TRANSPORTATION DEMAND MANAGEMENT
SACRAMENTO

Travel Patterns Analysis

City of Sacramento

Disclaimer

How does Replica define a trip?

Replica defines a trip as travel between two locations with a discrete origin and destination. A trip begins when a person leaves a place and ends when a person stops to do a non-travel activity in a place. A typical duration of a period of stay that can be detected from a typical mobile location data feed with continuous temporal sampling (1 location sample per minute) is a stay of over 5 minutes in duration (over 85% detection accuracy), with most stays of 15 minutes identified at 90% accuracy. Some intermediate stops with short dwell times (under 5 mins) may not be reliably detected and may be captured within a single trip. For example, it is often not possible to identify events such as buying a coffee at a drive-through location, particularly with no significant stationary periods (such as a long wait in line).

How does Replica determine trip purpose in a dense urban area?

In Places, Replica uses a fine-grained location choice model (LCM) to determine location choices for discretionary activities (i.e. not home/work/school) made by the device owner of the de-identified mobile location data. The model selects individual venues (businesses, shops, services) and Points of Interest (parks, places of historic interest, tourist attractions) as potential destinations. Replica relies on having an independent and accurate source for the total number of visits for every venue / point-of-interest. Destinations of individual trips are always randomized within proximity of real observed locations. If a persona trained from a cellular device went to a shopping plaza, the synthetic person guided by that persona would go to any of the businesses at that plaza, proportionally to how popular they are in aggregate on that day of the week and hour of the day. For example, if a real person went to a hairdresser and not Target, it is very likely that a synthetic person guided by that persona will go to Target (because of its relative popularity) and some other synthetic person would go to the hairdresser.

While this analysis examines the geographic distribution of trips occurring in the city, it cannot take into consideration externalities such as differences in access to transportation infrastructure and transit options.

What is Replica?

Replica is a location-based services platform that provides insights into mobility, demographics, economic activity, and land use through activity-based travel modelling.

- Data for this analysis was sourced from Replica, a third-party vendor, using their product referred to as ‘Replica Places’.
- This product is a detailed activity-based travel model that simulates complete activities and movement of people in a selected region on a typical day of a given season.
- This model is sourced using mobile location data to develop personas that are representative of daily trips in a specific region. These trips are calibrated to demographic data (ACS, PUMS), land use data, economic transaction data, and is calibrated to ground truth data (e.g, traffic counts, transit ridership, pedestrian counts).
- The data used for this analysisrepresents travel patterns for a typical weekday in Fall 2022.

While the model is calibrated to census data to generate a statistically equivalent synthetic population, the Project Team does not have enough information to endorse Replica’s process of calculating absolute value of actual total trip counts. However, after an extensive review of Replica’s methodology and data verification process, it can be assumed that while values may not be the true absolute counts, the ratios and relationships of origin and destination flows are consistent. These ratios are valuable for cityplanners in understanding where percentages of total trips begin and end, and the Project Team will continue to make use of this data in this study.

Replica Analysis Overview

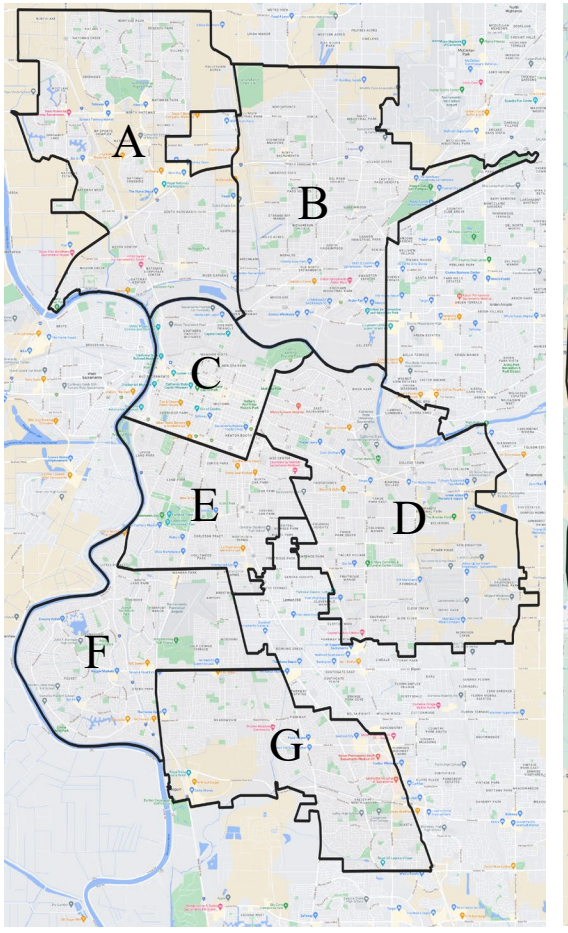
Purpose of Analysis

- Understand trip patterns occurring within, into, and out of the City of Sacramento to inform the TDM Ordinance update
- Identify areas that generate a significant proportion of trips
- Understand the main trip purposes and modes

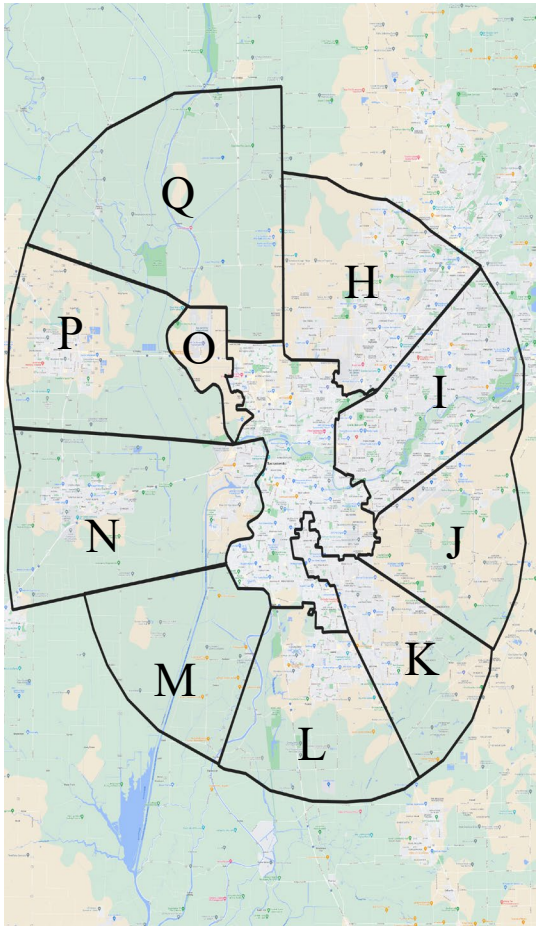
Study Area

- Internal Zones: City of Sacramento was divided into 7 zones (A-G). These zones are not political boundaries - they were defined based on distinctive characteristics, from employment hubs, residential neighborhoods, shopping centers, and more.
- External Zones: The area surrounding the city was divided into 10 zones (H-Q). The zones to the east extended 10-miles and the zones to the west extended 15-mile (to capture 90% of trips going into and out of the city).

Internal Zones



External Zones



Data

- Data analyzed represents a typical weekday for Fall 2022

Data Dictionary

Term	Definition
Internal Zones	Zones within the City of Sacramento (Zones A-G)
External Zones	Zones that border City boundaries (Zones H-Q)
Trip Generators	Zones that produce trips
Trip Attractors	Zones that attract trips
Trips that originate and end within City of Sacramento	These are trips that stay within the city boundaries
Trips that originate in City of Sacramento and end outside the city	These are trips that originate in the city and end outside city's boundaries
Trips that originate outside City of Sacramento and end in the city	These are trips that originate outside of city's boundaries and end in the city
Trip	Movement by a person between places
Traveler	Person traveling between places
Trip Mode	Primary form of transportation used for a trip. Modes include: • Single-Occupancy Vehicle (SOV) • Carpool (more than one occupant) • On demand (rideshare) • Public Transit • Biking • Walking • Others (Commercial trips, other travel modes)
Trip Purpose	The reason a trip is undertaken. Trip types include: • Work • Social • Recreation • Eat • Shopping • School • Others (Commercial trips, trips to the dry cleaners, banks, hairdressers, etc. and other trips that were not assigned of the purposes listed prior)

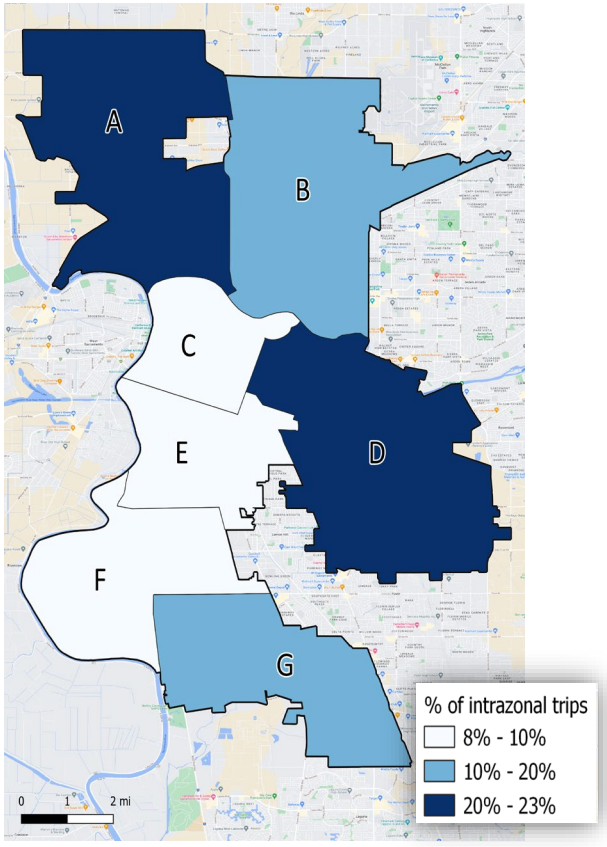
Origin-Destination Analysis: Internal Trip Proportions

Internal trips are represented by Zones A-G.

There are two types of internal trips:

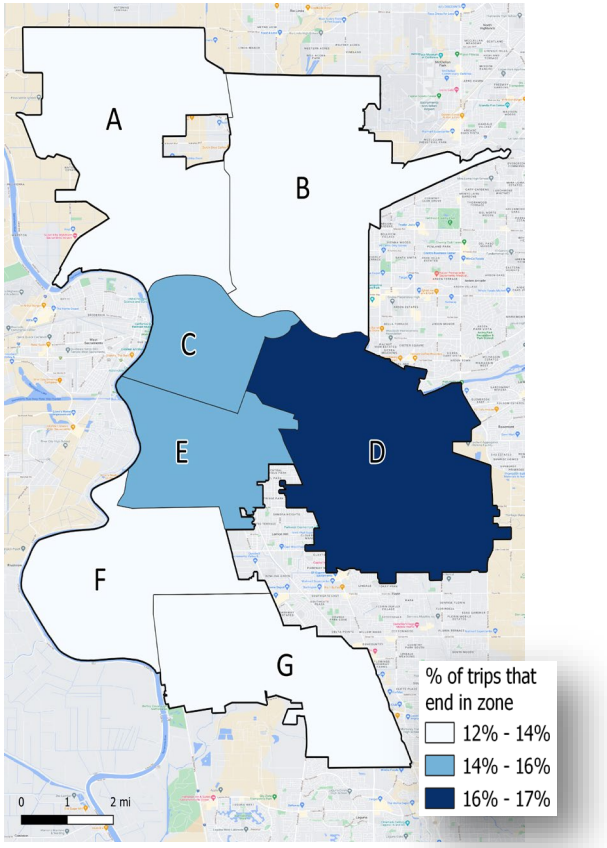
- Intrazonal Trips: trips that start and end within a single internal zone.
- Interzonal trips: trips that originate in an internal zone with a destination in another zone within City boundaries.

Proportion of Intrazonal Trips
(trips within a zone)



Large proportions of residents in Zones A and D stay within their zones for their needs. Therefore, there's an opportunity to shift those neighborhood-level single occupancy vehicle (SOV) trips to active transportation or public transit.

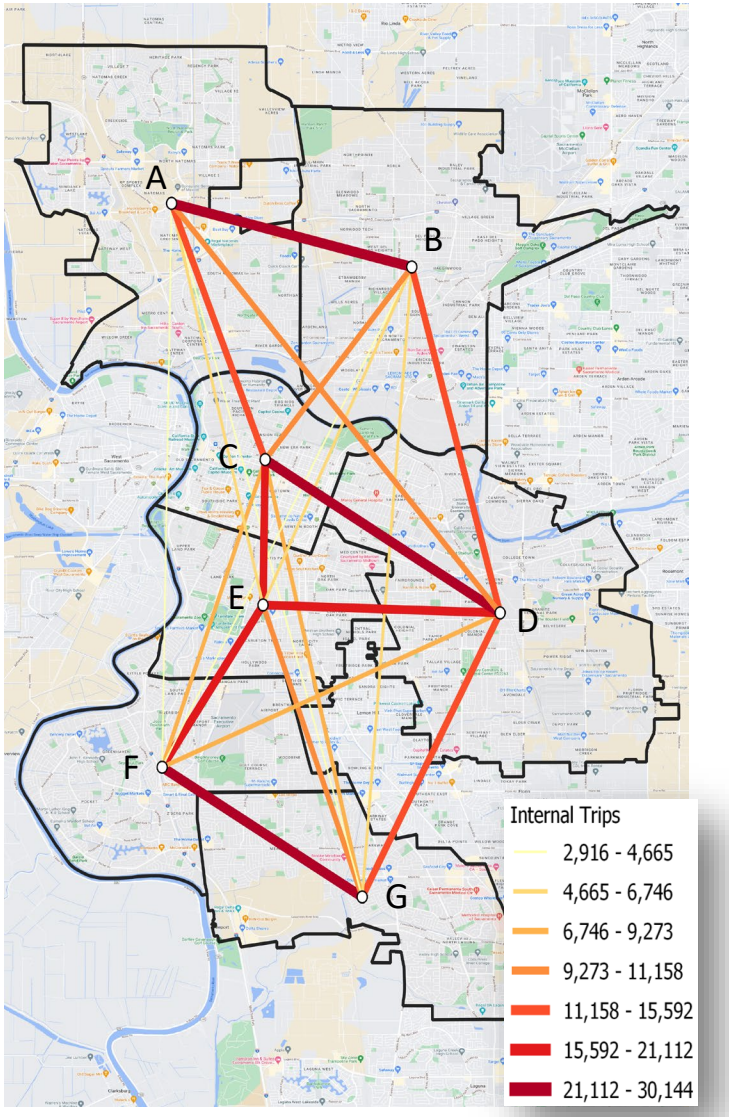
Proportion of Interzonal Trips that End in an Internal Zone



Conversely, when residents travel outside their zones, they tend to travel to Zones C, D, and E. This means these zones are trip attractors and it would be important to have end-of-trip supportive services.

Origin-Destination Analysis: Internal Trip Flows

Average Daily Trip Flows between Internal Zones



Large proportions of internal trips follow an east-west pattern.

The highest trip flows between zones occur between:

- Zone F and Zone G,
- Zone A and Zone B, and
- Zone C and Zone D.

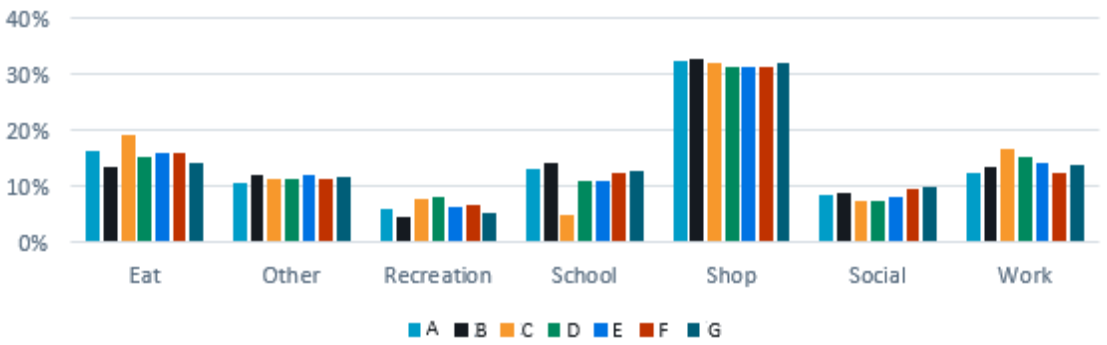
**The points on the map represent the centroid of the zone, not the specific location of the zone*

Origin-Destination Analysis: Internal Trip Purposes

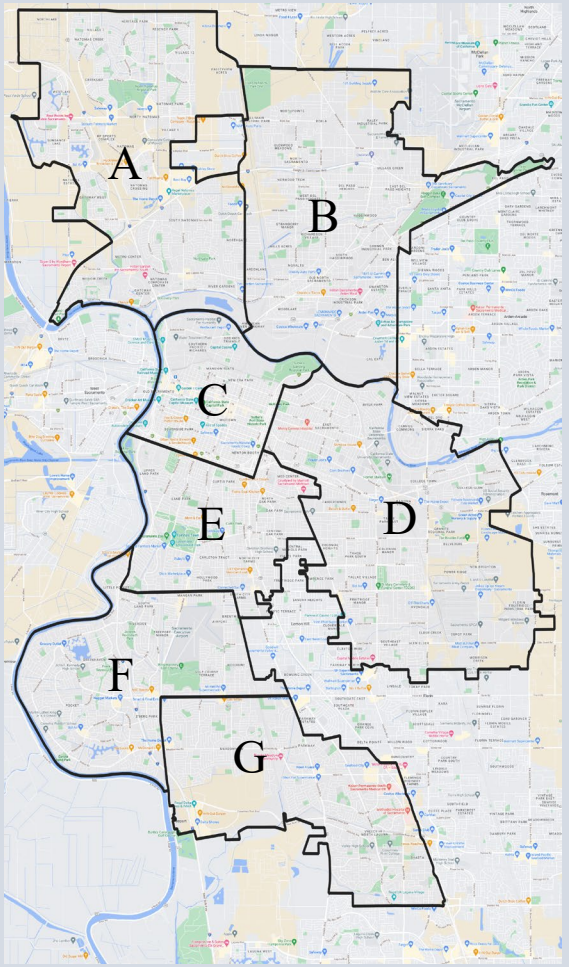
Trip Purpose

- Most trips occur for shopping, eating, and working
- Other includes freight, maintenance trips, and all other trips
- More school trips in Zone A and Zone B cross zone boundaries compared to other zones
- Zone C (Downtown) has the most internal trips for eat and work purposes.

Trip Purpose for Internal Trips by Zone Origin



Internal Zones



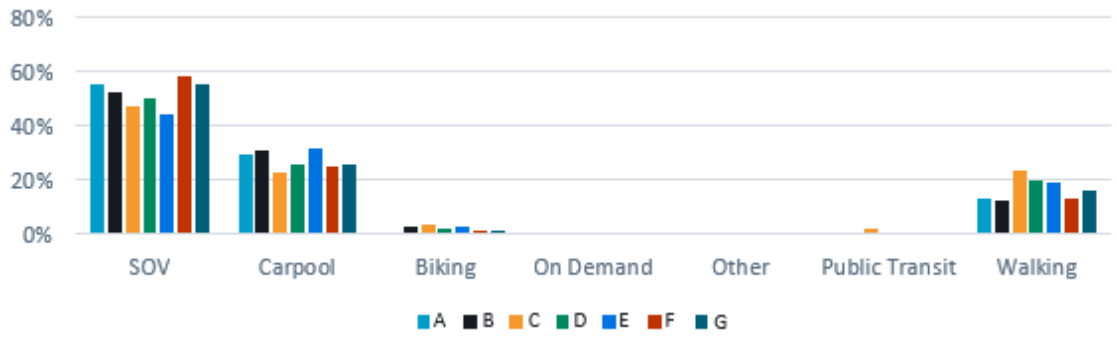
Based on this analysis, with work trips making up less than a quarter of all trips occurring within the city, the TDM Ordinance may want to explore extending applicability beyond employers to capture residential trips.

Origin-Destination Analysis: Internal Trip Modes

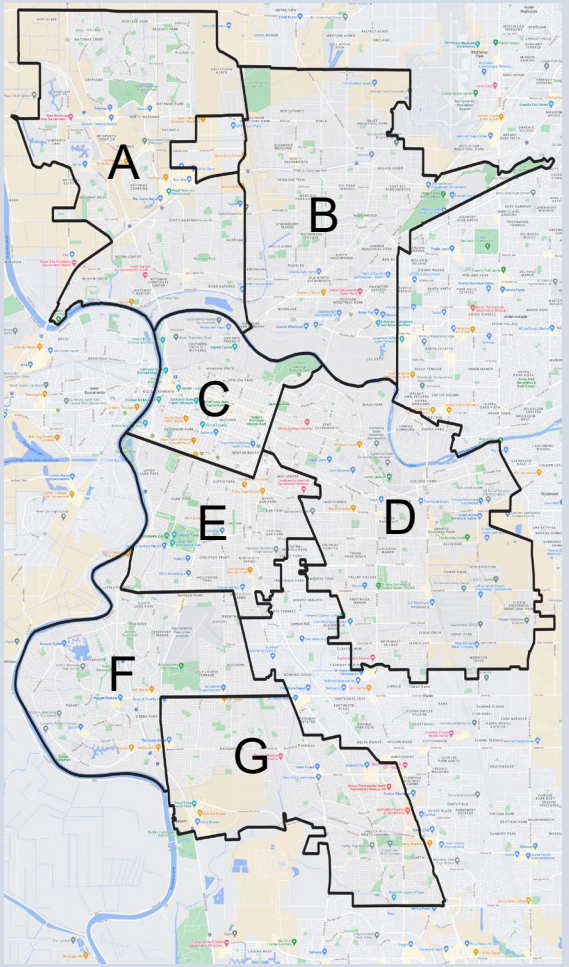
Trip Mode

- SOV trips make up the highest trip mode for all zones, followed by carpool and walking trips
- Carpool is defined as having more than one individual in the vehicle, including children and other family members
- Bike and Public Transit trips are generally low but occur the most in Zone C

Trip Mode for Internal Trips by zone Origin



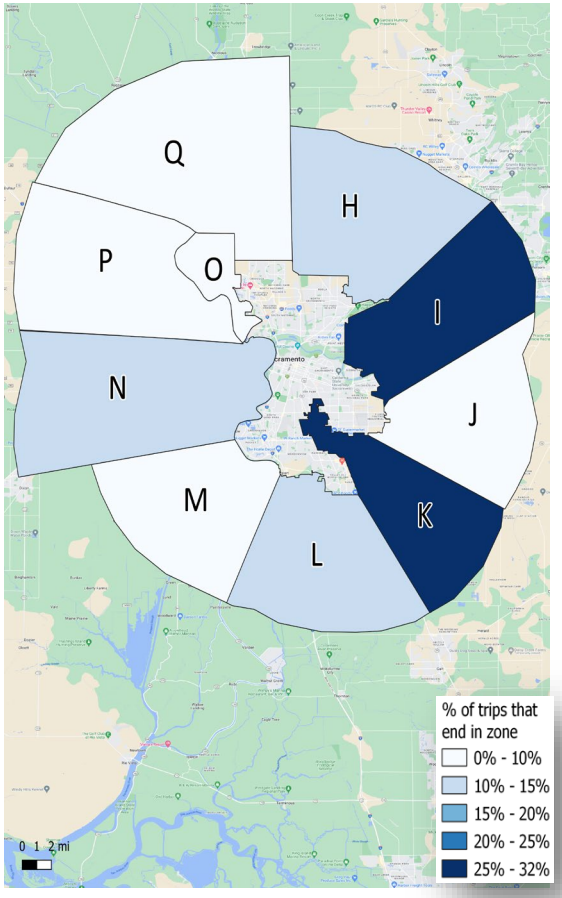
Internal Zones



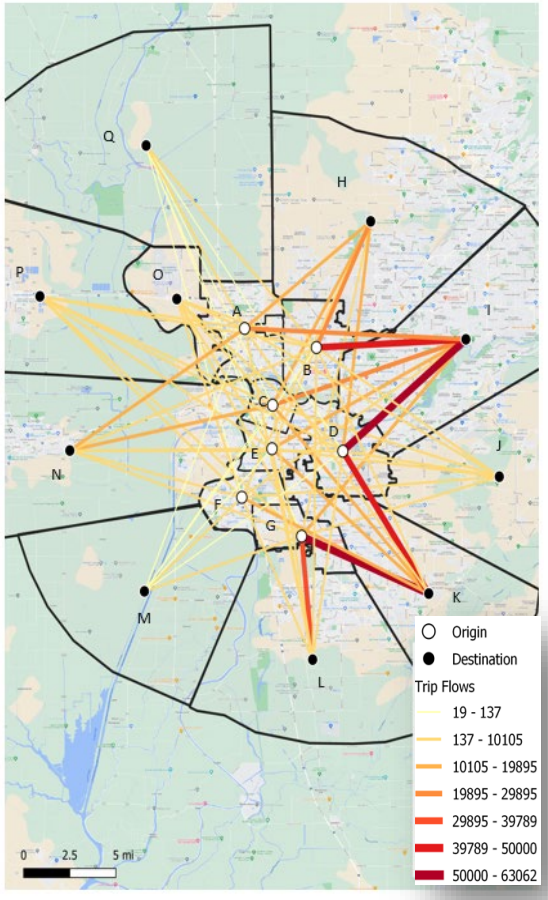
Based on this data, walking appears to be a viable mode for many internal trips. Therefore, the ordinance should continue to support walking for internal trips , especially in Zones C, D, and E. Strategies could include wayfinding and sidewalk improvements.

Origin-Destination Analysis: Trips that originate in Internal Zones and end in External Zones proportions and flows

Proportion of Trips that End in External Zones



Trip Flows From Internal Zones to External Zones



**The points on the map represent the centroid of the zone, not the specific location of the zone*

The results of this analysis show that when trips are taken out of the city, they tend to end to the east of the city where there is more development, especially in Zones I and K. These zones are key external destinations so ensuring sustainable transportation options to these zones may help reduce SOV. However, trip volumes going into and out of Zone K may be inflated due to the county segment which cuts into city boundaries. Note that the ordinance will only be applicable within City boundaries.

Origin-Destination Analysis: Trips that originate in Internal Zones and end in External Zones purposes and modes

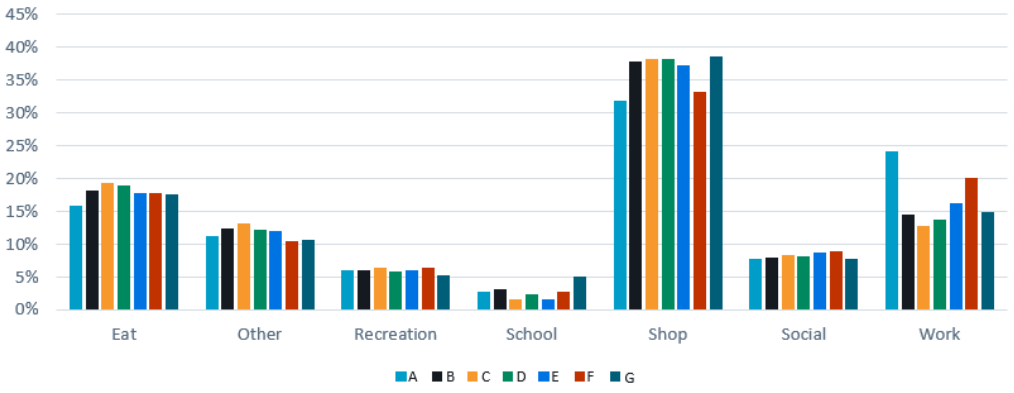
Trip Purpose

- Most trips occur for shopping and working
- Shopping trips to external zones from internal zones make up almost 40% of trips

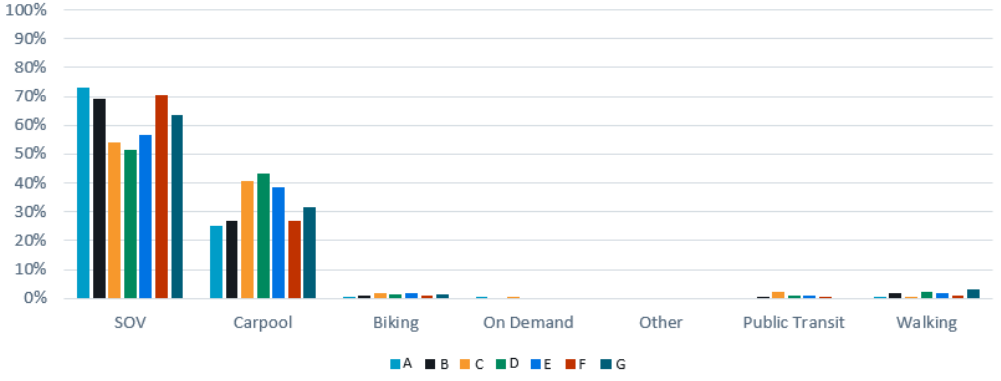
Trip Mode

- Almost all trips made from internal zones to external zones are made by SOV or carpool

Trip Purpose by Destination



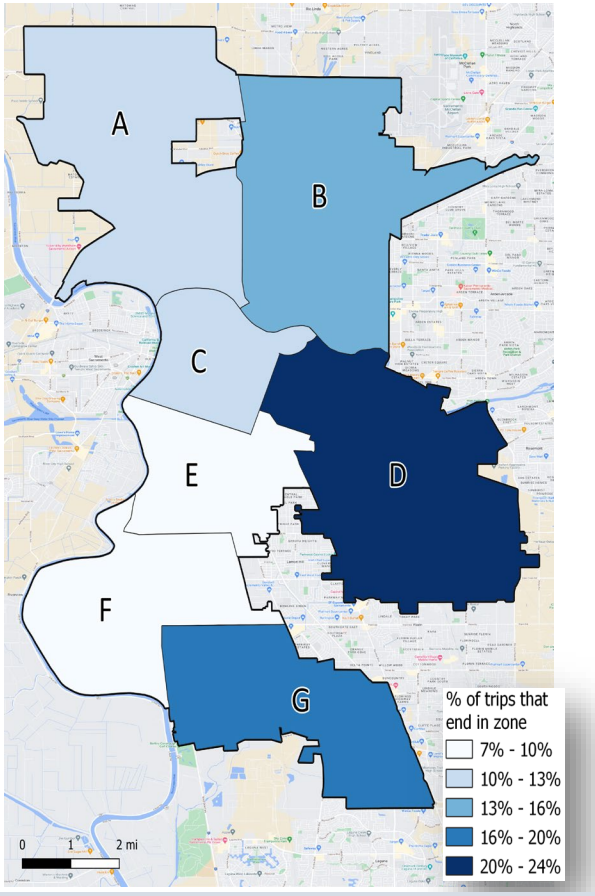
Trip Mode by Origin



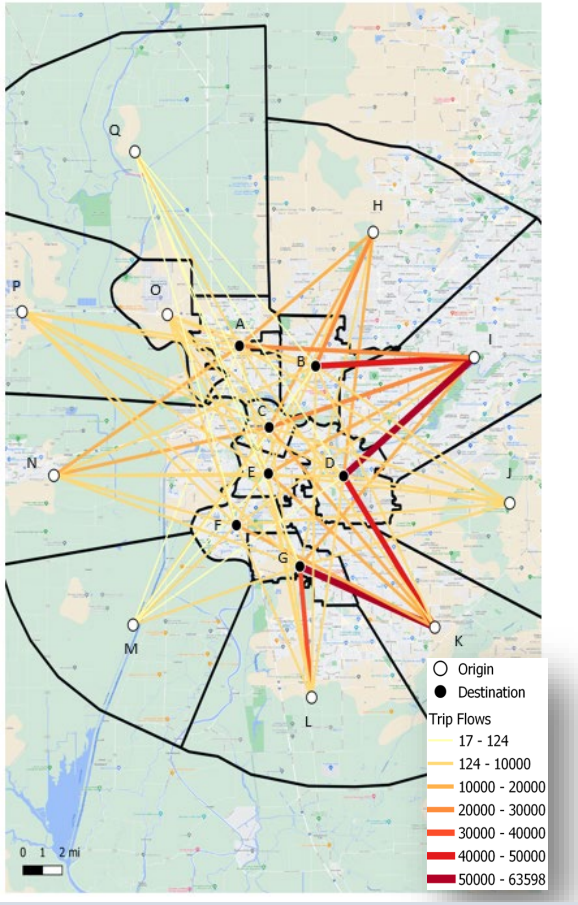
- Most external trips tend to happen by car, possibly due to the lack of other transportation options that cross city boundaries.
- Therefore, the priority for TDM would be to meet those needs locally and connecting to key destinations (through shuttles, bike paths, etc.).

Origin-Destination Analysis: Trips that originate in External Zones and end in Internal Zones proportions and flows

Proportion of Trips that End in Internal Zones



Trip Flows From External Zones to Internal Zones



**The points on the map represent the centroid of the zone, not the specific location of the zone*

Zone D and Zone G are major trip attractors from those living outside the city, especially those from Zones K, I, and L. Again, trips follow an east-west travel pattern.

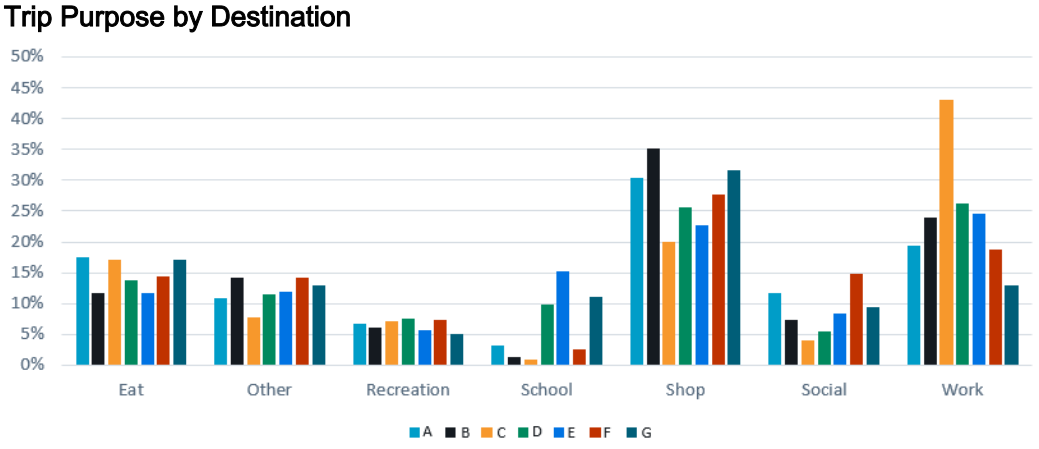
Origin-Destination Analysis: Trips that originate in External Zones and end in Internal Zones purposes and modes

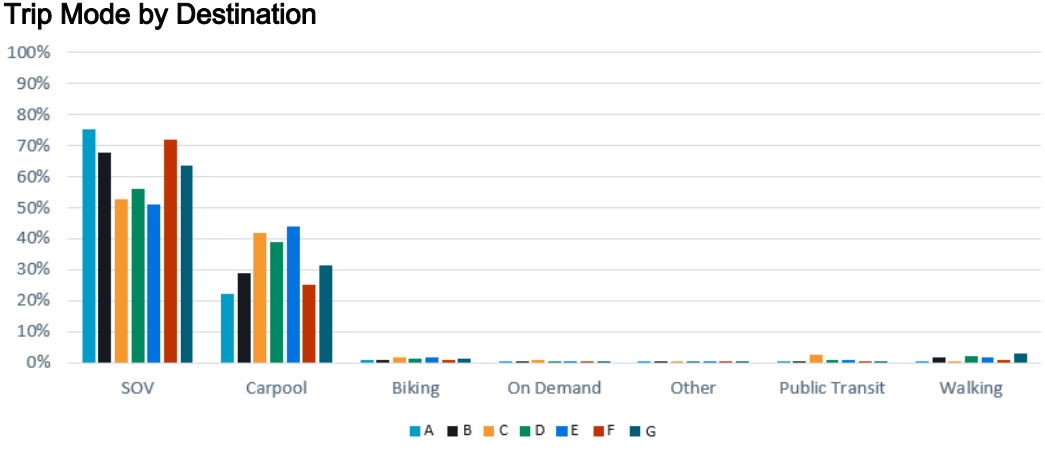
Trip Purpose

- Most trips occur for shopping, particularly to Zones A, B and G
- Trips to Zone C have a highest work trip purpose compared to other zones

Trip Mode

- Almost all trips made from external zones to internal zones are made by SOV or carpool trips





Some commuters living outside of the city travel into Zone C (Downtown) for work. Therefore, TDM interventions in Downtown should also consider longer-distance commuters (e.g., vanpool, carpool, SacRT Commuter Routes).

Replica Analysis
Conclusions

Key findings for the TDM ordinance update from this analysis include:

- Most residents stay within their own zones and travel less than 4 miles.
  - There is an opportunity to convert those SOV trips to other transportation modes.
- Trips leaving the city are mainly for shopping and working purposes
  - Connections to and availability of transportation options at entertainment and recreational destinations is important.
- Most internal trips follow an east-west pattern
  - It would be crucial to ensure access to transportation options to support these trips.

1/3 trips are for shopping purposes

80% of all internal trips are made by auto

4 miles is the median trip distance for all internal trips

Project Website & Contact Details

Click the link below for updates on the TDM Ordinance update project:

TDM

Transportation Demand Management

Contact us!

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