

# Identifying, Evaluating, and Selecting Indicators and Data for Tracking Land Use and Transportation-related Trends Related to SB 375 Goals

**(15RD010 Phase I\*)**

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CARB Research Seminar | April 2, 2018 | Sacramento, CA

*\*Phase 2, funded by Caltrans, will continue this research and scale the effort up to the whole state.*



# Research Team

## **Principal Investigator:**

- Paul M. Ong (UCLA)

## **Co-Principal Investigator:**

- Gian-Claudia Sciara (UTSOA, UC-Davis)

## **Key Researchers:**

Chhandara Pech (UCLA), Alycia Cheng (UCLA), Silvia González (UCLA), and Sarah Strand (UC Davis)

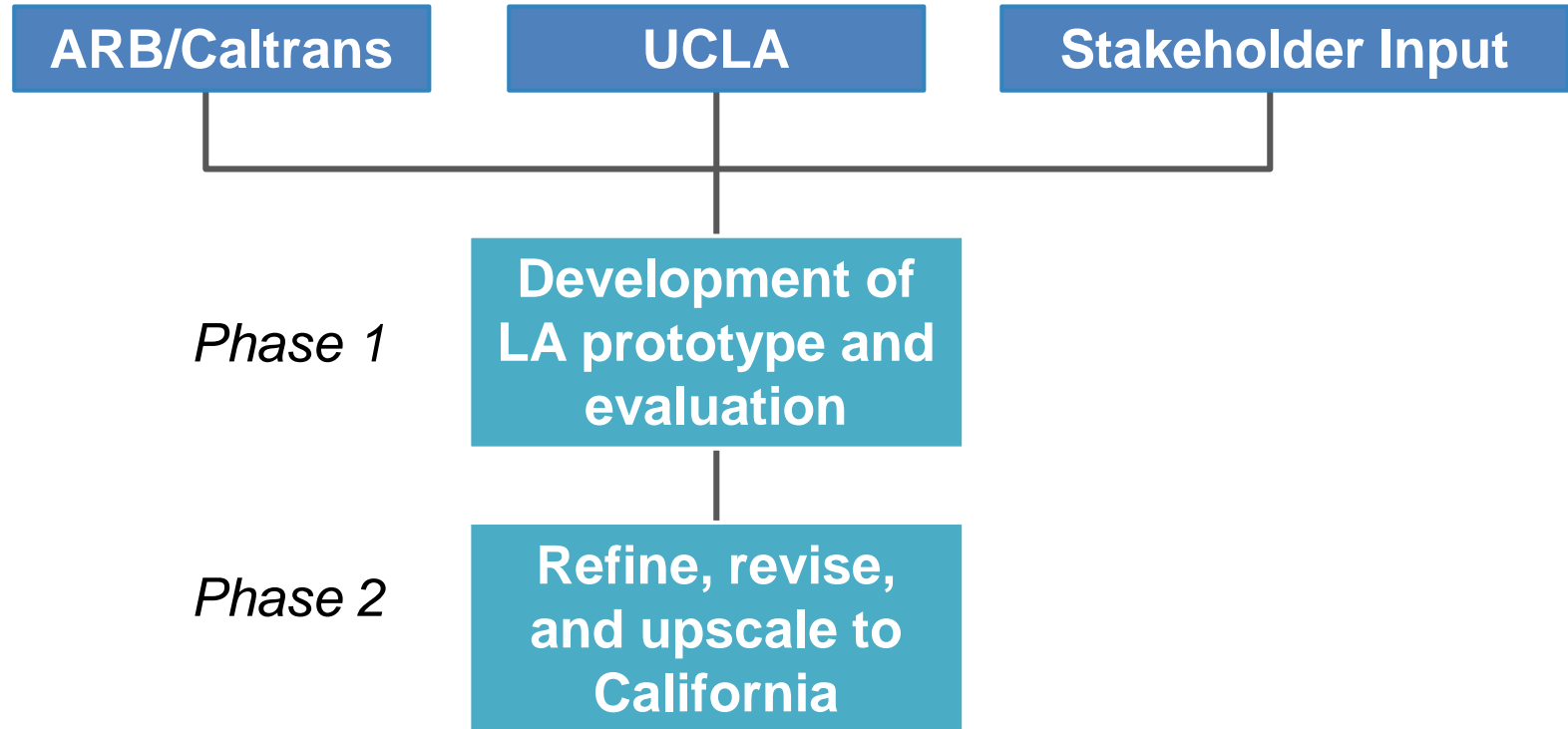
## **Consulting Experts:**

Michael Lens (UCLA), Paavo Monkkonen (UCLA)

# Outline

- 1. Project Overview**
- 2. Broader Context**
- 3. Project Objectives**
- 4. Process Overview**
- 5. Los Angeles Prototype**
- 6. Interviews with Metropolitan Planning Organizations (MPOs)**

# Project Overview



# Relevant SB 375 Goals

- Lower vehicle miles traveled (VMT) because it has a direct (albeit complex) relationship with greenhouse gases (GHGs)
- Pursue changes in the built environment and its use to promote sustainable community strategies (SCSs)

# Project Objectives

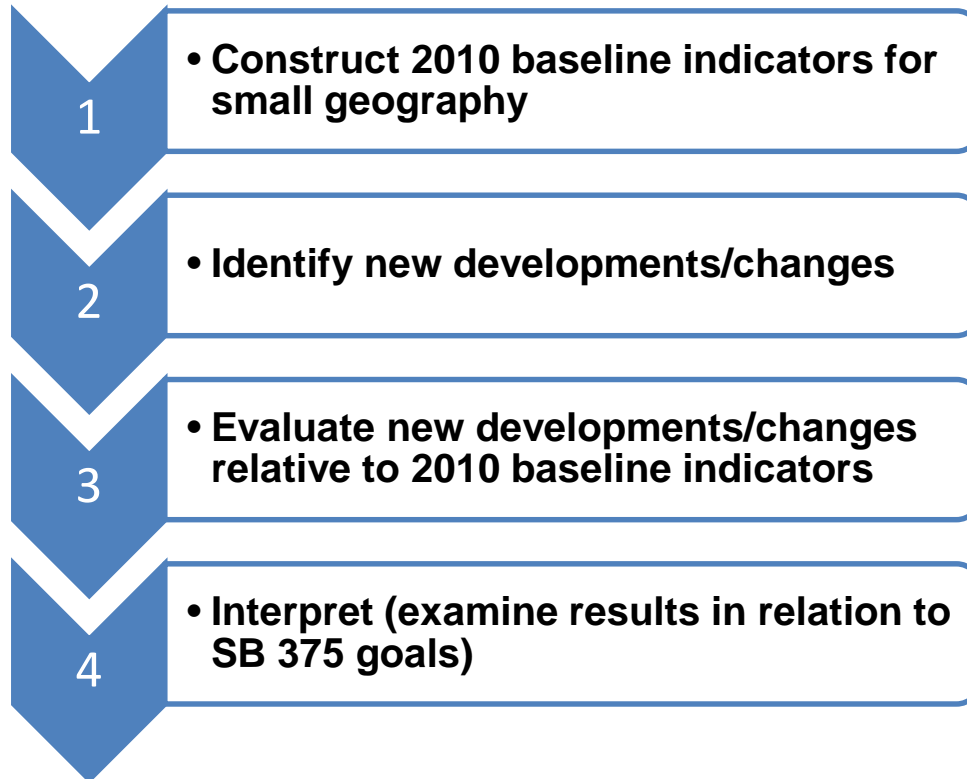
1. With input from stakeholders, identify, and assess data sources, indicators, and indices that can be used to develop a system for monitoring short-term land-use developments. Utilize results to assess if short-term changes are consistent with SB 375 goals.
2. Design a pilot system for Los Angeles County.

# Project Objectives

3. Develop recommendations for how to refine the Los Angeles prototype monitoring system for upscaling to state-level analysis (which will occur in Phase 2)
4. Learn about MPOs', local jurisdictions', and state agencies' practices related to proposed monitoring system



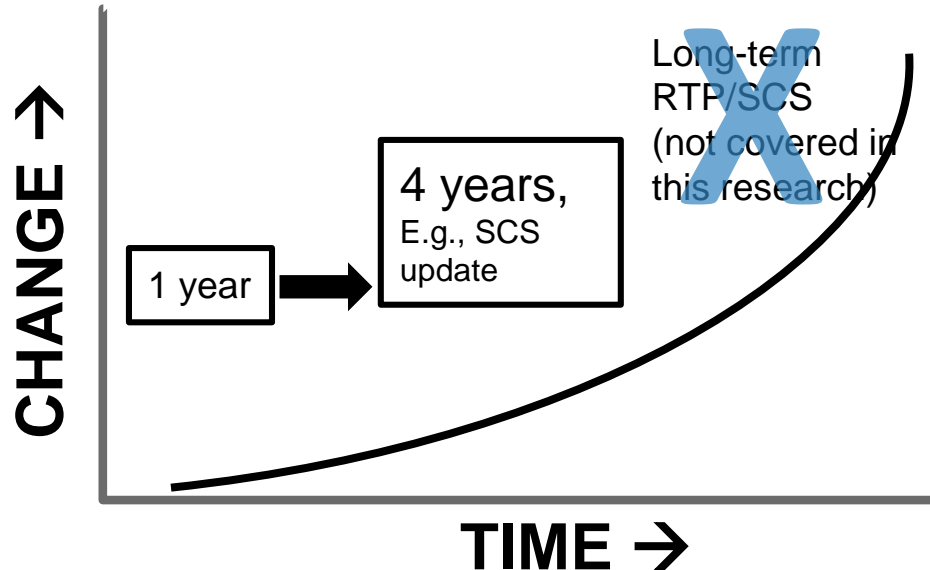
# Process Overview



# Short-Term Monitoring

Confirmed:  
**1 year  
assessment**

When  
possible:  
**4 year  
assessments**  
(to be consistent  
with RTP/SCS  
update cycles)



*Note: While this research contract did not look at longer-term indicators, ARB will continue to consider these in future changes and additional developments of the SB 375 monitoring system.*

# Data Assessment

- Consistency in geographies and units over time
- Spatial, temporal, and activity coverage
- Spatial, temporal, and activity resolution
- Availability and cost (direct and indirect)
- Timeliness
- Accuracy and precision
- Errors, biases, and other limitations

# Geographic Unit of Analysis

## 2010 Census tracts

- **Advantage:** most widely available geography for data; small geographic data can be aggregated to tracts (i.e., parcel)
- **Disadvantage:** tract boundaries are not consistent over time; some data are only available for large geographies (i.e., zip code)

# Key Baseline

Through input from the Advisory Committee and CARB, the following baseline indicators were selected for the monitoring system:

- Housing density
- Access to jobs
- Access to retail
- Access to transit\*

The year 2010 was agreed upon as the baseline year.

# Baseline: Housing Density (2010)

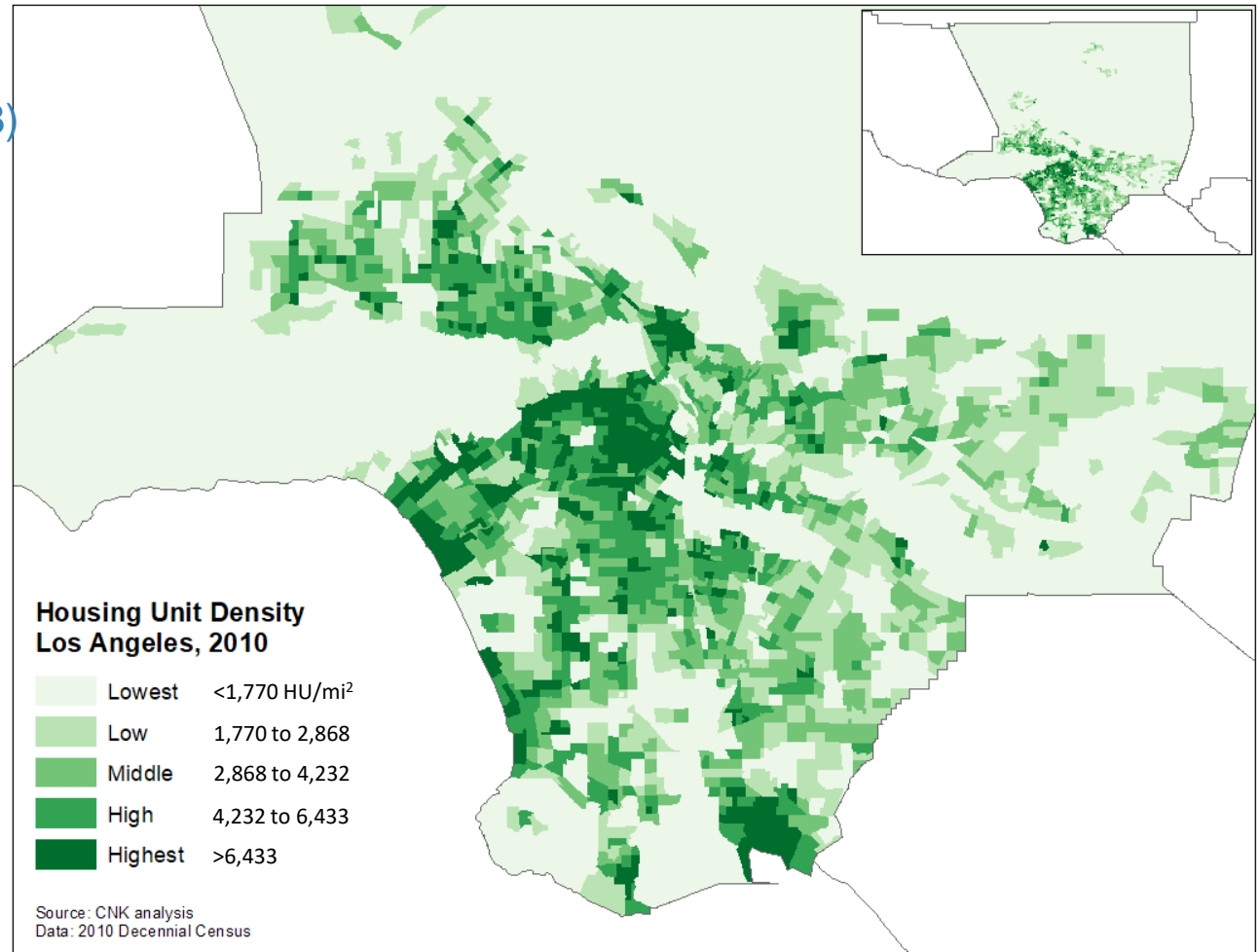
## **Activity space data source:**

- Census Decennial Enumeration

## **Calculation method:**

- Area density = housing units/sq mi (by tract)

# Housing Density



# Baseline: Access to Jobs (2010)

## **Activity space data source:**

- Longitudinal Employer-Household Dynamics

## **Origin-destination network:**

- NAVTEQ/HERE network distances and time

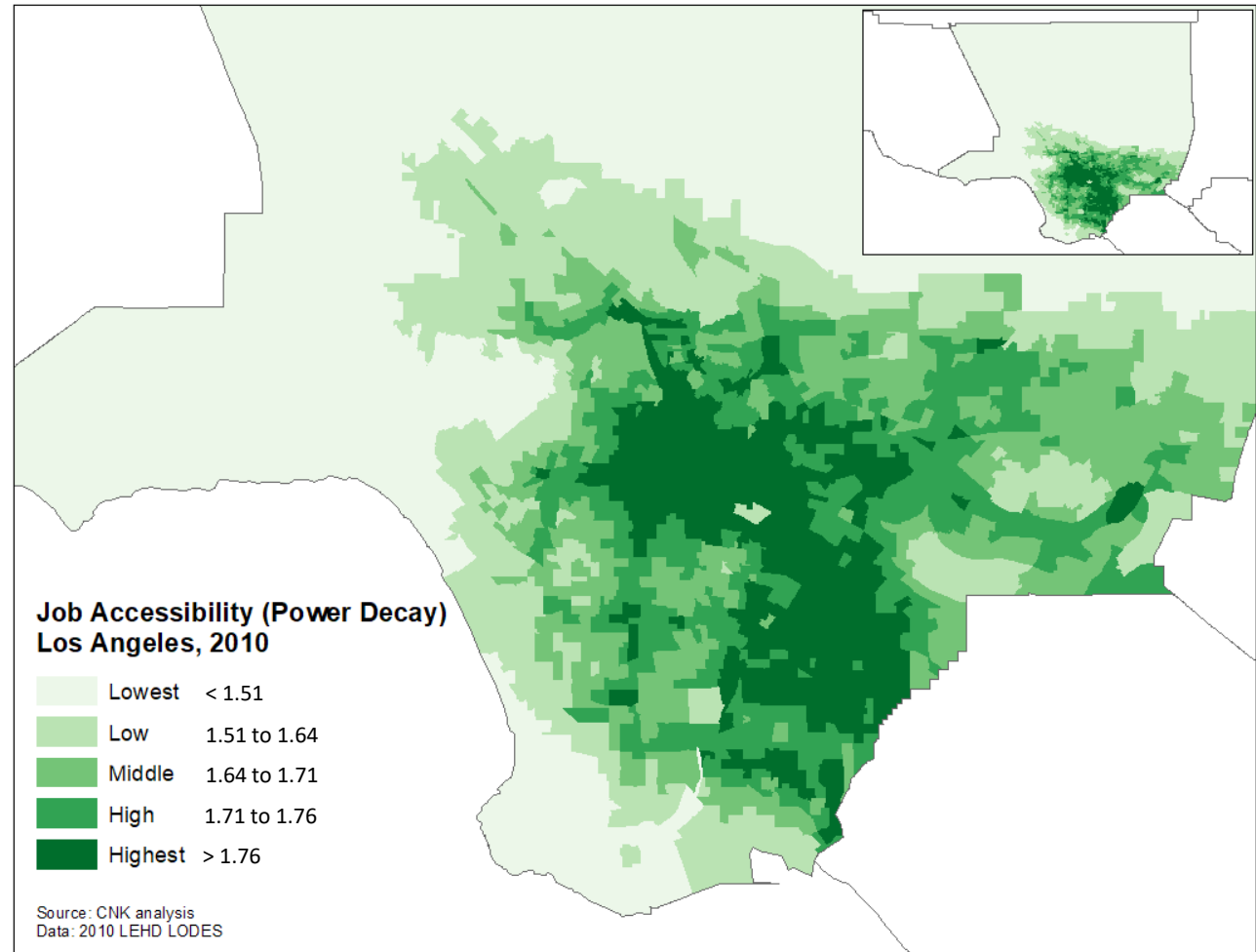
## **Accessibility calculation method:**

- Power decay with estimated regional parameters\*

*\*Note: The researchers evaluated different functional forms (simple gravity, power decay, EPA hybrid) before selecting power decay*



# Access to Jobs



Note: Index figures are scaled by one million

## Baseline: Access to Retail (2010)

### **Activity space data source:**

- Dun and Bradstreet
  - Examining baseline through retail revenue

### **Origin-destination network:**

- NAVTEQ/HERE network distances and time

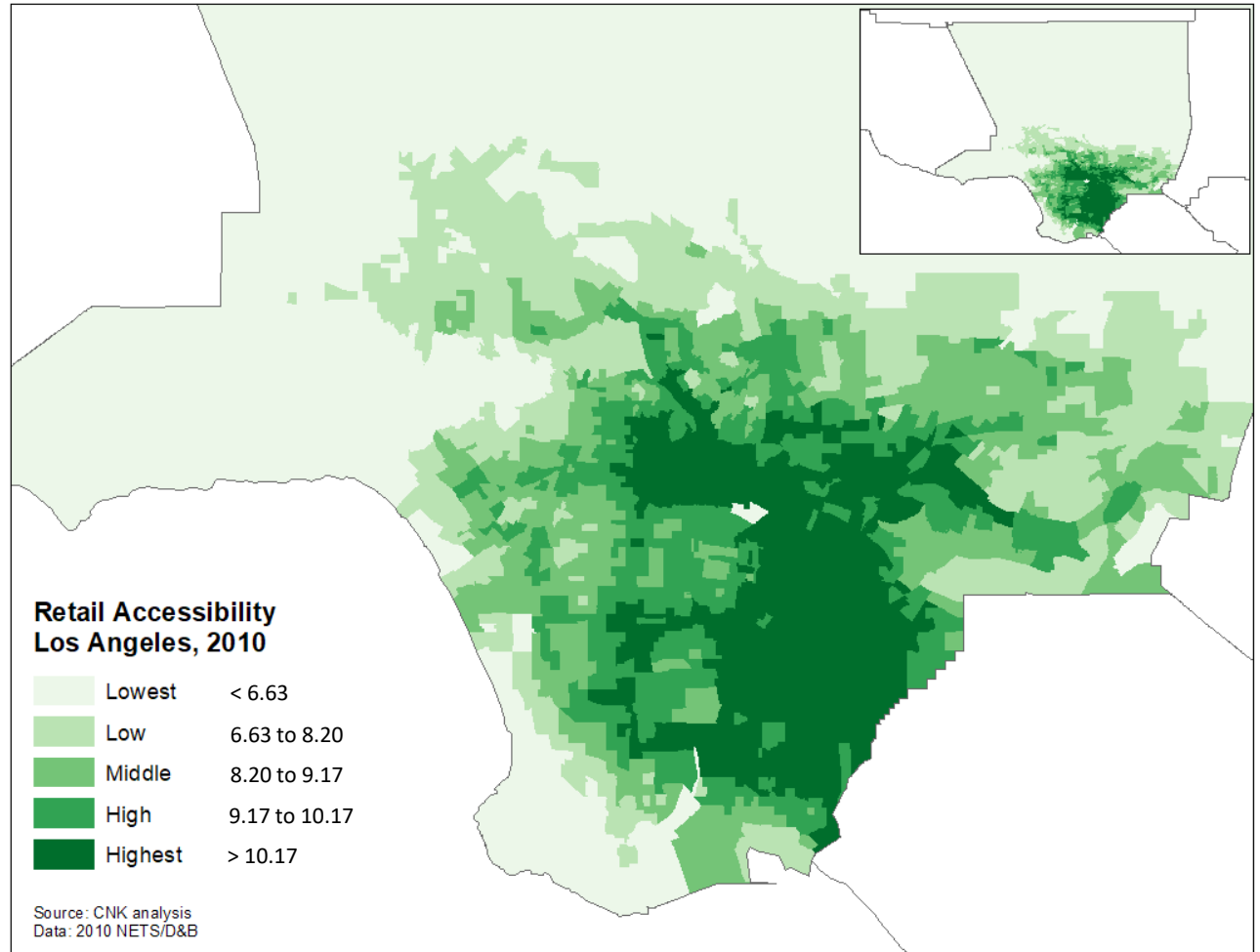
### **Accessibility calculation method:**

- Inverse\*

*\*Note: The researchers evaluated different functional forms (simple gravity, inverse, power decay, and EPA hybrid) before selecting the inverse method.*

CARB Research  
Seminar (April 2, 2018)

# Access to Retail



Note: Index figures are scaled by one billion

# Baseline: Access to Bus Transit (2010)

## **Activity space source:**

- General Transit Feed Specification (GTFS)

## **Accessibility calculation method:**

- Two components:
  - Catchment area (1/4 mile buffer); and
  - Levels of service (the number of buses that go through a stop on a given weekday)

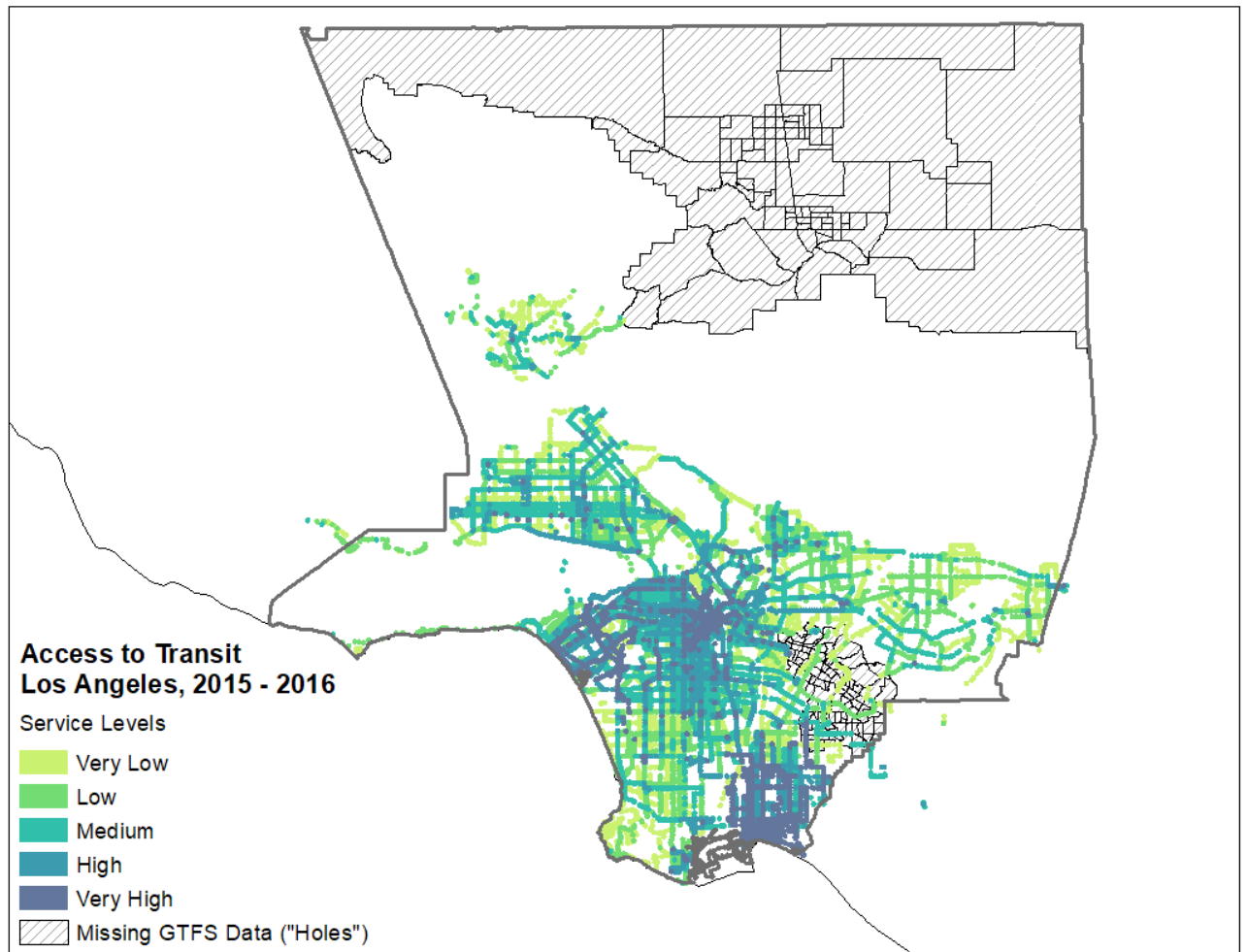
## **Major problem:**

- Data gaps (GTFS data coverage)

CARB Research  
Seminar (April 2, 2018)

# Access to Bus Transit

**Very Low** = at least 1 service frequency  
(defined as the number of times a bus  
stops at the location on a given weekday);  
**Low** = at least 51 stops;  
**Medium** = at least 101 stops; High = at  
least 201 stops;  
**Very High** = 401 stops or more



## Short-Term Indicators (Monitored)

### **Monitor 1- and 4-year changes from baseline (2010)**

- **New housing units**
  - Source: County assessor parcel data
- **Net changes in jobs**
  - Source: LEHD
- **Changes in retail activity (net changes in retail revenue)**
  - Source: NETS Dun & Bradstreet

## CARB Research Seminar (April 2, 2018)

What does this research say about the relationship between baseline indicators and short-term measures, relative to SB 375 goals?

	New housing units	Changes in jobs	Changes in retail sales
Higher housing unit density	Relationship is CLEAR	Relationship is <b>UNCLEAR / Ambiguous</b> (i.e., does locating jobs in housing-dense areas lead to a decrease in VMT?)	<b>Unclear / Ambiguous</b> (i.e., does locating retail in housing-dense areas lead to a decrease in VMT?)
Greater access to jobs	Clear	<b>Unclear / Ambiguous</b>	<b>Unclear / Ambiguous</b>
Greater access to retail	Clear	<b>Unclear / Ambiguous</b>	<b>Unclear / Ambiguous</b>
Greater access to transit	Clear	Clear	Clear

# Comparing Change Relative to Baseline


## **Evaluated new development relative to the baseline using a quintile analysis:**

1. Neighborhoods ranked:  
*LEAST dense/accessible → to → MOST dense/accessible*
2. Examined the distribution of new development in each quintile category and compare to distribution in the baseline\*

\* “Overrepresentation/disproportionate share” regarding distribution of new development occurs when a greater share of new development is located in these areas compared to the baseline distribution of housing units in these areas (i.e. 25% of 2011-2014 development occurring in an area with only 20% of housing units in 2010)



# New Housing Relative to Housing Density

 = new development is greater than the baseline


## Interpretation:

- ***Finding:*** Disproportionate share of new housing is being built in less dense neighborhoods (relative to the baseline)
- ***Conclusion:*** May indicate a deviation from SB 375 goals / efforts to promote more housing in denser neighborhoods
- ***However:*** must be noted that this method does not consider local efforts to (1) comply with fair housing laws, (2) develop affordable housing, and (3) improve jobs-housing balance

Baseline Indicator	Baseline 2010	New Housing Development	
Housing Unit Density	Share of all Housing Units	Units Built in 2011	Units Built in 2011-14
Lowest Quintile	17%	21%	24%
Low Quintile	19%	22%	20%
Middle Quintile	20%	16%	15%
High Quintile	20%	20%	18%
Highest Quintile	24%	20%	23%

*Each quintile contains roughly 20% of all census tracts in LA County*

# New Housing Relative to Access to Jobs

 = new development is greater than the baseline


## Interpretation:

- *Finding:* On average, new housing is disproportionately being built in lower job-accessible neighborhoods.
- *Conclusion:* May indicate a **deviation** from the goals of SB 375 of promoting more housing closer to jobs to reduce distance traveled to work.

Baseline Indicator	Baseline 2010	New Housing Development	
Job Accessibility	Share of all Housing Units	Units Built in 2011	Units Built in 2011-14
Lowest Quintile	22%	25%	26%
Low Quintile	22%	26%	22%
Middle Quintile	20%	16%	18%
High Quintile	19%	14%	12%
Highest Quintile	18%	18%	21%

*Each quintile contains roughly 20% of all census tracts in LA County*

# New Housing Relative to Access to Retail

 = new development is greater than the baseline


## Interpretation:

- Finding: New housing units are disproportionately overrepresented in lower and higher retail-accessible neighborhoods
- However, most of the concentration occurs in lower retail-accessible neighborhoods
- Conclusion: This would be considered a **deviation** from goal of locating new housing closer to retail

Baseline Indicator	Baseline 2010	New Housing Development	
Retail Accessibility	Share of all Housing Units	Units Built in 2011	Units Built in 2011-14
Lowest Quintile	21%	24%	26%
Low Quintile	21%	28%	25%
Middle Quintile	21%	15%	17%
High Quintile	19%	16%	12%
Highest Quintile	18%	17%	20%

*Each quintile contains roughly 20% of all census tracts in LA County*

# New Housing Relative to Access to Transit

 = new development is greater than the baseline

## Interpretation:

- Finding:* New housing units are disproportionately overrepresented in both the lowest and highest transit-accessible neighborhoods
- Conclusion:* On average, more are disproportionately being built in high transit access areas, a pattern **consistent** with SB 375

Baseline Indicator	Baseline 2010	New Housing Development	
Transit Accessibility	Share of all Housing Units	Units Built in 2011	Units Built in 2011-14
Lowest Quintile	18%	18%	16%
Low Quintile	20%	23%	24%
Middle Quintile	21%	19%	15%
High Quintile	20%	17%	15%
Highest Quintile	20%	24%	29%

*Each quintile contains roughly 20% of all census tracts in LA County*

# Limitations of Los Angeles Prototype

## 1. Does not directly measure VMT

- Difficult to estimate for small geography
- Flow (origin-destination) data only available for commute and not other activities (e.g., shopping).
- For latter, existing data is based on surveys with small sample size
- Current commuting flow data allows for calculating PMT, not VMT
- Estimating other types of trips requires running full transportation model, beyond contract resources

## Limitations of LA Prototype

- 2. Changes in jobs and retail revenues are both highly susceptible to economic fluctuations**
- 3. Changes in retail compounded by increase in e-commerce (impacts not measured in this project)**

# Concluding Observations from LA Prototype

## **Grouped into two broad categories:**

1. Assessment of key data sources and methods for construction of baseline indicators relating to VMT and GHG
2. Measuring short-term changes and interpreting quantitative results as they relate to promoting the goals of SB 375 (based on LA Prototype)

# 1. Assessment of key data sources

- A. No perfect data or set of indicators for tracking progress toward SB 375 goals exists
- B. However, Census Decennial Enumeration, LEHD, D&B, GTFS, assessor parcel data, and NAVTEQ/HERE are usable data sets
- C. Two major challenges related to data needs for upscaling to statewide:
  - Availability and consistency of data for all regions (e.g., GTFS coverage, parcel)
  - Data costs



## 2. Results from LA Prototype

- A. An assessment of the LA prototype shows mixed results regarding progress toward SB 375 goals
- New housing is disproportionately located in less dense, less job accessible, and less retail accessible neighborhoods
  - Difficult to interpret changes in jobs and retailing and current baseline measures of access to jobs and access to retail
  - Short-term changes in jobs and retailing are dominated by business cycles, thus do not capture long-term changes

Interviews of MPOs

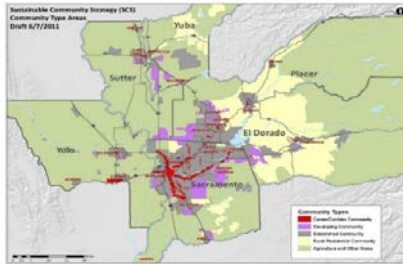
## **What is known about whether / how regions monitor land use changes on their own?**

To inform development of the prototype monitoring system, this research also examined what California MPOs may be doing already to monitor land use and development changes in their regions.

# Survey of MPOs & Local Governments

## SB 375 Institutional Framework

California metropolitan planning organizations (MPOs) craft the “forecasted regional development pattern.”



**Sacramento**



**San Diego**



**Los Angeles**



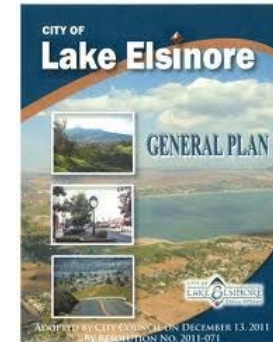
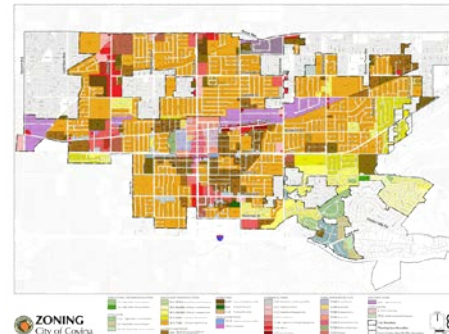
**S.F. Bay Area**



# Survey of MPOs & Local Governments

## SB 375 Institutional Framework

Cities & counties implement land use and development changes, using their authority to adopt general plans & zoning ordinances, approve development proposals, and issue building permits.



# Survey of MPOs & Local Governments

## We asked:

- Do MPOs track land use and development changes in their respective regions?
- Do MPOs formally monitor these changes?  
If so, how?

# Survey of MPOs & Local Governments

## Methods:

- 25 interviews w/ senior MPO land use staff  
70+ minutes per interview
- Review of the Regional Transportation Plan (RTP)/SCS, particularly:  
SCS chapter/section  
Technical appendices on land use

# Survey of MPOs & Local Governments

## **We learned:**

1. MPOs collect diverse and sometimes extensive data about land use & development changes in the region.
2. Yet, few MPOs see it as their role to track whether local government land use and development decisions “align” or are “consistent” with the RTP/SCS.

# Survey of MPOs & Local Governments

## **We learned:**

3. MPOs collect these data mostly to update the RTP, for SCS monitoring purposes.
4. Few MPOs try to comprehensively update land use and development data outside the four-year RTP cycle.



# Survey of MPOs & Local Governments

## We learned:

5. Most MPOs receive a regular flow of *certain* land use data, regardless of the RTP cycle.
6. But many MPOs also struggle to collect & maintain reliable sources of data for tracking local land-use developments.

# Survey of MPOs & Local Governments

## **Data MPOs commonly receive or collect:**

- Land use and zoning maps
- General plan updates
- Proposed general plan amendments
- Development proposals that trigger environmental review / intergovernmental review (IGR)

# Survey of MPOs & Local Governments

## **MPOs want more data on housing provision:**

- Local updates of housing elements
- Local housing reports to California Department of Housing and Community Development (HCD)
- Housing permit data
- Building permit data

# Survey of MPOs & Local Governments

## **Other data needs identified by MPOs:**

- Agricultural/conservation easements
- Affordable housing data (deed-restricted properties)
- Assessors' parcel data with land-use characteristics
- Assessors' parcel data with building detail (type, size, year built)
- Bicycle-network data (city level)
- Bicycling data—STRAVA data
- Bicycle counts
- Certificates of occupancy
- County General Plan with digital maps (updated)
- Employment data (employees, sector, location)

# Survey of MPOs & Local Governments

## **Other data needs identified by MPOs:**

- Commercial/nonresidential vacancy rates
- Business permits (standardized across local governments)
- House price data
- Impact fee data (city level, for individual parcels)
- Parking inventory data (off-street)
- Pedestrian counts
- Pedestrian-network data (city level)
- Real time traffic data
- Rental price data
- Transit passenger counts

# MPO land use tracking practices vary widely.

		Extent		
		High	Medium	Low
Data collection & analysis		Comprehensive, proactive data collection from jurisdictions & other sources; some MPO-initiated original data collection; certain data inputs received passively; extensive analysis	Proactive collection of some key data sources; limited MPO-initiated original data collection; other data inputs received passively	Little/no proactive data collection, focused on required model inputs; most data inputs received passively; limited analysis
Frequency	High	Annual updates for many inputs, where possible; ongoing collection (passive & active) for most data sources.	Largest, most urban, or special authority	Central coastal, slow growth
	Medium	Some interim collection outside 4-year RTP cycle; most ongoing info & data flows are procedural (mtgs.) / passive		
	Low	Little/no data collection outside 4-year RTP cycle; many data inputs collected or received sporadically; ongoing info & data flows are procedural (mtgs.) / passive	Smallest or least urban	

# Survey of MPOs & Local Governments

## What influences MPOs' land use tracking practices?

As this factor increases...	Extent	Frequency
<b>Regional Factors</b>		
Rate of growth in the region	↑↓	↑↓
Environmental sensitivity of the region	↑	↑
Number of local governments in the region	↓	↓
<b>Local Factors</b>		
Local government General Plan updates	↑	↑
Local government staffing/resource levels	↑	↑
Local government GIS capacity	↑	↑
Local projects submitted for clearinghouse reviews	↑	↑

# Survey of MPOs & Local Governments

## What influences MPOs' land use tracking practices?

As this factor increases...	Extent	Frequency
<b>MPO Factors</b>		
MPO staffing/resource levels	↑	↑
Overlaps between MPO and other regional functions	↑	↑
MPO–local government communication	↑	↑
MPO involvement in clearinghouse reviews	↑	↑
<b>Data Factors</b>		
Data standardization across local governments	↑	–
Private ownership of data	↓	↓
Data publication frequency	–	↑
Data quality	↑	–



# Survey of MPOs & Local Governments

## **Notable MPO land use tracking efforts:**

- Intergovernmental review and clearinghouse processes
- Internal tracking of development in the region
- Regional meetings for RTP/SCS development
- The benefit of overlapping organizational roles
- Project trackers and dashboards

# Survey of MPOs & Local Governments

## **MPOs' land use monitoring challenges:**

- Data integration, e.g., across many local government formats
- Local governments lack resources to collect & supply data
- In large regions, numerous local gov'ts to collect from
- Monitoring seldom explicitly assesses land use against SCS goals

# Survey of MPOs & Local Governments

## Concluding observations

1. Any statewide picture of SB 375 progress constructed from MPOs' land use and monitoring information would inevitably have inconsistencies and gaps.
2. Meaningful evaluation of statewide progress on SB 375 is likely to require a unified statewide data system and measures that can be used to assess progress consistently across CA's diverse regions.
3. A statewide approach to assessment of SB 375 implementation may be more politically acceptable than a MPO-driven approach.

# Acknowledgements

The research team would like to acknowledge the following individuals and organizations for their support of and participation in this project:

- **California Air Resources Board for funding and program support (Maggie Witt and Annalisa Schilla)**
- **Advisory Committee Members**

# Thank You!

