

# Maximum Mode Shift: A VMT Reduction Study



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# Study Goal



**Estimate the maximum possible shift to alternative modes, given existing land use and travel patterns.**

- Help set VMT reduction & mode share targets
- Identify geographies, trip types, demographic groups where mode shift has the greatest potential
- Alternative to forecast models

*Project uses open-source, reproducible tools to allow it to be repeated over time.*

# Research Approach

**Using 380,000 real-world auto trips reported by residents in the 2019 and 2021 Travel Behavior Inventory surveys, determine if:**

- 1 WALK, BIKE, OR TRANSIT ALTERNATIVES EXIST.**  
Calculate the best possible walk, bike and transit paths based on the observed origin, destination and timing, and OpenStreetMap data.
- 2 THE ALTERNATIVES ARE FEASIBLE.**  
An option is feasible if we observe a substantial number (5% or more) of people using that mode under similar circumstances, and if the traveler has sufficient time to complete the trip without interfering with another work, school or pick-up/drop-off activity.
- 3 THE FEASIBLE ALTERNATIVES ARE COMPETITIVE.**  
For trips with feasible non-car options, identify whether any of the non-car options has a competitive travel time (within 15 minutes).

# Finding the best alternative routes

**Our routing tools searched for paths that someone with options might use, taking into account safety, comfort and time.**



Stick to lower-speed streets and streets with pedestrian infrastructure.



Prefer Level of Traffic Stress 1 and 2 facilities (i.e., buffered or separated bike lanes).



Assume the observed arrival time is mandatory for work, school and medical appointments.

# Determining feasible alternatives

We examined existing walk, bike and transit trips, and defined a mode shift to be feasible if at least 5% use the mode under similar circumstances.



- Walking distance < 1.6 miles



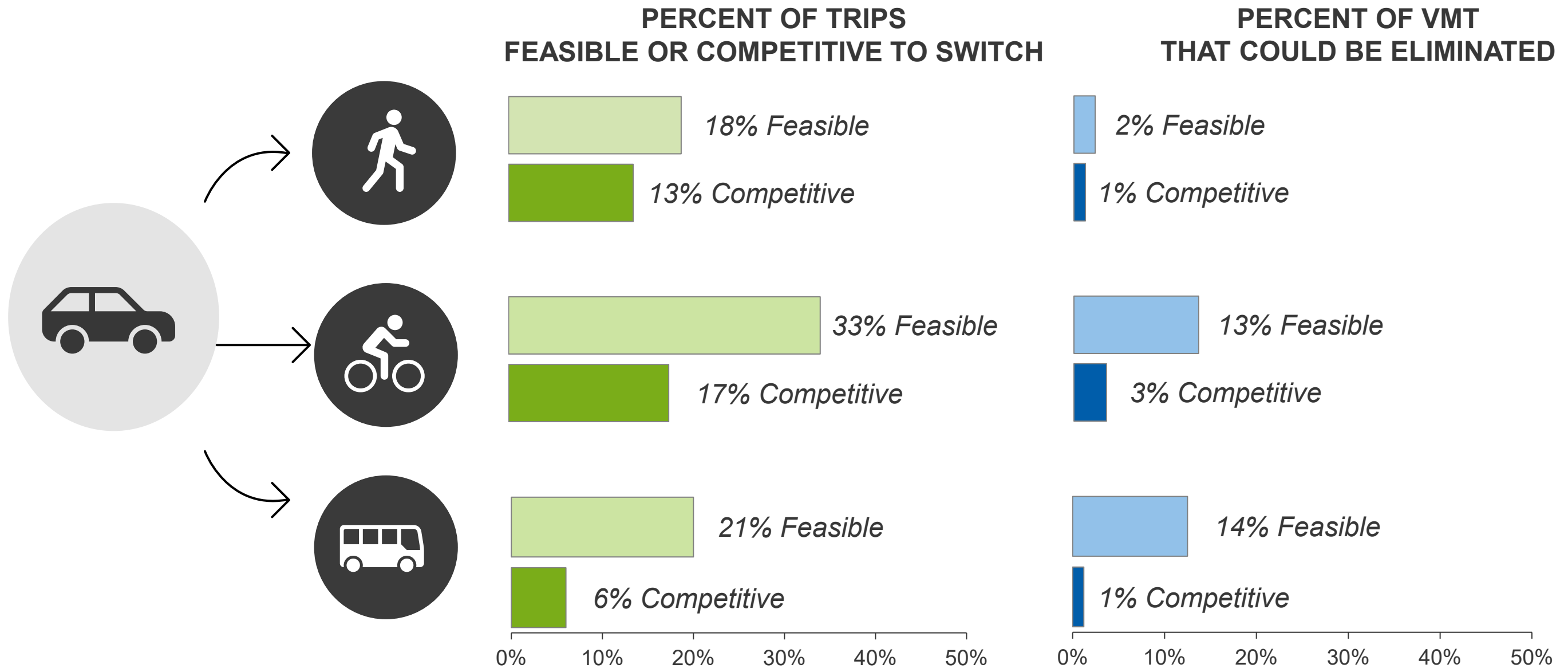
- Biking distance < 10 miles
- < 15% of biking distance on Level of Traffic Stress 3 and 4 facilities
- No snow on the ground



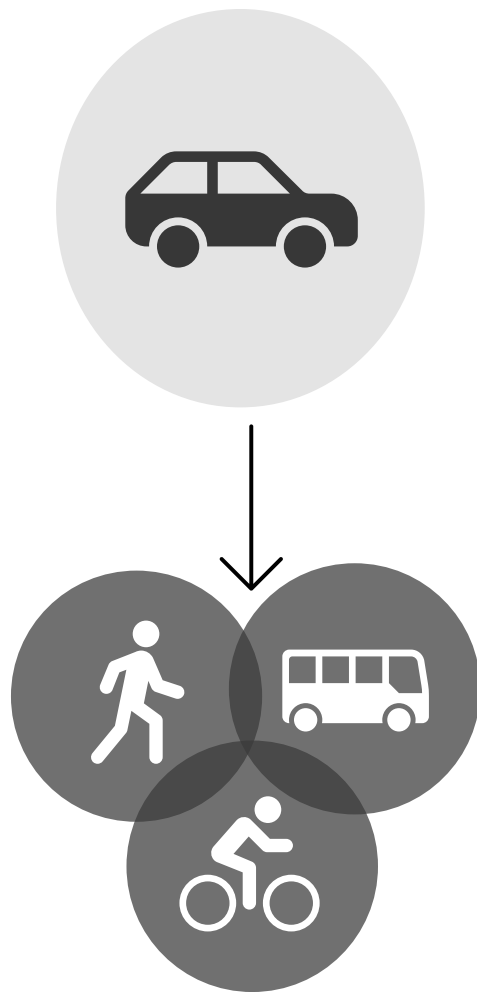
- Origin and destination are within 0.9 miles of transit stop
- Waiting time < 36 minutes
- No more than 2 transfers

In addition, there must be sufficient time to complete the trip without interfering with a work, school or escort passenger activity.

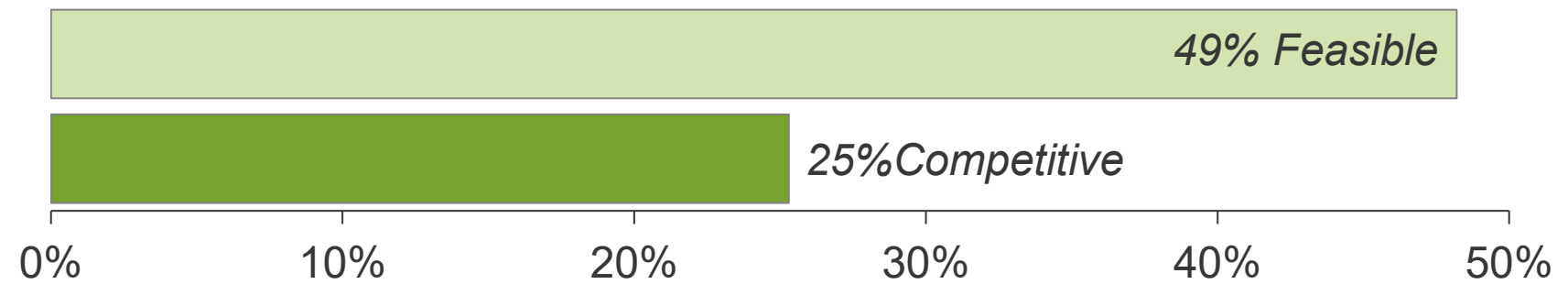
# Trip & VMT Mode Shift Potential by Alternative Mode



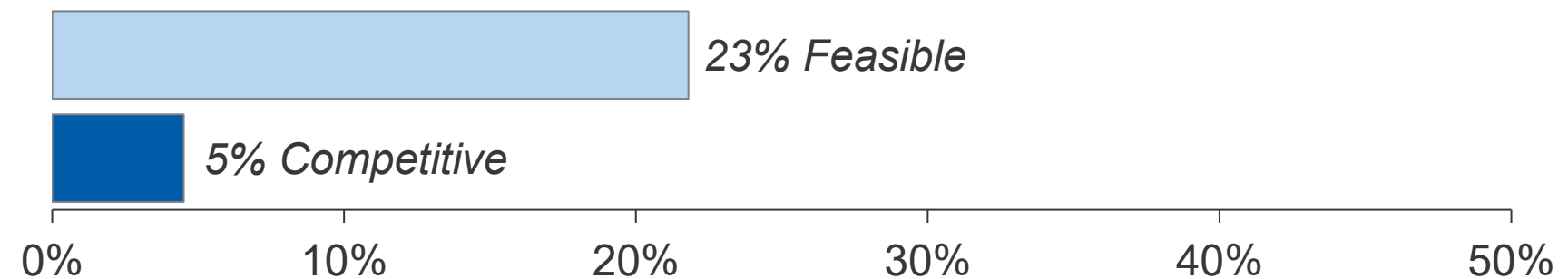
# Trip & VMT Mode Shift Potential, all Alternative Modes Combined



PERCENT OF ALTERNATIVE TRIPS THAT ARE FEASIBLE OR COMPETITIVE



PERCENT OF VMT THAT COULD BE ELIMINATED USING ALTERNATIVE MODES



# Scenario Analysis

## Considered very broad scenarios:

- Walk infrastructure – it is safe and comfortable to walk everywhere it is legal to do so
- Bike Infrastructure – it is safe and comfortable to bike everywhere it is legal to do so
- E-bikes – additionally, everyone has an e-bike
- Transit frequency – transit frequency is doubled across the board
- Highway speed – speed limits are reduced based on NACTO guidelines
- All of the above.



# Scenario Comparison

## Any Alternative is Within 15 Minutes of Driving

	Base	Walk Scenario	Bike Scenario	E-Bike Scenario	Transit Scenario	Car Speed Limit Scenario	All of the Above
% of Car Trips	25.1%	25.4%	42.9%	47.0%	25.9%	26.2%	49.7%
% of VMT	4.5%	4.6%	11.6%	14.4%	4.8%	4.9%	16.5%

# Conclusions

In the Twin Cities region today,

**25%** or **4.5%**  
of vehicle trips of vehicle miles traveled

could shift to walk, bike or transit with travel times within 15 minutes of driving.

If we made it safe and comfortable to walk and bike everywhere it is legal, made e-bikes available, doubled transit service, and reduced car speeds:

**50%** or **16.5%**  
of vehicle trips of vehicle miles traveled

could shift.

# Discussion

- **Biking has the highest potential for mode shift.** This potential can be further enhanced by building safe and comfortable bike infrastructure on all streets, but more work is needed to assess the extent to which this potential can be realized.
- Short trips have much higher mode shift potential. **Compact land-use can provide a double-benefit** of higher mode shift potential and shorter trips for those that remain in cars and is necessary to achieve greater VMT reduction.
- Even with broad changes to transportation infrastructure and service, many trips remain that cannot competitively shift. **Vehicle electrification policies can be targeted towards travelers least able to switch modes.**



# Questions?

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