

# JOINT TRANSPORTATION RESEARCH PROGRAM

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## Assessing the Travel Demand and Mobility Impacts of Transformative Transportation Technologies in Indiana

### Introduction

The transportation landscape has been quickly shifting in recent years because of the transformative transportation technologies, such as bike-sharing, shared e-scooters, and ride-hailing systems. The rapid development of different transformative technologies can dramatically change the transportation system and impact transportation agencies' planning, operations, and decision-making. The goal of this project is to develop a framework and models to understand how transformative transportation technologies can affect travel demand and mobility patterns in Indiana. The project involved four main tasks.

1. Analyzing the current trends of transformative transportation technologies in select case study cities in Indiana using collected historical data and survey results.
2. Developing Key Performance Indicators (KPIs) to evaluate the regional economic and mobility impacts of these transformative transportation technologies.
3. Developing a simulation model to analyze the impacts of transformative transportation technologies on vehicle use and ownership under different future development scenarios.
4. Analyzing the impacts of COVID-19 on transportation system usage using spatial-temporal data and two surveys.

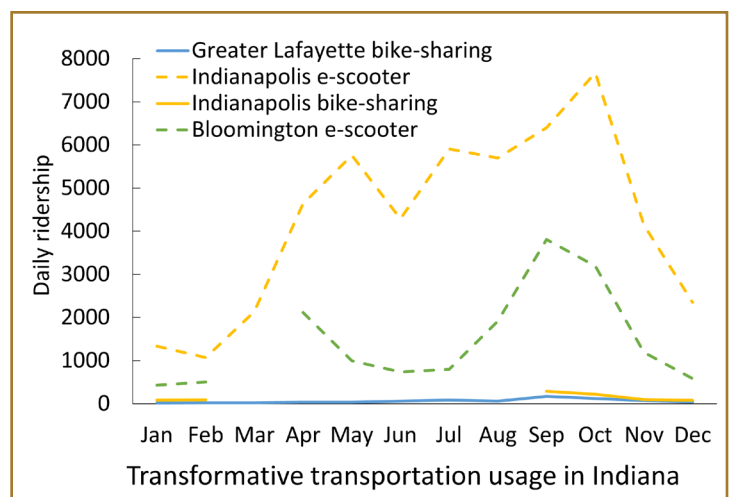
### Findings

Shared micro-mobility (i.e., bike-sharing and shared e-scooters) and ride-hailing services are the dominant

transformative transportation technologies currently available in Indiana cities. In general, shared e-scooter systems are much larger than bike-sharing systems and have higher usage rates. Ride-hailing use is more prevalent than both bike-sharing and shared e-scooters.

Transformative transportation technologies have not significantly affected car usage in Indiana cities but decreased transit use. Shared micro-mobility is replacing public transit more than complementing it. Very few users use shared micro-mobility for first-/last-mile connections to access bus service. The system operations and regulations need to be carefully designed to improve urban mobility. Operations, Accessibility and Equity, and Environment Health and Safety (EHS), are the three main categories of KPIs used to evaluate the impacts of transformative transportation technologies.

The continuous development of transformative transportation technologies, in terms of improved service



Transformative technology usage in Indiana.

availability and reduced price, is anticipated to impact private vehicle use and overall vehicle-miles-travelled (VMT). The Indianapolis survey show that there is a 10% probability that people will shift from private vehicles to transformative transportation technologies for short recreational trips; however, it is more challenging to shift mode choice for longer commuting trips. The simulation results further show that increased shared micro-mobility adoption can help reduce overall VMT by up to 2%, but a higher provision of ride-hailing services could increase total VMT by up to 30% due to dead-heading and rebalancing. In the short term, it is unlikely that car ownership would decrease due to these transformative transportation technologies because they cannot fully meet the diverse travel demands.

This study also provided a summary of literature on the impact of COVID-19 on traditional and transformative transportation system usage. The beginning stage of COVID-19 resulted in a decrease in private vehicle and transit use and an increase in walking and cycling nationwide. As of May 2021, trips to residences, grocery stores, and recreational venues have almost achieved pre-pandemic levels, while trips to workplaces and transit stations are still significantly less popular. Results from the Greater Lafayette and Indianapolis surveys suggest that both bike-sharing and shared e-scooters were used similarly during COVID-19. Additionally, insights from the Indianapolis survey show a significant change in travel habits caused by COVID-19.

## Implementation

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The following recommendations are derived from the findings of this project.

First, it is necessary to dynamically monitor and assess transformative transportation system performances to guide policy and infrastructure development decisions. Timely information about the system usage and performance is needed to effectively support decision-making for regulation and infrastructure development. While many cities have made open data a standard practice for transformative transportation systems, many Indiana

cities still lack such requirements on data sharing.

Second, better integration between the transformative transportation systems and the existing transportation systems needs to be promoted. Currently, shared micro-mobility has rarely been used for transit connection in Indiana, which is partially due to the concentrated distribution of the shared fleets in the downtown area. Better integrating these systems can enable multi-modal trips and improve urban mobility and transportation sustainability but will require integrated trip planning, payment, and fleet management.

Third, the results from the agent-based Integrated Traditional and Emerging Transportation System Use Model can help Indiana MPOs adjust the travel demand model and account for the impact of transformative transportation technologies. For other cities, the developed modeling framework can also be applied to generate city-specific results. The models developed in this project are available to analyze additional emerging transportation systems in Indiana cities or update the results for the current case study cities as more data becomes available. Results from this project can also inform future long-range transportation plan updates and provide useful information to the Multimodal Transit Team for their annual state transit reports.

## Recommended Citation for Report

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