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Ready or not – Small wheels buzz in urban landscape

Navigating Urban Mobility: Evaluating Infrastructure Strategies for Enhanced Energy-Efficient Access for Micromobility

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INTRODUCTION & MOTIVATION

Micromobility companies urged cities to think beyond 'blunt' regulation policies that restricts the use of e-scooters and e-bikes – SmartCitiesDive, 2023

What is the **future of micromobility** amidst varied infrastructure regulations impacting mode accessibility?

Cities	Restrictions
Chicago	Not permitted on sidewalks
San Jose	Not permitted on sidewalks
Washington DC	10 mph speed limit
Dallas	Midnight curfew
New York	Manhattan is a no-go zone

Few of the Top U.S. Metro Areas Regulating Micromobility (source: The Zebra)

Why a need to evaluate infrastructure strategies?

60% of all cars trips in the U.S. are under 6 miles

151 U.S. cities have at-least one shared micromobility option

1.7 Trillion in fuel cost savings by 2025 for American consumers

Cities and jurisdictions might want to weigh the benefits of enhancing infrastructure and adequately incorporating micromobility mode in multimodal planning to fully realize its accessibility benefits.

RESEARCH OBJECTIVE

1. Develop a **reproducible and transferable approach** to unravel the impact of various infrastructure strategies on micromobility access
2. Provide insights on **project prioritization and investment decisions** to enhance non-motorized infrastructure for micromobility modes
3. Evaluate the level of energy-efficient access availed to micromobility under **five** infrastructure scenarios

INTEGRATING OPENSOURCE TOOL AND DATASETS – PATHWAY TO DEVELOP A REPRODUCIBLE AND TRASFERABLE APPROACH

Mobility Energy Productivity (MEP) Metric — NREL's MEP Metric is an **opensource tool** that quantifies energy-efficient access for existing and emerging transport modes

OpenStreetMap (OSM) Dataset — OSM is a **crowd-source geospatial dataset** which provides reliable information for use in transport planning and accessibility computations

Level of Traffic Stress (LTS) — LTS is an approach that quantifies the amount of discomfort that people feel when they bicycle close to vehicular traffic (*Furth et al, 2016)

SCENARIO DESCRIPTION AND LTS CLASSIFICATION BY ROAD CLASS

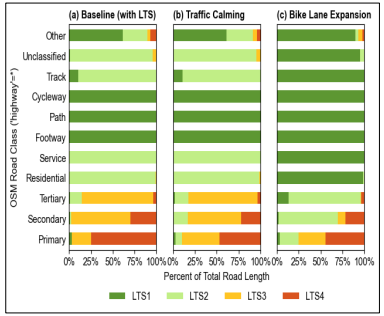
Naïve Baseline: LTS is not considered, and sidewalk use is prohibited

True Baseline (with LTS): LTS + sidewalk access is not allowed

Regulatory Scenario: LTS + sidewalk access is allowed

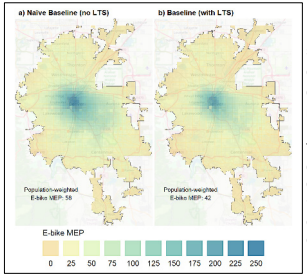
Traffic Calming Scenario: LTS + traffic calming measure

Bicycle Lane Expansion: LTS + increased bicycle lane infrastructure



SCENARIO ANALYSIS RESULTS – *"An ounce of practice is generally worth more than a ton of theory"* – E.F. Schumacher

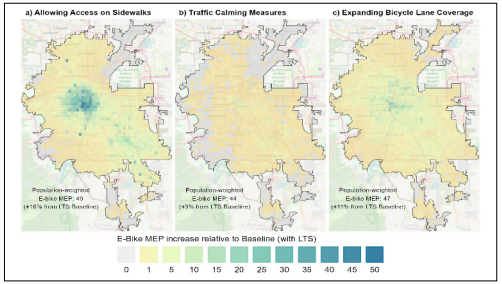
What is the Impact of Accounting for LTS in Micromobility Access Calculations?



Energy efficient access score decreased by 27% compared to naïve baseline, **questioning current infrastructure adequacy**

Traditional access calculations (that do not consider LTS) provide an **'inflated view'** of the level of energy-efficient access offered by micromobility

What are the Accessibility Benefits of Policy Regulations and Improved Non-Motorized Infrastructure?



- About 16% improvement (compared to true baseline) in energy-efficient access scores are observed when micromobility **use is allowed on sidewalks**
- In the **bicycle lane expansion scenario**, about 7,639 miles of roadways observed LTS improvements, resulting in 11% increase in accessibility scores (compared to true baseline)
- **Traffic calming measure** impacted about 1,457 miles of roadway facilities, resulting in accessibility benefits of 3% (compared to true baseline)

What is the Net Benefit (to public) from Infrastructure Investment to Enhance Access Efficiency of Micromobility mode?

Scenario	Percent of Population in Pixels with E-Bike MEP Score >50
True Baseline Scenario	28 percent
Regulatory Scenario (sidewalk access)	32 percent
Traffic Calming Measure Scenario	29 percent
Bicycle Lane Expansion Scenario	31 percent

DISCUSSION & CONCLUSIONS

- The study **integrated an opensource tool and dataset** to develop a **reproducible and transferable approach** that cities and planning agencies can implement to evaluate the accessibility implications of infrastructure planning for micromobility use
- It was observed that most of the population in Denver-Aurora region is **experiencing lower accessibility** due to presence of high stress network connections
- The scenario analyses underscores the importance of **infrastructure investments** to realize substantial accessibility benefits for micromobility
- The findings indicate the importance of **equity-driven urban planning ,** aiming not only to improve accessibility for micromobility users but also ensure these enhancements cater to a larger population

*P. G. Furth, M. C. Mekuria and H. Nixon, " Network connectivity for low-stress bicycling," Transportation research record, vol. 2587, no. 1, pp. 41-49, 2016.

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