



USDOT NATIONAL CENTER FOR UNDERSTANDING FUTURE
TRAVEL BEHAVIOR AND DEMAND

Semi-Annual Progress Report for University Transportation Centers

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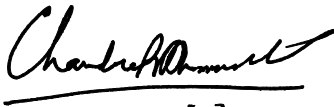
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1. ACCOMPLISHMENTS

The mission of TBD National Center is to revolutionize the understanding and management of travel behavior and demand through pioneering research and education, fostering a fair, efficient, and accessible transportation system that effectively serves and adapts to the evolving needs of the public. Led by The University of Texas at Austin (UT) and in partnership with Arizona State University (ASU), California State Polytechnic University – Pomona (CPP), Diné College (DC), Georgia Institute of Technology (GT), The City College of New York (CCNY), University of Michigan (UM), and University of Washington (UW), the TBD Consortium is committed to serving all communities and the entirety of the U.S. economy through the safe, efficient, and accessible movement of people and goods.

What are the major goals of the program?

The TBD Center’s overarching goal is to undertake breakthrough research that will fundamentally re-examine and transform the scientific base for measuring, monitoring, modeling, and managing traveler behaviors and demand, with an explicit focus on improving transportation system performance and reliability. The Center advances behaviorally grounded approaches that can be directly translated into tools and methods for transportation planning, operations, and policy decision-making. Through this work, TBD fosters the design, development, and operation of a people-centric, multimodal, intelligent transportation system that efficiently moves people and goods and supports the needs of individuals, institutions, and businesses for generations to come. The TBD initiative directly supports the U.S. DOT research priority area of improving mobility of people and goods and contributes to advancing a safe, efficient, and modern transportation system. Among its multitude of activities, the Center aims to undertake two flagship endeavors of national significance to bring about transformative impacts in planning and decision-making. The first is a *Travel Behavior Data (TBD) Hub* that the public, transportation planners, and policy-makers alike can leverage to understand the state of the transportation system, with built-in *quality of life, energy footprint, and mobility efficacy calculators* to aid in planning for efficiency, safety, and community wellbeing. The second is a panel-based multi-year *Transportation Heartbeat of America (THA) Travel Behavior and Demand Survey, including a survey of individuals, businesses, and employers*, to understand how travel behavior and demand are evolving, thereby providing critical insights into the future of transportation and the priorities of the nation.

What was accomplished under these goals?

Center-Wide Accomplishments

The TBD Center has continued to advance its mission through a range of impactful activities across research, education, workforce development, and technology transfer over the past six months. TBD researchers shared findings at leading national and international venues, including the 105th Annual Meeting of the Transportation Research Board (TRB), the 65th Annual Conference of the Association of Collegiate Schools of Planning (ACSP), and the INFORMS Annual Meeting. Center-affiliated scholars and students received prestigious awards and delivered invited seminars and webinars to diverse audiences. The Center also deployed the second wave of the Transportation Heartbeat of America (THA) Survey and expanded its suite of open-source data tools. These and other center-wide highlights are summarized below:

- TBD Center researchers and students [participated](#) in the 105th TRB Annual Meeting and contributed through panel discussions, poster sessions, and lectern presentations, engaging with the global transportation community to share TBD research findings and discuss emerging topics. A total of **58 presentations** were given by TBD researchers at TRB, including 32 by core center personnel.
- The TBD Center is organizing the [2026 National Mobility Summit](#), to be held on June 22, 2026, in Washington, D.C., in collaboration with the nine other UTCs. The Summit will convene leaders from the U.S. DOT, state and local government agencies, congressional offices, and industry partners to advance a shared national agenda for strengthening the mobility of people and goods.
- The 2nd wave of the THA Survey was successfully deployed during this reporting period, yielding 8,567 respondents, including 701 who also completed the 1st wave, forming the survey’s panel component.

- The TBD team at ASU added a new sample composition analysis capability to TBD dashboards – The Mobility Dashboard ([TMD](#)) and the Time Use, Travel, and Telework Dashboard ([T3D](#)) – enabling users to examine the demographic characteristics of ATUS respondents across all survey years.
- The TBD team at ASU published a technical brief titled "[Emerging Travel Behavior Insights From 2024 National Surveys and Count Data](#)", presenting a detailed synthesis of the American Community Survey, the Consumer Expenditure Survey, and the American Time Use Survey (ATUS), and providing key insights to aid planners and policymakers in navigating post-pandemic travel demand uncertainty.
- The TBD Center [website](#) continued to serve as the main hub for archiving and distributing information about the Center’s activities, including research updates, workforce development initiatives, and data products. During the current reporting period, the site attracted nearly 4,000 visitors.

Some other overall accomplishments of the TBD Center in this reporting period are listed below:

Selected TBD Awards and Honors:

- Dr. Alison Conway, TBD Associate Director, was appointed as Chair of the TRB’s Transportation and Data Analytics Section, recognizing her leadership and contributions to the field.
- Dr. Sofia Perez-Guzman (TBD researcher at GT) received the Fall 2025 CIOS Honor Roll recognition and was awarded the 2025–2028 Brook Byers Institute for Sustainable Systems Faculty Fellowship.
- During this reporting period, two TBD-sponsored graduate students were honored at the Council of University Transportation Centers (CUTC) Winter Meeting in Washington, D.C., on January 10, 2026. Dale Robbennolt was named the 2025 TBD National Center Outstanding Student of the Year in recognition of his exceptional contributions to transportation research. Debojjal Bagchi received the 2026 Milton Pikarsky Memorial Master's Award, recognizing his outstanding research impact.
- In addition, several TBD-affiliated graduate students received prestigious recognitions during this period. Eliana Duarte (GT) was awarded a three-year NSF Graduate Research Fellowship; PhD students Gulam Kibria, Yufei Xu, and Viswa Sri Rupa Anne (GT) received the ACM SIGSPATIAL Best Paper Award at the 33rd ACM International Conference on Advances in Geographic Information Systems; Yongyang Liu (GT) received the COTA Best Dissertation Award; and Yu-Chen Chu (UW) was awarded the \$7,500 Mt. Rainier Graduate Scholarship from COMTO Washington State.

Workforce Development/Technology Transfer Events:

- Dr. Chandra Bhat, TBD Center Director, delivered invited seminars at the National University of Singapore (February 2026), the University of Minnesota (February 2026), and the Northwestern University Transportation Center Seminar Series (February 2026), presenting findings on pedestrian safety, residential location choice, and the behavioral dimensions of online shopping and delivery.
- Dr. Patricia Mokhtarian, TBD Associate Director, delivered a keynote at the ETH Zurich Center for Sustainable Future Mobility Symposium (October 2025) and a webinar for the Atlanta Regional Commission Georgia Commute Options program (October 2025) on commute and telework trends.
- Dr. Cynthia Chen, TBD Associate Director, delivered invited seminars at Hong Kong University (December 2025) and the Southern California Association of Governments (January 2026), and participated in an IATBR webinar (October 2025), presenting findings on the use of location-based services data for transportation planning and demand analysis.
- Dr. Alison Conway, TBD Associate Director, delivered a keynote address at the University of Minnesota's Center for Transportation Studies (November 2025).
- The TBD team at ASU organized a webinar featuring Dr. Yichang (James) Tsai from Georgia Tech on innovative AI- and smartphone-based solutions for roadway safety assessment (March 2026).

Project-Specific Accomplishments

During this reporting period, TBD researchers made significant progress across various projects. The TBD Center has initiated a total of **73 projects** since 2023, of which **24 projects** were completed, while others advanced into subsequent phases. Final reports for the completed projects have either been distributed or are in the final stages of proofing for distribution in the coming months, per U.S. DOT guidelines. Table 1

presents the **49 projects** that are currently *active* across the Center’s research portfolio. To ensure accessibility and transparency, the TBD [website](#) continues to be regularly updated with information and deliverables related to all ongoing and completed research projects.

Table 1. TBD Research Projects (Currently Active)

Project Topic/Title	Institution (PI)	Start Year
1* Travel Behavior Data (TBD) Hub	ALL (Batur)	2023
2* Transportation Heartbeat of America Travel Behavior and Demand Survey	ALL (Bhat)	2023
3 City-Wide Strategic EV Charging Network Design: Demand-Supply Integration via Market Dynamics	ASU (Zhou)	2023
4 Exploring the Changing Dynamics of Household Vehicle Ownership and Use in the U.S.	ASU (Pendyala)	2023
5 Future Travel Foresight Catalyst: Phase 2	ASU (Maynard)	2024
6 Smart Transportation Digital Infrastructure: Advancing System Efficiency, Resilience, and Safety through Multi-Source Open-Standard Data Integration	ASU (Zhou)	2024
7* From Cross-Sectional to Longitudinal: The Impact of Sampling Strategies on Measuring Mobility Choices	ASU (Pendyala)	2024
8 Time Use, Travel, and Telework Dashboard (T3D)	ASU (Batur)	2024
9 The Mobility Dashboard (TMD)	ASU (Batur)	2025
10 Future Travel Foresight Catalyst – Phase 3	ASU (Maynard)	2025
11 Understanding Transportation Investment Priorities in Suburban Communities	ASU (Pendyala)	2025
12 Understanding Household Vehicle Fleet Evolution	ASU (Hennessy)	2025
13 Behavior-Aware Evaluation of Emerging Vehicular Technologies	ASU (Wang)	2025
14* Measuring the Last-Mile: A Comprehensive Evaluation of Synthesis Approaches to Address Data Gaps for Local Freight Decision-Making (Phase 1)	CCNY (Conway)	2023
15 Exploring Top-Down Visual Attention for Transportation Behavior Analysis	CCNY (Zhu)	2024
16 Investigation of Emerging Sensing and AI/ML Technologies to Enhance the Safety of Vulnerable Roadway Users at Signalized Intersection	CCNY (Li)	2024
17 Blockchain Application on Smart Transportation Systems	CCNY (Allahviranloo)	2024
18 From Reactive to Predictive: Modeling Urban Event Impacts on Transportation Systems	CCNY (Allahviranloo)	2025
19 The Home as a Trip Attractor: An Exploratory Study of Residential Service Demand	CCNY (Conway)	2025
20 Measuring the Last-Mile: Leveraging Synthetic Data to Evaluate the Effects of Urban Freight Interventions	CCNY (Conway)	2025
21 Exploring Top-Down Visual Attention for Transportation Behavior Analysis: Walkability and Pedestrian Behaviors	CCNY (Zhu)	2025
22 Leveraging Vision-Language Models for Efficient Understanding of Vulnerable Roadway Users via a Multimodal Traffic Sensing Approach	CCNY (Li)	2025
23 Vehicle Edge Computing for Travel Behavior and Demand in Future Intelligent Transportation Systems (ITS)	CPP (Wang)	2024
24* Spatiotemporal Heterogeneous Change of Travel Behavior during Wildfires in California	CPP (Gu)	2025
25 Examining Heterogeneity in Public Attitudes Toward Shared Autonomous Vehicles by User Experience	CPP (Zhang)	2025
26 Empirical Investigation of Post-Disaster Travel Behavior to Points of Distribution of Relief Supplies	GT (Perez-Guzman)	2024
27 Improving Mobility Options through Transit Signal Priority (TSP)	GT (Hunter)	2024
28 How Complete are Your City’s Streets? Evaluating the Completeness of Urban Streets Using Big Data and Computer Vision	GT (Guhathakurta)	2024
29 Neutralizing Onerous Heat Effects on Active Transportation (NO-HEAT) in Atlanta	GT (Basu)	2025
30* Enhancing the Use of Attitudinal Marker Variables in Travel Behavior Models: Evaluation of Latent Class Modeling Approaches Using a Nationwide Travel Survey	GT (Mokhtarian)	2025
31 From Perception to Policy: Measuring Road Driver Behavior and Public Support for Autonomous Truck Regulation	GT (Perez-Guzman)	2025
32 Fostering Multimodal Travel Options through Behavioral Interventions and Emerging Mobility Solutions	GT (Peeta)	2025
33 Investigating Travel Survey Representativeness	UM (Shaw)	2024
34* Michigan Mobility Metrics (M3): An Outcome-Focused, Multi-Year Survey Deployment and Data Collection Effort	UM (Shaw)	2024

Project Topic/Title	Institution (PI)	Start Year
35 An Application-Agnostic Investigation of Location-Based Services Data Quality: Using Synthetic Data and Empirical Benchmarking	UM (Shaw)	2025
36* Potential Use of Large Language Models (LLMs) for Travel Behavior Survey Research	UT (Bhat)	2025
37 Modeling Spatial Dependency of Active Travel Behavior	UT (Bhat)	2025
38 A Virtual Reality Framework for Analyzing Pedestrian Crossing Behavior and Decision-Making Factors	UT (Bhat)	2025
39 Data Collection, Weighting, and Modeling Techniques to Estimate Unbiased Population Parameters	UT (Bhat)	2025
40 Multimodal Freight Network Capacity and Resilience Under Demand Shifts	UT (Boyles)	2025
41 Development of Demand Estimation Methodology for On-street Shared Paths	UT (Machemehl)	2025
42 Do Millennials and Zoomers Participate in Teleactivities More and Travel Less Than Older Generations?	UT (Zhang)	2025
43 Quasi-Sparsity in Transportation Origin-Destination Demand	UW (Ban)	2024
44 Disabled Parking CV: Scalable Methods to Analyze Disability Parking Using Computer Vision and High-Resolution Aerial and Streetscape Images	UW (Froehlich)	2024
45 Real-Time Transportation Origin-Destination Demand Estimation Using Multimodality Data	UW (Ban)	2025
46* Estimating Point of Interests (POI) Visit Demand using Location-Based Services (LBS) Data and Large-Language Models (LLMs)	UW (Chen)	2025
47 Opportunities and Limits of Individual Behavioral Changes: Phase I	UW (Chen)	2025
48 Are We Ready? Evaluating Evacuation Preparedness, Behavior, and Vulnerability During Wildfires in Washington	UW (Lingzi)	2025
49 Determinants of Vehicle Holding Time and Scrappage	UW (MacKenzie)	2025

Note: (*) = Narrative provided below.

A few illustrative details about the progress made for *a sample* of active projects are provided below.

<p>Project #1: Travel Behavior Data (TBD) Hub PI: Chandra Bhat (UT) Co-PIs: Irfan Batur (ASU) and Ram Pendyala (ASU)</p>
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Progress: Serving as one of the two TBD flagship endeavors, this project aims to develop a comprehensive Travel Behavior Data (TBD) Hub that brings a variety of data sets into a single unified platform, thus serving as a one-stop shop for instant data-driven insights on travel behavior and demand. The team is leveraging advanced techniques in data aggregation, fusion, imputation, weighting, prediction, and visualization to build a national hub that can be used by the public, planners, and policymakers to better understand the state of the transportation system. The Hub is being built through a multi-year, multi-university effort spanning multiple disciplines and thrust areas. In previous reporting periods, the team developed two dashboards integrated into the Hub: (i) the Time Use, Travel, and Telework Dashboard (**T3D**) and (ii) The Mobility Dashboard (**TMD**). During this reporting period, the team added a new capability to both dashboards that enables analysis of sample composition across all American Time Use Survey (ATUS) datasets. In addition, the team continued developing the Community Adaptation and Resilience to Extremes (CARE) Dashboard. This dashboard will include a survey explorer tool for a nationwide survey focused on understanding how people adapt to extreme events, how these events alter daily routines, and the resulting transportation needs. CARE will also feature a scenario analysis tool to assess how specific geographic areas and user groups may be impacted under different extreme event conditions. In the next reporting period, the team will continue development of the CARE dashboard and incorporate the 2025 ATUS data into T3D and TMD, which is expected to be released in June 2026.

<p>Project #2: Transportation Heartbeat of America (THA) Travel Behavior and Demand Survey PI: Chandra Bhat (UT) Co-PIs: Irfan Batur (ASU), Ram Pendyala (ASU), Patricia Mokhtarian (GT), Atiyya Shaw (UM), Steve Polzin (ASU), Alison Conway (CCNY), and Cynthia Chen (UW)</p>

Progress: Serving as one of the two TBD flagship endeavors, TBD has begun to deploy a comprehensive longitudinal travel behavior and demand survey across the nation. The goal of the Transportation Heartbeat of America (“THA”) survey is to obtain a statistically representative depiction of attitudes and behaviors

across a wide range of transportation domains. To assess rapidly changing travel conditions and behaviors, the survey employs a combination of panel and cross-sectional methods deployed over a five-year period. In the previous year, the first wave of the THA survey was distributed to more than 8,000 participants. During the current reporting period, a second survey instrument was developed for the second wave and deployed across the nation. This second round of distribution yielded a total of 8,567 respondents who completed the entire survey and passed a set of detailed quality control checks, including 701 respondents who had also completed the wave 1 survey (the “panel” component of the survey). In the next reporting period, the responses from this second round of data collection will be analyzed and compared with the wave 1 results to develop a detailed understanding of the state of transportation in the United States and how it has evolved over the last year. In addition, work will begin on the design of the survey instrument for the third wave, which is planned for Fall 2026.

Project #7: From Cross-Sectional to Longitudinal: The Impact of Sampling Strategies on Measuring Mobility Choices | PI: Ram Pendyala (ASU), Co-PI: Irfan Batur (ASU)

Progress: This project aims to: (1) assess the representativeness of samples obtained from three survey respondent recruitment strategies used in a nationwide longitudinal panel survey (convenience, email, and online panel sampling); (2) evaluate the extent to which weighting can mitigate differences across these strategies in terms of socio-economic, demographic, and mobility variables; and (3) examine the impact of sampling strategies on mobility outcomes, including whether these effects persist after controlling for observed characteristics. The data analysis and modeling were completed during the previous reporting period, The team subsequently prepared a journal manuscript, which has now been published in the *Data Science for Transportation* journal. During the current reporting period, the team finalized the rebuttals, revised the manuscript, and completed the publication process. In parallel, the team has begun preparing the final project report. In the next reporting period, the team will finalize and submit the report.

Project #14: Measuring the Last-Mile: Leveraging Synthetic Data to Evaluate the Effects of Urban Freight Interventions | PI: Alison Conway (CCNY) Co-PIs: Michael Grossberg (CCNY)

Progress: The goal of this project is to develop, implement, and evaluate a machine learning–based simulation framework to quantify the effects of city logistics interventions using synthetic truck trajectories derived from GPS data. By the end of the project, a robust framework is expected to be delivered for evaluating such interventions. During this reporting period, data preprocessing and feature engineering were completed, multiple probabilistic models were developed to generate synthetic freight truck trajectories, and model performance was evaluated using cross-validation, with the kernel-based approaches demonstrating improved ability to replicate real-world trajectory patterns compared to the baseline model. In the next reporting period, efforts will focus on improving model performance for rare or underrepresented trajectories and further evaluating the simulation framework’s ability to support before-and-after analyses of city logistics interventions.

Project #24: Spatiotemporal Heterogeneous Change of Travel Behavior during Wildfires in California | PI: Yangsong Gu (CPP) Co-PIs: Yongping Zhang (CPP), Wen Cheng (CPP)

Progress: This project aims to examine the spatiotemporal changes in travel behavior during wildfire events in California. While prior research has largely focused on tourists and evacuees, this study emphasizes the travel behavior of residents, whose daily mobility needs may be significantly disrupted by wildfire-related factors such as infrastructure damage, road closures, and poor air quality. During this reporting period, a comprehensive literature review was conducted to assess existing research on wildfire impacts on mobility and access to essential services, and to identify key gaps. The study area was defined to focus on major recent wildfire events, including the 2025 Palisades and Eaton fires in California. Data collection was initiated, including mobility data (SafeGraph and Advan), wildfire perimeter data (CalFire), and socio-demographic data (American Community Survey). Initial data processing and visualizations were

also completed. In the next phase, a spatiotemporal machine learning framework will be developed to analyze the heterogeneous impacts of wildfires on travel behavior. The methodology and findings will be documented in at least one research paper for submission to the TRB Annual Meeting.

Project #30: Enhancing the Use of Attitudinal Marker Variables in Travel Behavior Models: Evaluation of Latent Class Modeling Approaches Using a Nationwide Travel Survey | **PI:** Patricia Mokhtarian (GT)

Progress: This project aims to demonstrate the practical value of incorporating attitudinal variables into travel demand forecasting models. Using data from the 2024 Transportation Heartbeat of America (THA) Survey ($N \approx 8,200$), the study evaluates the extent to which latent class modeling approaches can improve the performance of travel behavior models that include attitudinal measures. During this reporting period, a modeling framework was developed and implemented to provide systematic guidance for incorporating attitudes into travel demand models. The framework integrates both deterministic and latent class (probabilistic) segmentation approaches to support improved model specification. Application of this framework to vehicle ownership models demonstrated notable gains in predictive performance. The final project report and a journal manuscript are currently in preparation and are expected to be completed in the next reporting period. The outcomes will inform practitioners and researchers on the value of incorporating attitudinal variables into travel surveys and modeling efforts.

Project #34: Michigan Mobility Metrics (M3): An Outcome-Focused, Multi-Year Survey Deployment and Data Collection Effort | **PI:** Atiyya Shaw

Progress: This project aims to collect detailed behavioral data on transportation system users in Michigan to complement the ongoing statewide household travel survey. The effort is designed to provide a deeper understanding of residents' attitudes, preferences, and adoption of emerging transportation modes and technologies, addressing a current gap in data for the region. During this reporting period, the project remained in the survey design and planning phase. The proposed survey is intended to capture information on evolving mobility behaviors in the context of recent changes such as the growth of ridesharing and micromobility, advancements in electric and automated vehicles, and shifts in work. The survey will augment existing travel data by providing insights into behavioral drivers and future adoption trends. The resulting dataset will support improved travel demand modeling, planning, and policy development across Michigan, particularly by enabling integration with the ongoing household travel survey and informing activity-based modeling efforts in regions such as SEMCOG. In the next reporting period, the team will complete the survey design and initiate data collection, with implementation planned for August 2026.

Project #36: Potential Use of Large Language Models (LLMs) for Travel Behavior Survey Research
PI: Chandra Bhat (UT)

Progress: This project focuses on recent advances in large language models (LLMs), analyzing their potential to generate synthetic behavioral datasets to supplement or replace traditional survey data collection efforts. During the current reporting period, a complete synthetic dataset was generated using Gemini (the LLM created by Google) based on the survey instrument developed for the first wave of the Transportation Heartbeat of America (THA) survey and the real demographic characteristics of the human respondents to this survey dataset. Then the real THA dataset was used as a ground-truth for aggregate level comparisons of survey results compared with the LLM-generated responses. In the next reporting period, this analysis will continue at a disaggregate level, providing additional insights regarding the internal consistency of LLM responses across survey items as well as sensitivity to demographic and location characteristics provided as inputs for each individual.

Project #46: Estimating Point of Interests (POI) Visit Demand using Location-Based Services (LBS) Data and Large-Language Models (LLMs) | **PI:** Cynthia Chen (UW)

Progress: This project aims to develop a framework for predicting POI demand by integrating advanced modeling approaches with interpretability analysis. A key component of the work examines how Large

Language Models (LLMs) can be applied to spatiotemporal forecasting by formulating POI demand prediction as a zero-shot learning problem, where time series and contextual information are encoded into textual prompts. During this reporting period, a structured evaluation framework was developed to assess LLM-based predictions, including a risk decomposition approach that separates prediction error into components related to prompt design, model bias, and decoding variability. Results indicate that incorporating summary statistics into prompts improves prediction accuracy and stability, while additional contextual features (e.g., demographics) provide more limited and model-dependent benefits. In parallel, a spatiotemporal modeling framework was developed to capture temporal dynamics and inter-POI relationships using graph-based methods. This framework is complemented by embedding strategies and Transformer-based forecasting components. The next phase will focus on advancing the spatiotemporal modeling framework, including improving graph construction methods (both predefined and data-driven) and enhancing temporal modeling to better support forecasting across different time horizons.

What opportunities for training and professional development has the program provided?

The center-wide workforce development/technology transfer events are discussed earlier in this SAPR. In terms of education, the courses offered by faculty members closely affiliated with the Center are presented in Table 2. While there are many additional transportation-related courses taught at each TBD institution, the scope of activities reported in this SAPR is limited to the activities of faculty members who comprise the *core* group of the TBD, who are deeply engaged in advancing the activities and mission of the Center.

Table 2. Courses Offered by Core Faculty Members of TBD (Fall 2025 & Winter 2026)

Semester	Level	Course No	Course Title	No*	Instructor	Unit
Arizona State University						
Fall 25	Undergrad	CEE 372	Transportation Engineering	82	Wang	SSEBE
Fall 25	Undergrad	FIS 338	The Moviegoer's Guide to the Future	39	Maynard	FIS
Fall 25	Grad	CEE 598	Traffic Simulation Modelling and Applications	10	Zhou	SSEBE
Cal Poly Pomona						
Fall 25	Undergrad	CE 3601	Transportation Engineering	67	Zhang	CoE
Fall 25	Undergrad	CE 3601	Transportation Engineering	72	Cheng	CoE
Fall 25	Undergrad	EGR 4810	Senior Project	36	Zhang	CoE
Fall 25	Undergrad	CE4690	Traffic Engineering	26	Zhang/Gu	CoE
Fall 25	Undergrad	CS 3310	Design and Analysis of Algorithms	73	Wang	CS
Fall 25	Grad	CS 5230	Connected and Autonomous Vehicles	34	Wang	CS
City College of New York						
Fall 25	Undergrad	CE 10100	Introduction to Civil Engineering	85	Conway	GSOE
Fall 25	Undergrad	CE 32600	Transportation Planning	49	Allahviranloo	GSOE
Fall 25	Undergrad	ENGR 10200	Data Science and Statistical Approach to Programming	22	Grossberg	GSOE
Fall 25	Grad	CE 19800	Master's Project	1	Conway	GSOE
Fall 25	Grad	DSE I1020	Introduction to Data Science	24	Grossberg	GSOE
Fall 25	Grad	CS 16716	Computer Vision	22	Zhu	GSOE
Georgia Institute of Technology						
Fall 25	Undergrad	CEE 4610	Multimodal Transportation Plan., Design, and Oper.	28	Perez-Guzman	CEE
Fall 25	Undergrad	CEE 4600	Transportation Planning and Design	42	Hunter	CEE
Fall 25	Undergrad	CEE 4803	Transportation Simulation and Impact Assessment	10	Hunter	CEE
Fall 25	Grad	CEE 6650	Discrete Choice Modeling	14	Mokhtarian	CEE
Fall 25	Grad	CEE 8813-F	Transportation Network Modeling and Analysis	18	Peeta	CEE
Fall 25	Grad	CP 6112	Introduction to Land Use	35	Guhathakurta	CP
University of Michigan						
Winter 26	Undergrad	CEE 450	Introduction to Transportation Engineering	43	Shaw	CEE
University of Texas at Austin						
Fall 25	Undergrad	CE 311S	Probability/Statistics for Civil Engineering	72	Boyles	CE
Fall 25	Undergrad	CE 321	Transportation Systems	84	Bhat	CE
Fall 25	Undergrad	CE 377K	Public Transportation Engineering	26	Machemehl	CE
Fall 25	Grad	CE 381D	Linear Regression and Discrete Choice Methods	10	Bhat	CE
Fall 25	Grad	CE 392C	Transportation Network Analysis	19	Boyles	CE
Fall 25	Grad	CE 392M	Public Transportation Engineering	10	Machemehl	CE

Fall 25	Grad	CRP 384	Transit Oriented Development	15	Zhang	CRP
Fall 25	Grad	CRP 384	Metro Transport Analysis Using TransCAD GIS	6	Zhang	CRP
Fall 25	Grad	CRP 386K	Intro Vis Comm/Geog Inf Sys Pl	33	Karner	CRP
University of Washington						
Winter 26	Undergrad	CEE410	Traffic Engineering	37	Ban	CEE
Fall 25	Grad	CET513	Transportation Networks and Optimization	13	Ban	CEE
Fall 25	Grad	CET512	Transportation Data Collection	20	Chen	CEE
Win 26	Grad	CET581	Transportation Demand Forecasting	6	Chen	CEE
Fall 25	Grad	CM 449	Construction Plan Reading and Estimating	19	Wu	CM
Winter 26	Grad	CET 521	Inferential Data Analysis for Engineers	17	MacKenzie	CEE
Winter 26	Grad	CET 565	Climate Change & Energy	19	MacKenzie	CEE

Notes: CEE = Civil and Environmental Engineering; CET = Civil, Environmental, and Transportation Engineering; CM = Construction Management; FIS = School for the Future of Innovation in Society; ISE = Industrial and Systems Engineering; SSEBE = School of Sustainable Engineering and the Built Environment; GSOE = Grove School of Engineering. *Enrollment number.

Over **100** students across all levels, along with postdoctoral scholars at TBD institutions, participated in TBD-related activities during the reporting period. Table 3 provides a list of graduate students and postdoctoral scholars *primarily* involved in these activities. During this period, several students from TBD institutions achieved significant academic milestones. Shing-Fu Kuo completed his Ph.D. at UT Austin in Fall 2025 and transitioned to a postdoctoral fellow position with Dr. Machemehl in January 2026. Ekin Ugurel completed his Ph.D. in Civil and Environmental Engineering at UW and started a postdoctoral position at New York University. Mohammed Zaid, a M.S. student at ASU, graduated in Fall 2025 and started working as an Assistant Research Technologist in March 2026.

Table 3. Students and Research Staff Engaged in TBD-Related Research and Education Activities

Name of Scholar	Level	Major/ Unit	Supervisor/ Advisor
Arizona State University			
Roberto Dimas Valle	PhD Student	SSEBE	Ram Pendyala
Fan Yu	PhD Student	SSEBE	Ram Pendyala
Victor O. Alhassan	PhD Student	SSEBE	Ram Pendyala
Jinghai Huo	PhD Student	SSEBE	Ram Pendyala
Miguel Rodriguez Ocana	PhD Student	SSEBE	Ram Pendyala
Fawzan Alfawzan	PhD Student	SSEBE	Ram Pendyala
Mohammed Zaid	MS Student	Information Technology	Ram Pendyala
Cal Poly Pomona			
Yichi Cheng	MS Student	Civil Engineering	Yongping Zhang
Daniel Nomura	MS Student	Civil Engineering	Yangsong Gu
Michelle Chen	MS Student	Civil Engineering	Wen Cheng
Jordan Syrilla	MS Student	Civil Engineering	Wen Cheng
Rafael Trinidad	MS Student	Computer Science	Yunsheng Wang
City College of New York			
Fateme Rezapour Fardin	PhD Student	Civil Engineering	Alison Conway
Shradha Ghodse	MS Student	Data Science	Alison Conway/Michael Grossberg
Nikhita Kannam	MS Student	Data Science	Mahdieh Allahviranloo
Bilal Abdulrahman	PhD Student	Computer Science	Zhigang Zhu /Alison Conway
Gong Qi Chen	PhD Student	Computer Science	Zhigang Zhu /Alison Conway
Bo Shang	PhD Student	Civil Engineering	Yiqiao Li
Faed Ahmed Arnob	PhD Student	Civil Engineering	Yiqiao Li
Matthew Grafals	MS Student	Data Science	Yiqiao Li
Weicong Feng	PhD Student	Computer Science	Jie Wei
Georgia Institute of Technology			
Chaeyeon Han	PhD Student	City and Regional Plan.	Subhrajit Guhathakurta
Sujin Lee	MS Student	Urban Analytics	Subhrajit Guhathakurta
Hojung Yu	MS Student	City and Regional Plan.	Rounaq Basu
Hajra Shahab	PhD Student	City and Regional Plan.	Rounaq Basu
Ilsu Kim	PhD Student	Civil and Env. Eng.	Patricia Mokhtarian
Seung-eun (Katy) Choi	PhD Student	Civil and Env. Eng.	Patricia Mokhtarian

Eliana Duarte	PhD Student	Civil and Env. Eng.	Patricia Mokhtarian
Rachael Panik	Postdoc	Civil and Env. Eng.	Patricia Mokhtarian
Viswa Sri Rupa Anne	PhD Student	Civil and Env. Eng.	Srinivas Peeta
Yuming Chang	PhD Student	Civil and Env. Eng.	Srinivas Peeta
Valentina Castaneda Torres	MS Student	Civil and Env. Eng.	Sofia Perez-Guzman
Meen-Sung Kim	PhD Student	ISyE	Sofia Perez-Guzman
University of Michigan			
Amy Fong	PhD Student	Civil and Env. Eng.	Atiyya Shaw
Ivan Shih	PhD Student	Civil and Env. Eng.	Atiyya Shaw
Sungho Lim	PhD Student	Civil and Env. Eng.	Atiyya Shaw
Brynn Woolley	PhD Student	Civil and Env. Eng.	Atiyya Shaw
Emily Youngs	PhD Student	Civil and Env. Eng.	Atiyya Shaw
Owen Schwartz	Undergrad	Civil and Env. Eng.	Atiyya Shaw
University of Texas at Austin			
Hyunjun Hwang	PhD Student	Civil Engineering	Chandra Bhat
Adeeba Naz	PhD Student	Civil Engineering	Chandra Bhat
Ifratul Hoque	PhD Student	Civil Engineering	Chandra Bhat
Dale Robbennolt	PhD Student	Civil Engineering	Chandra Bhat
Anna Beliveau	MS student	Civil Engineering	Chandra Bhat
Stella Boswell	MS student	Civil Engineering	Chandra Bhat
Carol Anne Starks	MS student	Civil Engineering	Chandra Bhat
Debojjal Bagchi	PhD student	Civil Engineering	Stephen Boyles
Kyle Bathgate	PhD student	Civil Engineering	Stephen Boyles
Jake Robbennolt	PhD student	Civil Engineering	Stephen Boyles
Shing-Fu Kuo*	PhD Student	Civil Engineering	Randy Machemehl
Yue Qi	PhD Student	Civil Engineering	Randy Machemehl
Seungwan Park	PhD Student	CRP	Ming Zhang
University of Washington			
Lyra Chen	Research scientist	Civil and Env. Eng.	Cynthia Chen
Donghun Son	Postdoc	Civil and Env. Eng.	Cynthia Chen
Ekin Ugurel	PhD student	Civil and Env. Eng.	Cynthia Chen
Yuteng Zhang	MS student	ISE	Cynthia Chen
Adam Schultz	MS student	Civil and Env. Eng.	Cynthia Chen
Chu Li	PhD student	CSE	Jon E. Froehlich
Jared Hwang	PhD student	CSE	Jon E. Froehlich
Mohammad Oshanreh	PhD student	Civil and Env. Eng.	Don MacKenzie
Zepu Wang	Ph.D. student	Civil and Env. Eng.	Jeff Ban
Yu-Chen Chu	Ph.D. student	URBDP	Lingzi Wu

What do you plan to do during the next reporting period to accomplish the goals?

In the next reporting period, active projects will continue to advance according to their proposed schedules, and the two flagship endeavors will proceed with major milestones. The THA survey data will continue to be extensively analyzed for the THA Survey, and a series of interactive data briefs summarizing key findings will be produced and disseminated. The TBD Hub will continue to grow with the release of additional data products (including the CARE Dashboard). Existing dashboards in the Hub will also be updated with the upcoming release of the ATUS 2025 dataset.

While detailed project-specific plans are provided in earlier sections for a sample of projects, several key activities are anticipated across the TBD project portfolio in the next reporting period. At the **University of Texas at Austin**, research teams will advance work on LLM-based synthetic travel behavior data generation, pedestrian crossing behavior using virtual reality simulations, and multimodal freight network resilience. Software codes for travel prediction will be released within the GAUSS software for public policy use. The TBD team at **Arizona State University** will deploy the National Household Vehicle Survey (NHVS), produce new interactive data briefs, finalize multiple journal submissions, and continue development of the CARE Dashboard to visualize survey findings on resilience and adaptive behaviors. Researchers at **The City College of New York** will extend the blockchain simulation framework through an agent-based modeling approach to simulate cryptocurrency adoption dynamics among diverse transit

users, and continue advancing pedestrian behavior analysis using vision-language models. The team at **Cal Poly Pomona** will continue development of LiDAR-based roadway monitoring and vehicle edge computing frameworks for real-time safety and infrastructure assessment. At **Georgia Tech**, the team will continue analyzing THA Survey data on attitudinal factors in travel behavior modeling, deploy a post-disaster mobility survey in Puerto Rico, and advance the NO-HEAT project on extreme heat impacts on active transportation. Dr. Mokhtarian will deliver a keynote at the World Transportation Convention in Tianjin, China (June 2026), and Dr. Perez-Guzman will deliver invited seminars at Rotterdam School of Management and Delft University of Technology (April 2026). At the **University of Michigan**, Dr. Shaw's team will continue advancing methodological frameworks for assessing travel survey representativeness and bias, and expand outreach through mentoring and undergraduate research engagement. At the **University of Washington**, the TBD team will extend dynamic graph neural network models for point-of-interest demand prediction using LBS data, continue real-time OD demand estimation using multimodal data, and advance wildfire evacuation preparedness modeling. The team will also continue engagement with planning partners such as the Puget Sound Regional Council (PSRC).

Across the Center, dissemination efforts will continue through publications, presentations, and outreach. TBD-supported papers accepted for presentation at the 17th edition of the World Conference on Transport Research (WCTR) will highlight the Center's research accomplishments and impact. In addition, TBD researchers will participate in international, national, and regional conferences, workshops, and professional events to further disseminate findings, strengthen collaborations within the transportation community, and help advance the nation's transportation priorities. A number of seminars/webinars is also planned for the next reporting period.

2. PARTICIPANTS & COLLABORATING ORGANIZATIONS

What organizations have been involved as partners?

- Arizona Department of Transportation (ADOT), Phoenix, Arizona: Collaborative research
- Army Corps of Engineers Coastal Hydraulics Laboratory, Vicksburg, MS: Datasets, collaboration, in-kind support
- California Department of Transportation (Caltrans) District 8: Co-advising of senior projects
- CCNY College-wide Research Vision (CRV) project: Collaborative research to perform research for urban scenes.
- CUNY Research Foundation: In-kind support, machine learning server infrastructure
- City of Peachtree Corners, Georgia: Transit ridership data, AV shuttle data, community engagement
- Commute Seattle and the Seattle Department of Transportation: Collaborative research
- Foothill Transit: In-kind support, panel discussion and hands-on activities for the Summer Transportation Institute
- Institute for Social Research Survey Methodology Program, Ann Arbor, MI: Collaboration and personnel exchanges
- Institute of Urban Science/Department of Transportation Engineering, University of Seoul, South Korea: Collaborative research
- King County Metro: Collaborative research
- Maricopa Associations of Government (MAG): Collaborative research
- Metropolitan Council, regional planning agency for the Twin Cities region, Minneapolis-St.Paul: Collaborative research
- Michigan Department of Transportation, Lansing, Michigan: Collaborative research and data sharing
- National Renewable Energy Laboratory (NREL), CO: In-kind support. access to their mobile application
- New York City Department of Transportation, NY: In-kind support, datasets, participation in a workshop
- Puget Sound Regional Council (PSRC): Collaborative research
- Seattle Department of Transportation: Collaborative research
- Sky Packets, New York, NY: Sensor Installation
- Southeast Michigan Council of Governments: Collaborative research and data sharing
- Technical University of Denmark: Collaborative research
- Texas Department of Transportation (TxDOT), Austin, TX: Collaborative research
- Town of Queen Creek, AZ: Collaborative research
- Urban and Regional Planning Department at the University of Michigan: Collaboration and personnel exchanges
- Women's Transportation Seminar-Los Angeles Chapter (WTS-LA): Co-hosted Girls' Empowerment Day

Have other collaborators or contacts been involved?

- Dr. Abdul R. Pinjari, Indian Institute of Science, India
- Dr. Sung Hoo Kim, Hanyang Univ, S. Korea
- Dr. Abolfazl Mohammadian, Univ of Illinois-Chicago, IL
- Dr. Sunghye Lee, University of Michigan, Ann Arbor, MI
- Dr. Baloka Belezamo, ADOT, Phoenix, AZ
- Dr. Sybil Derrible Univ of Illinois-Chicago, IL

- Dr. Basar Ozbilen, U. of California, Davis
- Dr. Bert van Wee, Delft University of Technology
- Dr. Brian German, Georgia Tech, Atlanta, GA
- Dr. Brian Lee, PSRC, Seattle, WA
- Dr. Deborah Salon, ASU, Tempe, AZ
- Dr. Diana Ramirez-Rios, University of New York at Buffalo
- Dr. Filipe Rodrigues, DTU, Copenhagen, DK
- Dr. Giovanni Circella, Ghent Univ, Belgium
- Dr. Jason Soria, Cintra
- Dr. Jinhua Zhao, Massachusetts Institute of Technology
- Dr. Joe Grengs, University of Michigan, Ann Arbor, MI
- Dr. Laurie Garrow, Georgia Tech, Atlanta, GA
- Dr. Maryam Hosseimi, UC Berkeley
- Dr. Mikhail Chester, ASU, Tempe, AZ
- Dr. Seungnam Kim, Chung-Ang University, S. Korea
- Dr. Steve Mooney, University of Washington
- Dr. Taehooie Kim, Maricopa, MAG, Phoenix, AZ
- Dr. Tassio Magassy, WSP USA
- Dr. Trilce Encarnación, U. of Missouri-St. Louis, MO
- Dr. Vivien Lim, National Univ of Singapore
- Dr. Xinyi Wang, MIT, Cambridge, MA
- Dr. Ying Chen, Northwestern U, Evanston, IL
- Dr. Yongsung Lee, U. of California, Davis
- Dr. Zihao Zhang, City College of New York, NY
- Brice Nichols, PSRC, WA
- Henry Quintin, Sky Packets, New York, NY
- Jason Collado, Caltrans District 8, San Bernardino, CA
- Joanne Lin, PSRC, Seattle, WA
- Justine Niu, Caltrans District 8, San Bernardino, CA
- Kerwin Trenard, MS, Haiti Community Representative
- Kurt Winner, Commute Seattle, WA
- Tianming Liu, U. of Michigan, Ann Arbor, MI

3. OUTPUTS

Publications, conference papers, and presentations:

Journal Publications: Papers Published Within Reporting Period

1. Alhassan, V.O., F. Yu, I. Batur, T.B. Magassy, J.R. Dimas Valle, D. Salon, C.R. Bhat, and R.M. Pendyala (2026). Investigating the Influence of Alternative Survey Participant Recruitment Strategies on Measurement and Inference of Mobility Patterns. *Data Science for Transportation*, 8, 10.
2. Batur, I., A. Mondal, V.O. Alhassan, K.E. Asmussen, C.R. Bhat, and R.M. Pendyala (2026). The Induced Demand Implications of Alternative Adoption Modalities of Automated Vehicles. *Transport Policy*, 175, 103879.
3. Bhat, C.R. (2026). A New Flexible Skewed Bimodal Distribution with Multivariate Extensions: Theory and Application to Traffic Crash Injury Severity Analysis. *Transportation Research Part B*, 204, 103364.
4. Bhat, C.R., A. Mondal, and A.R. Pinjari (2025). A Flexible Non-Normal Random Coefficient Multinomial Probit Model: Application to Investigating Commuter's Mode Choice Behavior in a Developing Economy Context. *TR Part B*, 195, 103186.
5. Chen, C.; Wang, R.; Bansal, P.; Chen*, L.; Ugurel*, E.; Zhang*, Y.; and Wu, X. (2026) From biases to opportunities: leveraging Location-Based-Service (LBS) data for next-generation transportation planning. *Transportation Research Part C*.
6. Chen, Z., Xu, Y. and Peeta, S. (2025). "Deep Learning-Based Travel Choice Prediction with Provable and Adaptable Fairness Guarantees," *Transportation Research, Part B: Methodological*, Vol. 200, ID 103318.
7. Choi, S.-E., I. Kim, X. Wang, J. Soria, and P. L. Mokhtarian (2026) How Has the Importance of Factors Influencing Telework Adoption Changed Over Time? Observing Pre- to Late-Pandemic Trends Using Multi-Year Data from Two US Regions. *Travel Behaviour & Society* 44, 101233.
8. Conway, A. (2025) (Invited). Aligning Urban Transportation Policies with the Modern Movement of Consumer Goods. *Journal of Critical Infrastructure Policy*, 2.
9. Conway, A., & Conway, M. (2026). The community impacts of ecommerce warehousing growth: A case study of Berks County, Pennsylvania, USA. *Research in Transportation Economics*, 101722.
10. Crocker, A. J., and S. D. Boyles (2025). Heuristic selection in disaster recovery sequencing. *Journal of Infrastructure Systems*, 31(3), 04025010.
11. Feng, G., Li, Y., Tok, A. Y. & Ritchie, S. G. (2025). Freight Rail Activity Inventory System using a Vision-based Deep Learning Framework. *Computer-Aided Civil and Infrastructure Engineering*.
12. Feng, G., Li, Y., Tok, A.Y.C. & Ritchie, S. G. (2026). Domain informed vision language model for sustainable freight with drayage truck powertrain and cargo classification. *npj. Sustain. Mobil. Transp.* 3, 15.
13. Giubergia, D., A.J. Haddad, F. Piras, C.R. Bhat, and I. Meloni (2025). Modeling Spatial and Social Interdependency Effects on Commuting Mode Choice. *Transportation Research Part A*, 196, 104474.
14. Guan, X.; Huang, S.; and Chen, C. (2025) Using Multiple Biased Datasets to Recover Missing Trips with a Behaviorally-informed Model, *Transportation Science*, published May 16.
15. Hwang, H., A.J. Haddad, and C.R. Bhat (2025). Multivariate Analysis of Frequency, Duration and Companionship in Walking Behaviors Among Adults Over 50. *Journal of Transport & Health*, 44, 102161.
16. Hwang, U., P. L. Mokhtarian, B. W. Koo, and S. Guhathakurta (2026) Perceived Streetscape Quality and Bike Lane Effectiveness: A Computer Vision Approach. *Transportation Research Part D* 154, 105248.
17. Jia*, G.; Ng*, K.; Ugurel*, E.; Lee, B.; Pendyala, R.; and Chen, C. (2025) COVID & telecommuting-induced changes in individual activity and travel patterns: evidence from the Puget Sound Region. *Transport Policy*. Vol. 173, November,
18. Khaloei, M., Oshanreh, M.M., Tu, Y., Gurumurthy, K., & MacKenzie, D. Automating ridehailing services would reduce pooling, especially among women. *Transportation Research Part A: Policy and Practice* 204, (104766), 1-23. (2025).
19. Kim, I. and P. L. Mokhtarian (2026) How Much Do Attitudinal Variables Improve Travel Demand Models? Evaluation Using an Overlap Sample from an Attitude-rich Survey and the 2017 National Household Travel Survey. *TR Part A*, 104998.

20. Kim, Ilsu, Yongsung Lee, Patricia L. Mokhtarian, and Giovanni Circella (2025) “How Will People Spend Travel Time in Autonomous Vehicles? A Four-Region Study Focusing on Heterogeneous Preferences”. *Transportation*.
21. Kim, S. H., X. Wang, and P. L. Mokhtarian (2026) Quantifying aggregate-level telework occasions and their impacts on vehicle-miles traveled in the US. *Technological Forecasting and Social Change* (in proof stage).
22. Kothawala, A., A.J. Haddad, P. Loa, Y. Lee, G. Circella, and C.R. Bhat (2025). Hybrid Workers' Activity Intensity: Post-Pandemic Comparison of Telework-Only and In-Person Workdays. *Transportation Research Record*.
23. Li, Y. and Zhang, M. 2026. Understanding the emerging interregional travel amid shifting societal and technological trends. *Travel Behavior and Society*, 42, 101133
24. Li, Y., He, X., Baldi, S., Levin, M.W., Peeta, S., Hu, X., and Zhao, H. (2026). “Preface for Feature Topic on Intelligent Transportation Systems,” *Automotive Innovation*.
25. Lieu, S. J., Koo, B. W., Hwang, U., & Guhathakurta, S. (2025). Automated detection and classification of bike lanes using multimodal imagery. *Remote Sensing Applications: Society and Environment*, 101817.
26. Liu, Y. and Peeta, S. (2025). “Human-Like Lane-Change Control Strategy for Connected and Autonomous Vehicles to Improve Interactions with Human-Driven Vehicles,” *Transportation Research, Part C: Emerging Technologies*, Vol. 177, ID 105211.
27. Ng, K.; Chen, C. and Jenelius, E. (2025) The 15-minute city around one's trajectory: Evaluating food accessibility for transit users in Stockholm, Sweden, *Journal of Transport Geography*, Volume 127, July 2025, 104283.
28. Ng, K.; Mishra, G.S.; Chen, C. (2025) Understanding access to restaurants through personas: A latent class approach integrating preferences and travel behavior, *Journal of Transport & Health*, Volume 44, 102135, ISSN 2214-1405.
29. Oshanreh, M.M., Khan, N.A., & MacKenzie, D. Propagating Synthetic Populations with Dynamic Bayesian Networks: A Framework for Long-Horizon Demographic Forecasting. *Travel Behaviour and Society* 43, (101226). (2026).
30. Ramakrishnan, G.A., K.K. Srinivasan, S. Saxena, A.R. Pinjari, C.R. Bhat, and R. Pendyala (2025). Exploring the Relationship between Mode Selection and Usage Frequency in Multi-Day Mode Choice Patterns for Commute Trips. *Current Science*.
31. Rezapour Fardin, F., Morvan-Chevestre, M. L., & Conway, A. (2026). How teleworking affects online shopping and home delivery: a joint modeling perspective from post-pandemic New York City. *TR Interdisciplinary Perspectives*.
32. Robbennolt, D., A. Beliveau, and C.R. Bhat (2025). An Investigation of Physical Participation Dissonance and Virtual Activity Participation in the United States. *Transportation Research Part A*, 201, 104696.
33. Robbennolt, D., A.J. Haddad, and C.R. Bhat (2026). A Rank-Based Model of Residential Location Preferences Before and During the COVID-19 Pandemic. *Transportation Research Part A*, 203, 104780.
34. Robbennolt, D., R.M. Pendyala, and C.R. Bhat (2026). Data Collection, Weighting, and Modeling Techniques to Estimate Consistent Population Parameters," *Transportation Research Part B*, 203, 103349.
35. Robbennolt, D., S. Hardman, J. Firestone, and C.R. Bhat (2025). A Model of Electric Vehicle Adoption and Motivating Reasons for Adoption. *Transportation Research Part D*, 146, 104906.
36. Robbennolt, J., D. Robbennolt, and S. D. Boyles (2025). Relaxed Singly Constrained Static Traffic Assignment Model with Elastic Demand: Application to Telework and Urban Development Scenarios in Austin, Texas. *TRR*.
37. Robbennolt, J., L. Xu, K. Bathgate, S. Pan, and S. D. Boyles (2025). Identifying critical locations for traffic monitoring devices during hurricane evacuations. *Journal of Infrastructure Systems*, 31(2), 04025006.
38. Shang, B., Li, Y. (2026). Roadside LiDAR for Cooperative Safety Auditing at Urban Intersections: Toward Trustworthy V2X Infrastructure Intelligence. The IEEE/CVF Conference on Computer Vision and Pattern Recognition DriveX Workshop.
39. Smith, B.V., D. Robbennolt, and C.R. Bhat (2025). An Evaluation of the Long-Term Effects of the COVID-19 Pandemic on Public Transit Use in the United States. *Transport Policy*, 169, 90-100.
40. Tejada, C., & Conway, A. (2025). An empirical approach to modeling online shopping and its effects on urban freight planning: The case of New York City. *Case Studies on Transport Policy*, 101473.
41. Tu, Y., Oshanreh, M.M., Khaloei, M., Khan, N.A., & MacKenzie, D. Effect of trip attributes on ridehailing driver trip request acceptance. *International Journal of Sustainable Transportation* 20(4), 362-373. (2026).
42. van Wee, Bert and Patricia Mokhtarian (2025) “A Meta-Theory for Travel-related Choices”. *Transportation Research Interdisciplinary Perspectives* 34, 101653.
43. Wang, Z., Oshanreh, M.M.¹, & MacKenzie, D. A Hybrid Temporal-Spatial Framework for Understanding Public EV Charging Usage Patterns: Evidence from Bay Area. *Sustainable Cities and Society* 136, (107052), 1-13. (2026).
44. Yang, Y., Li, X., Guo, Y., MacKenzie, D., Qian, X., & Liu, H. Understanding joint Travel-Charging decisions of battery electric vehicle users during typhoons. *Transportation Research Part D: Transport and Environment* 154, 1-28, (2026).
45. Zafri, N. M. and M. Zhang (2025). A novel integrated machine learning and inferential modeling approach to explore non-linear effects of built environment on travel: a three-wave repeated cross-sectional study. *Travel Behavior and Society*.
46. Zhang, M. 2025. Next-Gen TOD: Transforming transit oriented development to embrace new challenges and opportunities. *Urban Rail Transit*.
47. Zhu, T., S. D. Boyles, and A. Unnikrishnan (2025). Plug-In Hybrid Electric Vehicle Traveling-Salesman Problem with Drone. *Transportation Research Record: Journal of the Transportation Research Board*, 2679(3), 438-456.

Presentations Within Reporting Period

1. Fong, A.Z., and F.A. Shaw. *Evaluating Strategies to Improve Travel Survey Representativeness / Impacts of Survey Compensatory Strategies on Bias and Precision*. Presented at the 105th TRB Annual Meeting (2026).
2. Amy Z. Fong, F. Atiyya Shaw, "Who Makes Housing and Transport Trade-offs and What are the Consequences?", Association of Collegiate Schools of Planning (ACSP) 65th Annual Conference, Minneapolis, MN, United States of America, 10/2025

3. Aalami, S. and Peeta, S. (2026). "Balancing Vehicle Utilization and Service Quality in Autonomous Shuttles through Compensation Mechanisms," *105th Annual Meeting of the Transportation Research Board*, Washington, D.C., January 2026.
4. Anne, V.S.R., Y. Chang, and S. Peeta. Reinforcement Learning Based Framework to Design Behavioral Interventions to Improve Sustainability and Public Health. Presented at the INFORMS Annual Meeting, Atlanta, Georgia, 2025.
5. Arnob, F., Shang, B., Li, Y., 2026, Understanding Infrastructure-ADAS Interactions in Urban Crash Risk: A Multimodal AI Approach for Intersection Safety. Transportation Research Board 105th Annual Meeting.
6. Bagchi, D., K. Bathgate, S.D. Boyles, and M. Asborn, "A Dynamic Ultimate Capacity Framework for Seaport Systems," Transportation Research Board (TRB) Annual Meeting, Washington, DC, January 2026.
7. Basu, R. and Yu, H. (2026). Mobility Matters: Examining Exposure to Extreme Heat while Walking and Biking in Metro Boston. Presentation at the 105th Annual Meeting of the Transportation Research Board, Washington, DC, USA.
8. Basu, R., Shahab, H. and Sinha, S. (2026). Hot and Bothered: Exploring the Effect of Extreme Heat on Taxi and TNC Usage in New York City. Presentation at the 105th Annual Meeting of the Transportation Research Board, Washington, DC, USA.
9. Basu, R., Shahab, H., Sinha, S. and Abdallah, F. (2025). How Do People Adapt Their Multimodal Travel Behavior to Extreme Heat? Presentation at the 64th Annual Conference of the Association of Collegiate Schools of Planning, Minneapolis, MN.
10. Bathgate, K., D. Bagchi, S.D. Boyles, K. Mitchell, M. Asborn, and M. Kress, "Characterizing Anchorage Queue Dynamics Due to Channel Fog Closures at the Port of Houston," at the 105th TRB Annual Meeting, Washington, DC, January 2026.
11. Beliveau, A.E., A.J. Haddad, E.A. Podnar, D. Sharma, and C.R. Bhat. *Disparities in Pedestrian Crossing and Driver Yielding Behaviors*. Presented at TRB (2026), UT Austin Symposiums (2026), and invited seminar at NUS (2026).
12. Bhat, C.R., "A New Flexible Skewed Bimodal Distribution with Multivariate Extensions: Theory and Application to Traffic Crash Injury Severity Analysis," Transportation Research Board (TRB) Annual Meeting, Washington, DC, January 2026.
13. Bhat, C.R. *Behaviorally Grounded Ethics for Autonomous Mobility*. Presented at NC State (2025) and UT Austin GDA Symposium (2026).
14. Bhat, C.R. *How to Write a Paper and Respond to Reviewers*. Invited workshops at CTRG India (2025), NUS (2026), and University of Minnesota (2026).
15. Bhat, C.R., "Inaugural Address," Chief Guest, Young Professionals Conference (YPC), 8th Conference of the Transportation Research Group of India (CTRG 2025), Guwahati, India, December 2025.
16. Bhat, C.R., "Reasons for Residential Relocation: A Structuration Approach to Analyze Evolving Motivations in the Housing Market," Invited Seminar, Department of Civil, Environmental, and Geo- Engineering, University of Minnesota, Feb. 2026.
17. Bhat, C.R., E. Clower, A.J. Haddad, and J. Jones, "BHATLIB: A Modular GAUSS Library for Advanced Econometric Models," Transportation Research Board (TRB) Annual Meeting, Washington, DC, January 2026.
18. Brynn Woolley, Sungho Lim, F. Atiyya Shaw "The Effects of Completeness Filtering on Behavioral and Population Representativeness in Location-Based Services Data". 105th TRB Annual Meeting, Washington, DC, 01/2026
19. Chang, Y., Y. Liu, R. Yang, N. Moradloo, and S. Peeta. Uncertainty-Aware Large Language Models for Risk-Sensitive Motion Planning in Autonomous Driving. Presented at the INFORMS Annual Meeting, Atlanta, Georgia, 2025.
20. Chen, Y., S. Agrawal, I. Bedyk, and S. Peeta. Evaluating the Impacts of Mental Stress on Car-Following Performance Under CAV Cyberattacks in Mixed-Flow Traffic. Presented at the INFORMS Annual Meeting, Atlanta, Georgia, 2025.
21. Chen, L.; Chen, C. and Mooney, S. (2026) Impact of street repurposing on travel patterns in Seattle: a study using location-based service data. 105th annual meeting of Transportation Research Board, Washington DC.
22. Choi, S.E. and P. Mokhtarian. Understanding driverless taxi adoption and its impacts on travel behavior. Presented at the 65th Annual Conference of the American Collegiate Schools of Planning, Minneapolis, Minnesota, October 23-25, 2025.
23. Conway, A. (Keynote) E-Commerce Evolution and Its Implications for Transportation Planning and Infrastructure Design. Center for Transportation Studies Transportation Research, University of Minnesota, Minneapolis, November 6, 2025.
24. Conway, A. Measuring the Quality-of-Life Impacts of Goods Movement. Presentation to the Project Panel, TRB Consensus Study (TRB-CAAS-25-03), Online, March 27, 2026.
25. Conway, A. Operator Safety and Working Conditions for Urban Goods Movement in NYC. Research on the Road Conference, New York, November 20, 2025.
26. Ding, S., & Wu, L. (2025) "Spatial patterns of electric vehicle miles traveled (EVMT) as a proportion of total mobility" ACSP 2025 Annual Conference
27. Faghihinejad, F., and R.B. Machemehl, "A Multidisciplinary Framework for Assessing Public Transit Readiness in Smart City Integration: A Case Study of Austin, Texas," at the 105th TRB Annual Meeting, Washington, DC, January 2026.
28. Godse, S. Measuring the Last Mile: Data for Measuring Freight Activity on Local Streets. The 2026 TRB Annual Meeting.
29. Bhat, C.R., and A.J. Haddad. *The Reverse Side of Online Shopping: Determinants of Delivery Returns*. Presented at TRB (2026) and Northwestern University Seminar (2026).
30. Hwang, H., I. Batur, D. Robbennolt, A.J. Haddad, J.R. Dimas Valle, R.M. Pendyala, and C.R. Bhat, "A Tale of Two Perspectives: The Mileage-based User Fee Conundrum," at the 105th TRB Annual Meeting, Washington, DC, January 2026.
31. Hwang, H., I. Batur, F. Yu, D. Robbennolt, R.M. Pendyala, and C.R. Bhat, "Understanding Public Perceptions of Congestion Pricing – A U.S. Perspective," Transportation Research Board (TRB) Annual Meeting, Washington, DC, January 2026.
32. Kibria, G. and S. Peeta. Decomposition-Based Framework for Optimizing Transit Stop and Route Placement to Enhance Accessibility in Transit Deserts. Presented at the INFORMS Annual Meeting, Atlanta, Georgia, 2025.
33. Kibria, G., Anne, V.S.R., Xu, Y., Eluru, N., and Peeta, S. (2026). "Scalable Decomposition Approach for Joint Optimization of Transit Stops and Routes to Enhance Accessibility to Points of Interest," *105th TRB Annual Meeting*, January 2026.

34. Li, Y., Jie, W., Shang, B., Kamga, C., 2026, Few-Shot Learning for Truck Classification from LiDAR Sensor using Vision-language Models. Transportation Research Board 105th Annual Meeting.
35. Li, Y., M. Zhang, "Constructing Multi-Day Activity-Travel Patterns from Single-Day Data: A Clustering-Based Sampling Framework," Transportation Research Board (TRB) Annual Meeting, Washington, DC, January 2026.
36. Li, Y., Wei, J., Kamga, C., 2025, Investigating Vision-Language Model for Point Cloud-based Vehicle Classification. The IEEE/CVF Conference on Computer Vision and Pattern Recognition DriveX Workshop.
37. Liu, Y., and S. Peeta. *Human-like Lane-Change Control Strategy for CAVs*. Presented at INFORMS (2025) and TRB (2026).
38. Long, W., Li, Y., Jie, W., 2026, Bridging Human and Machine Perception of Urban Safety Using Multimodal Foundation Models. Transportation Research Board 105th Annual Meeting.
39. Mokhtarian, P. Keynote speaker: Is Teleworking an Environmentally Benign Arrangement, or Not? Annual Symposium of the Center for Sustainable Future Mobility, ETH Zurich, October 2, 2025, Zurich, Switzerland.
40. Mokhtarian, P. Webinar: How hybrid work is changing travel, talent, and the workplace: Insights for employers. Hosted by Atlanta Regional Commission Georgia Commute Options, October 30, 2025.
41. Oshanreh, M.M., Khan, N.A., & MacKenzie, D. Propagating Synthetic Populations with Dynamic Bayesian Networks: A Framework for Long-Horizon Demographic Forecasting. TRB Paper No. 26-00586. 105th TRB Annual Meeting. 2026.
42. Park, S. and Zhang, M. 2026. National Trends and Regional Variations in Time Use and Travel Distance across Work Modalities Before and After COVID-19. The 2026 Western Regional Science Association Annual Meeting, Santa Fe, NM.
43. Pérez-Guzmán S., Castaneda V. Empirical Investigation of Post-Disaster Travel Behavior to Points of Distribution of Relief. 2026 TRB Annual Meeting. Washington, DC. January 14, 2026.
44. R. Trinidad, M. Ly, Y. Cheng, Y. Wang, Y. Zhang, and W. Cheng, "Vehicle Edge Computing for Intelligent Transportation Systems (ITS)", Presented at the TRB Annual Meeting, Washington, D.C., January 11–15, 2026
45. R. Fardin, F. An Investigation of the Joint Relationships Between Personal Travel Choice, Home Delivery Frequencies, and Attitudes Toward Sustainability in the U.S. The 105th TRB Annual Meeting, Washington, DC, January 14, 2026.
46. Robbennolt, D., H. Hwang, A. Jaiswal, S. Verma, S. Chakrabarti, and C.R. Bhat, "Who is Willing to Pay for Travel Time Savings and How Much? An Iterative Bidding Contingent Valuation Study in Mumbai," TRB Annual Meeting.
47. Robbennolt, D., H. Hwang, M.G. Rodriguez Ocana, I. Batur, R.M. Pendyala, and C.R. Bhat, "Trapped by Transport: Exploring the Everyday Impact of Mobility Challenges and Transportation Insecurities in the United States," TRB Annual Meeting.
48. Robbennolt, D., J. Robbennolt, Z. Guo, S.D. Boyles, and C.R. Bhat, "Understanding Delivery Driver Order Acceptance: A Dynamic Discrete Choice Approach with Markov Decision Processes," The 2026 TRB Annual Meeting.
49. Robbennolt, D., R.M. Pendyala, and C.R. Bhat, Data Collection, "Weighting, and Modeling Techniques to Estimate Unbiased Population Parameters," Transportation Research Board (TRB) Annual Meeting, Washington, DC, January 2026.
50. Robbennolt, D., S. Hardman, J. Firestone, and C.R. Bhat, "A Model of Electric Vehicle Adoption and Motivating Reasons for Adoption," Transportation Research Board (TRB) Annual Meeting, Washington, DC, January 2026.
51. Robbennolt, J., D., Bagchi, and S.D. Boyles, "Dynamic Traffic Assignment with Uncertain Demand: A Localized Queue Spillback Approach," Transportation Research Board (TRB) Annual Meeting, Washington, DC, January 2026.
52. Robbennolt, J., S. Munira, and S.D. Boyles, "A Comparative Study of Spline-Based Trajectory Reconstruction Methods Across Varying Automatic Vehicle Location Data Densities," The 105th TRB Annual Meeting, Washington, DC, 2026.
53. Robbennolt, J., S. Munira, D. Lee, and S.D. Boyles, "A Practical Framework for Evaluating Transit Signal Priority Efficiency and Safety Using Automatic Vehicle Location and Transit Signal Priority Log Data," The 2026 TRB Annual Meeting.
54. Shang, B., Li, Y.*, Horbach, B. and Villon, K., 2026, Scalable Urban Truck Characterization using Deep Learning and Street View Imagery: A Drive-by Sensing Approach. Transportation Research Board 105th Annual Meeting.
55. Singh, R., Malarkey, D., & MacKenzie, D. Evaluating the Impact of E-Bike Purchase Incentives on Vehicle Travel via a Randomized Rebate Program. TRB Paper No. 26-03044. The 105th TRB Annual Meeting. January, 2026.
56. Singh, R., Malarkey, D., MacArthur, J., & MacKenzie, D. Effects of Washington State's E-Bike Subsidy Program on Automobile Travel and Greenhouse Gas Emissions. Behavior, Energy & Climate Change Conference. November 2025.
57. Singh, R., Quinn, C., & MacKenzie, D. Poor Reliability of Public Charging Stations Can Impede the Growth of the Electric Vehicle Market. Behavior, Energy & Climate Change Conference. Sacramento, CA. November, 2025.
58. Son, D. and Chen, C. (2026) Crowd-relay relief delivery system with the courier incentive scheme. 2026 TRB Annual Meeting.
59. Synn, S.H., Jones, B., Lieu, S. J., & Guhathakurta, S. Street-Level Transit Accessibility: Integrating Bus Stop Quality and Transit User Locations. Presented at the 65th Annual Conference of the Association of Collegiate Schools of Planning.
60. Ugurel, E.; Chen, C.; and Rodriguez, F. (2026) On predicting demographics from mobility signals. TRB Annual Meeting.
61. Ugurel*, E.; Wu, X.; Wang, Q.; Lee, B.; and Chen, C. (2026) Metropolitan Planning Organizations' Uses of and Needs for Big data. 105th annual meeting of Transportation Research Board, Washington DC.
62. Unnikrishnan, C., Ban, X., 2026. Quasi-sparsity in origin-destination trips. TRB Annual Meeting, 2026.
63. Wang, Z., Oshanreh, M.M., & MacKenzie, D. A Hybrid Temporal-Spatial Framework for Understanding Public EV Charging Usage Patterns: Evidence from Bay Area. Transportation Research Board 105th Annual Meeting. January, 2026.
64. Wu, L. "Building Resilient Transportation Systems for a Sustainable, Equitable, and Electrified Future," University of Alberta, AB, CA, Dec 4, 2025.
65. Xu, Y., Z. Chen, and S. Peeta. Fusing Federated Learning and Knowledge Distillation for Fair Travel Choice Prediction. Presented at the INFORMS Annual Meeting, Atlanta, Georgia, 2025.
66. Yang, R., Y. Liu, and S. Peeta. Modeling the Fundamental Diagram in Pure CAV Multi-String Traffic Environment with Lane-Changing Considerations. Presented at the INFORMS Annual Meeting, Atlanta, Georgia, 2025.

67. Yang, Y., Li, X., Guo, Y., MacKenzie, D., Qian, X., & Liu, H. Joint Adaptations of Battery Electric Vehicle Users under Typhoon Threats: A Two- Stage Analysis Framework. Transportation Research Board 105th Annual Meeting. January, 2026.
68. Yang, Y., Li, X., MacKenzie, D., Guo, Y., & Qian, X. Understanding Adaptive Charging–Travel Strategies of BEV Users: A Mixed Logit Analysis with Latent Psychological Constructs. The 105th TRB Annual Meeting. January, 2026.
69. Yang, Y., Li, X., MacKenzie, D., Guo, Y., Qian, X., & Zhong, M. Weather-Aware Grid-Level Forecasting of BEV Charging Demand: An Interpretable Machine Learning Framework. The 105th TRB Annual Meeting. January, 2026.
70. Yichi Cheng, Wen Cheng, Yongping Zhang, Yunsheng Wang, and Wenxi Zhao, “Enhancing OC-SORT for Robust Multi-Object Tracking in Urban Traffic Scenes”. The 105th TRB Annual Meeting, Washington, D.C., January 11–15, 2026

Other Publications Within Reporting Period

1. Rohit Malshe, Mahdiah Allahviranloo, Chinmoy Mohapatra, Enhanced Bath Computing Architecture And Technique for Consensus Planning for Large-Scale Supply Chains, Patent No. US12,499,399 B1. Dec 16, 2025.

Website(s) or other Internet site(s)

One of the center’s significant products is the TBD [website](#), which serves as a central hub for all information related to the Center’s objectives and activities. The website includes dedicated sections for [research projects](#), along with detailed descriptions, updates, and reports. It also houses [data products](#) and [software and tools](#) developed by TBD researchers. Additionally, the site provides a platform for sharing [policy briefs](#), as well as disseminating TBD [events](#) and [news](#) to a global audience. Similar to previous reporting periods, the TBD website has been consistently maintained to reflect developments in TBD’s research, technology transfer, education, workforce development, and outreach activities. The Project #5 team also maintains an affiliated [web page](#) through the ASU Future of Being Human initiative to document and promote project outputs, including articles, podcasts, and media engagements.

Technologies or Techniques (software codes and products)

As noted in prior progress reports, the TBD team at ASU has been heavily involved in the development and application of open-source tools that reflect model outputs of the TBD projects. In previous reporting periods, the ASU team developed and released the **Time Use, Travel, and Telework Dashboard (T3D)** and **The Mobility Dashboard (TMD)**, both designed to provide insights into travel, time use, and telework patterns captured in the American Time Use Survey (ATUS). During this reporting period, both dashboards were enhanced with a new sample composition analysis capability, enabling users to examine the demographic characteristics of ATUS respondents across all survey years. The team also maintains and periodically updates two additional open-source tools: the **synthetic population generator software PopGen** and the **Wellbeing Estimator for Activities and Travel (WBEAT)** Dashboard. Together, T3D, TMD, and WBEAT have reached nearly 10,000 users since their releases. In the next reporting period, the 2025 ATUS data will be integrated into all three dashboards. R and Python code developed as part of TBD’s transportation model estimation, implementation efforts, and data fusion procedures continue to be documented in publications and shared publicly through repositories such as the ASU team’s GitHub [page](#). At the University of Texas at Austin, researchers developed BHATLIB, an open-source code library as a supplement to the GAUSS matrix programming language, which was presented at the 105th TRB Annual Meeting and publicly released during this reporting period.

Furthermore, the TBD team at the University of Washington continues to maintain and enhance the **Mobility Analysis Workflow (MAW)** tool by adding functions to detect travel modes and infer home and work locations at the census block group level. The MAW tool is publicly available on [GitHub](#) with detailed documentation. Additionally, the team maintains a public [dashboard](#), which was developed in previous reporting periods using NREL OpenPATH data that displays travel metrics such as trip counts, trip lengths, and trip purposes over time. The **Project #44** team at UW has also developed and released an open-source **computer vision (CV) pipeline** for disability parking recognition, available on GitHub at [AccessParkCV](#). Moreover, the TBD team at the UT Austin has developed a prototype open-source port simulation model in Python, which will be made publicly available as an outcome of their [project](#).

Databases and Research Materials

In a number of TBD projects, integrated datasets have been developed (or are under development), using data fusion techniques to study the impact of attitudes on different transportation-related choices such as

residential location choice, mode choice, vehicle ownership, and adoption of emerging mobility services and technologies. While some of the datasets are based on native survey data collection efforts undertaken by the TBD team, others have been assembled by integrating and fusing data that is already available in the public domain. All datasets assembled by TBD are being made publicly available (without personally identifiable information) via the TBD website. In the meantime, findings from the surveys have been disseminated to the community through webinars, research papers, and interactive data briefs. Also, many TBD publications include applicable model specifications that can be used by practitioners to better model the recent changes in traveler behavior and values.

A few specific instances of database and research materials development are as follows. The TBD team at GT has published several datasets called ASPED (Audio Sensing for Pedestrian Detection), a compilation of large-scale audio and video data prepared for pedestrian detection. ASPED consists of almost 2,600 hours of audio, more than 3.4 million continuous frames in video, and corresponding annotation of pedestrian count for each. More information is available [here](#), [here](#), and [here](#). Project #44 team at the University of Washington publicly hosts its training dataset on [Hugging Face](#), corresponding to their open-source computer vision pipeline for disability parking recognition. Finally, Table 4 provides a summary of the TBD metrics on software/data/models and the number of journal publications.

Table 4. TBD Metrics on Products

Metric	Annual Target	Previous Period	This Period	Annual Total	Assessment
Number of software/data/models	2	3	2	5	Datasets are being cleaned, weighted, and documented. The codes are in beta versions.
Number of journal publications	25	22	47	69	Greatly exceeded the annual target.

4. OUTCOMES

During this reporting period, the TBD Center made substantial progress across multiple fronts, advancing transportation knowledge, improving analytical methods, developing new research tools, and contributing to the education and development of the next generation of transportation professionals. TBD projects expanded understanding of key transportation issues with direct implications for policy and practice.

Some key examples are as follows. At **ASU**, outcomes centered on enhancing the Center's data infrastructure and policy relevance. Both T3D and TMD were enhanced with a new sample composition analysis capability, enabling users to examine the demographic characteristics of ATUS respondents across all survey years. These dashboards have reached nearly 10,000 users since their release, providing planners, researchers, and policymakers with up-to-date insights into time use, travel, telework, and wellbeing. The ASU team also published a technical brief that presents a detailed synthesis of national surveys, providing key insights to aid planners and policymakers in navigating post-pandemic travel demand uncertainty. At **CCNY**, key outcomes included new behavioral evidence linking demographic, household, and built-environment factors to home delivery demand using THA Wave 1 data, a successful demonstration of blockchain's potential to enable secure, transparent, and interoperable mobility payment systems across multiple modes, and advances in Vision-Language Model applications for context-aware urban safety analysis. At **CPP**, the development of LiDAR-based roadway monitoring and vehicle edge computing frameworks demonstrated practical applications of artificial intelligence and real-time analytics for system performance and safety management, resulting in two TRB presentations and an invited talk. At **GT**, research advanced the integration of attitudinal factors into travel demand models, demonstrating that including as few as four attitudinal items in household travel surveys can meaningfully improve model performance, offering a feasible path toward enhancing regional travel demand forecasting models. The GT team also focused on behavioral interventions and emerging mobility solutions that promote multimodal travel. At **UM**, projects generated methodological advances in assessing travel survey representativeness and bias, offering agencies guidance to enhance data quality and reduce inefficiencies in survey deployment. At **UT**, research outcomes spanned multiple domains of national significance. Insights from the THA Survey advanced understanding of contemporary transportation issues, including congestion

pricing fairness, public perceptions of the mileage-based fee concept, transportation insecurity, and household vehicle fleet evolution. Other projects contributed to improved understanding of port resilience to weather disruptions, generating actionable findings for freight operations and network recovery. The BHATLIB open-source code library for the GAUSS matrix programming language was also publicly released, providing a new tool for transportation researchers and practitioners. At UW, outcomes focused on open-source data tools and human-centered analytics. The UW team released an open-source computer vision pipeline for automated disability parking recognition, with a publicly available training dataset.

Overall, the TBD Center continued to play a national leadership role in shaping discussions on travel behavior, emerging technologies, and data-driven decision-making – advancing topics at the forefront of the nation’s transportation research agenda and aligned with the U.S. DOT’s priorities. The Center’s commitment to open science and workforce development remained strong, with undergraduate, graduate, and postdoctoral researchers across partner institutions actively engaged in data analysis, model development, dashboard design, and dissemination activities. Through the release and maintenance of open-source tools, dashboards, and curated datasets, TBD continued to democratize access to transportation data and strengthen collaboration across academia, government, and industry. Collectively, these efforts underscore the Center’s ongoing role in informing policy, enhancing behavioral understanding, and preparing the next generation of transportation professionals to address the nation’s mobility challenges.

5. IMPACTS

What is the impact on the effectiveness of the transportation system?

TBD’s research activities have generated significant insights and tools that are enhancing the operations and effectiveness of the transportation system. The TBD Hub has expanded access to critical national datasets through open, interactive dashboards such as T3D and TMD, which now include a new sample composition analysis capability enabling users to examine the demographic characteristics of ATUS respondents across all survey years. These platforms provide policymakers, planners, and researchers with user-friendly tools to monitor evolving trends in time use, travel, telework, and wellbeing, thereby supporting more informed, data-driven decisions. The second wave of the THA Survey has further expanded the Center’s nationally representative dataset capturing changing attitudes, values, and behaviors, offering insights to guide investment and policy strategies. At the University of Michigan, projects on travel survey representativeness and location-based services (LBS) data quality have direct implications for the data used in modeling and forecasting. Findings on sample design are expected to reduce bias and improve the precision of travel datasets, while research on LBS data quality has the potential to enable the use of passive data to expand the datasets available for transportation planning and forecasting. In addition, several TBD projects have demonstrated system-level applications of emerging technologies and analytical methods. Research on vehicle edge computing and LiDAR-based roadway monitoring has advanced the use of AI for real-time safety and infrastructure assessment, while blockchain simulation research has shown the potential for secure, transparent mobility payment systems. Other studies have explored port resilience to weather disruptions, telecommuting’s influence on transit and delivery demand, and attitudinal integration in travel demand modeling, all of which contribute to improving planning, forecasting, and management strategies. These outcomes are strengthening the nation’s capacity to anticipate behavioral shifts, optimize operations, and plan for a more adaptive, resilient, and efficient transportation future.

What is the impact of technology transfer on industry and government entities, on the adoption of new practices, or on research outcomes which have led to initiating a start-up company?

TBD’s research outcomes continue to influence industry practices and government applications across survey design, data sharing, policy development, and system management. The **TBD Hub**, which hosts open dashboards such as T3D and TMD, has become a valuable resource for planners, policymakers, and researchers seeking actionable insights on national time use, travel, telework, and wellbeing trends. By democratizing access to integrated datasets and models, the Hub supports evidence-based decision-making and strengthens collaboration across agencies and institutions. In addition, the standardized attitudinal

components developed for the **THA Survey** have been adopted in major data collection efforts, including the Georgia add-on to the NextGen National Household Travel Survey (NHTS) and the Puget Sound Regional Household Travel Survey, ensuring that future regional travel models will better integrate behavioral and attitudinal factors. Several TBD projects also demonstrated significant technology transfer and practical application. **Project #14** produced a comprehensive resource to help agencies identify available freight data sources, evaluate their usefulness for specific local applications, and identify potential machine learning and generative AI approaches to address data gaps – serving both agencies that lack internal freight data expertise and data providers seeking to improve their products. **Project #17** demonstrated that decentralized blockchain payment systems can process multi-provider transportation transactions with full reliability, transparent pricing, and automatic cross-provider discounts, providing a blueprint for how transit agencies could implement unified payment systems that enhance transparency and eliminate single points of failure. **Project #32** advanced behavioral intervention tools that promote sustainable travel through app-based systems integrating trip tracking, gamification, and targeted messaging. Overall, these initiatives demonstrate TBD's growing role in bridging research and practice by translating academic insights into data tools, policy guidance, and applied methods that enhance transportation planning and management capabilities nationwide.

What is the impact on the body of scientific knowledge?

TBD's research is making important contributions to advancing the body of scientific knowledge in travel behavior, travel demand, urban analytics, and mobility systems research. Through the **TBD Hub**, which integrates multiple large-scale national datasets such as ATUS, NHTS, ACS, CES, and VIUS into a unified suite of open dashboards, the Center has established a new model for democratizing access to comprehensive travel behavior and mobility data. Each dashboard independently processes, analyzes, and visualizes specific aspects of these datasets, providing tools to explore patterns in time use, travel behaviors, household transportation expenditures, socio-demographic characteristics, and freight movements. Complementary to these efforts, the **THA Survey** continues to produce fresh empirical evidence on evolving post-pandemic trends in travel behaviors, attitudes and values, and accessibility patterns across diverse population groups. As such, these initiatives are strengthening the empirical and analytical foundations needed to understand contemporary transportation challenges and opportunities. By making these resources publicly accessible, TBD supports interdisciplinary research that advances understanding of accessibility, travel behavior dynamics, and system efficiency, laying a stronger foundation for improved demand modeling, infrastructure investment decisions, and evidence-based policy development.

Beyond these flagship initiatives, research conducted across TBD institutions has advanced theoretical and methodological frontiers in several areas. Recent work has expanded the application of artificial intelligence and data fusion techniques in transportation modeling, developed new frameworks to assess how remote work influences accessibility and mode choice, and refined approaches for incorporating attitudinal and behavioral data into traditional travel demand models. In addition, novel analytical frameworks have also been introduced to better understand logistics system resilience, particularly regarding how frequent yet understudied disruptions such as fog closures affect port operations and vessel queuing. These insights contribute to filling critical knowledge gaps in the literature and improving the broader understanding of transportation system resilience and reliability. Finally, Table 6 provides TBD metrics on the Center's broader impacts, including the number of new agencies adopting TBD data and tools, as well as Google Scholar citation counts for all publications by core researchers from 2023 to date.

Table 6. TBD Metrics on Impacts

Metric	2023	2024	2025	2026 (+)	Total
Number of new agencies adopting TBD data/tools	0	2	2	1	5
Citations of TBD Publications (Google Scholar)	8,100	8,661	8,435	2,791	28,187

What is the impact on transportation workforce development?

TBD has continued to play a vital role in developing the future transportation workforce by providing students and early-career researchers with meaningful, hands-on research and training opportunities. Across consortium universities, undergraduate and graduate students have engaged in a wide range of activities – from survey design and data collection to artificial intelligence applications, dashboard development, and GPS mobility analysis. During this reporting period, over 100 students across all levels were engaged in TBD-related research activities, receiving training in high-demand areas including travel behavior modeling, machine learning, data science and analytics, and transportation systems planning. At CCNY, interdisciplinary collaboration has proven particularly impactful, with three students who began as data and computer science researchers now pursuing PhD in Transportation Engineering. Students and researchers also benefited from collaborations with planning agencies and industry partners, ensuring that their training is grounded in real-world practice and aligned with national transportation priorities. Furthermore, through webinars, workshops, internships, and agency collaborations, TBD has created a pipeline of early-career transportation researchers and practitioners, emphasizing interdisciplinary thinking, technical skills, and expertise in behavioral modeling, system performance, and accessibility analysis. Multiple students supported by the TBD Center received national awards and presented their work at major venues such as the 105th TRB Annual Meeting, ACSP Annual Conference, and the INFORMS Annual Meeting, demonstrating the Center's strong impact on shaping future transportation leaders.

6. CHANGES/PROBLEMS

Changes in approach and reasons for change

Nothing to report.

Actual or anticipated problems or delays and actions or plans to resolve them

The final report for Project #14 was previously expected to be submitted in January 2026. Preparation took longer than anticipated due to the effort required to properly structure the report for usability and remove redundancies between chapters, compounded by the simultaneous start of the Phase 2 project. The internal draft is now complete and will be finalized and submitted to the TBD Center by May 2026.

Changes that have a significant impact on expenditures

In December 2025, the Research Foundation of CUNY transitioned to a new research management system ahead of schedule, resulting in a steep learning curve for faculty and administrative staff. While technical research progress has not been significantly affected, processing times for administrative tasks have slowed, causing some lag in project spending. This is not expected to have any long-term impact on project costs.

Significant changes in use or care of human subjects, vertebrate animals, and/or biohazards

Nothing to report.

Change of primary performance site location from that originally proposed

Nothing to report.