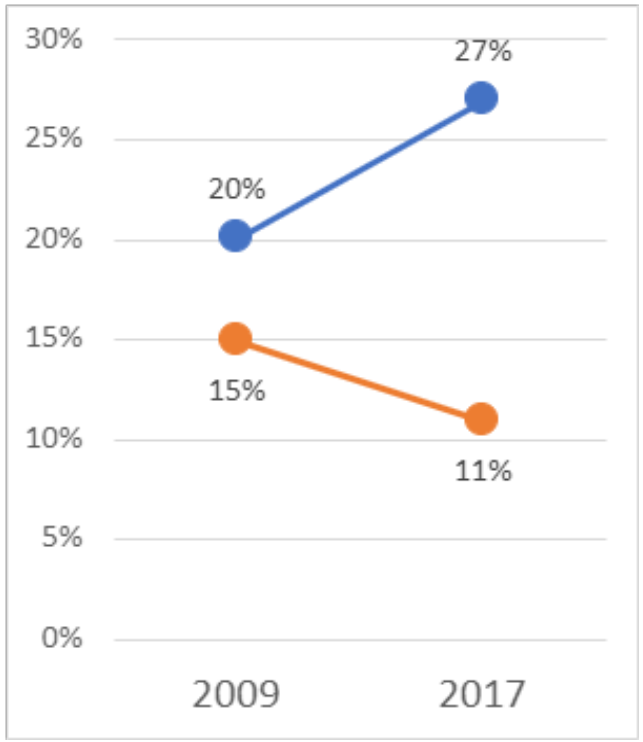
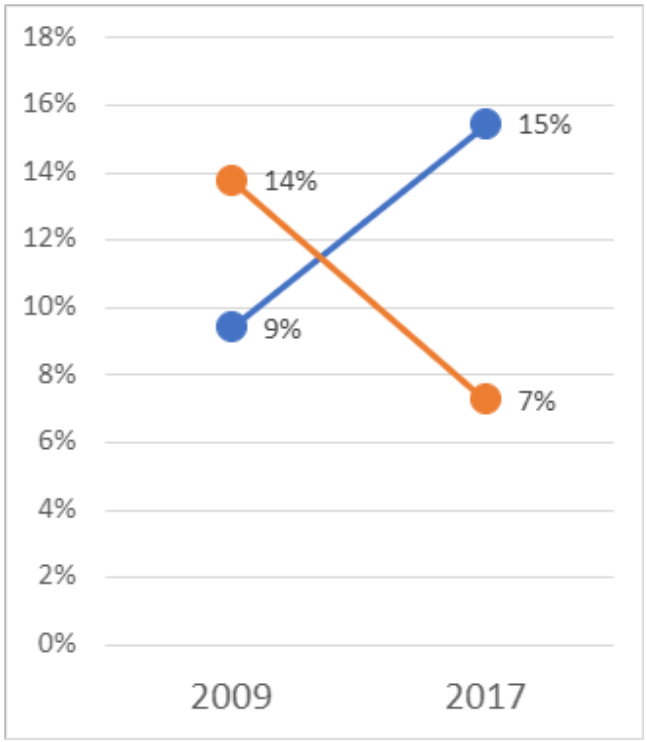


Fresno



Walk shares down for Santa Monica but up for Sacramento and Fresno
Walk shares are higher in the case study areas than in the cities

Summary

- Significant built environment changes in all three areas:
  - Increases in housing
  - Increases in bicycle infrastructure
  - Street improvements to promote active modes
- Built environment changes resulted from:
  - Strong political leadership
  - Innovative policies, plans, and programs
  - Interested and motivated developers
- Limited evidence of a shift in travel behavior:
  - Downward trend in VMT but based on small samples
  - Driving shares mostly down and other modes up

To consider

- The evidence is not conclusive but it mostly points in the right direction.
- Change is slow, both to the built environment and to travel patterns, and still in progress.
- Shifts in demographics, especially income, may have dampened the impacts on travel.
- Additional housing in these areas is itself a promising sign given less dependence on driving.

Scaling up

- Where else could these strategies be applied?
  - Case studies are pre-WWII communities with grids, mixed land uses, transit service, sidewalks, some bike infrastructure to start.
- What policies can the state adopt to foster changes to the built environment more widely?
  - Many policies already: SB375, SB1, ADU policies, RHNA, elimination of parking minimums, complete streets policy, Active Transportation Program, transit funding, CEQA reforms, SB743, “fix-it-first” policy, etc.
  - Policies that discourage driving? Pricing, highway expansion

Recommendations

Support longitudinal studies of the impact of changes in the built environment on travel behavior.

- Develop a plan for preserving smartphone-based data at several points over time for a selection of small areas where significant changes to the built environment are planned.
- Encourage or require before-and-after evaluations of specific projects, particularly those funded by the state, using methods appropriate to that type of project.

This is how we will know if it is working!

Measuring, Analyzing, and Identifying Small-Area Vehicle Miles Traveled Reduction

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Amy Lee
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Elham Pourrahmani
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Claire McGinnis