
Program Progress Performance Report for University Transportation Center at
Johns Hopkins University

Submitted to U.S. Department of Transportation
Office of the Assistant Secretary for Research and
Technology (OST-R)

Grant Number: 69A3552348325

Project Title: **Center for Climate-Smart Transportation (CCST)**
Consortia member:

- Diné College, Tsaile, AZ 86556
- Massachusetts Institute of Technology, Cambridge,
MA 02139
- Morgan State University, Baltimore, MD 21251
- University of Texas at Austin, Austin, TX 78712
- University of Utah, Salt Lake City, UT 84112

Program Director: Shima Hamidi, Ph.D
Bloomberg Assistant Professor, Johns Hopkins University
Director, Center for Climate-Smart Transportation (CCST)
Phone: 801-809-3569
Email: Shamidi2@jhu.edu

Submitting Official: Same as above

Submission Date: April 30, 2024


DUNS Number: 001910777
EIN Number: 52-0595110

Recipient Organization: Johns Hopkins University

Grant Period: June 1st, 2023 - May 31th, 2028

Reporting Period End Date: March 31, 2024

Report Term: Semi-annual

Signature: 

1. **ACCOMPLISHMENTS:** What was done? What was learned?

What are the major goals and objectives of the program?

MISSION:

The Center for Climate-Smart Transportation (CCST) is a consortium of 6 universities including Diné College, Massachusetts Institute of Technology(MIT), Morgan State University(MSU), University of Texas at Austin(UT), University of Utah (UU) and led by Johns Hopkins University(JHU). CCST's proposed research, education, leadership and technology transfer programs and activities are inspired by the urgent call for an evidence-based research agenda that goes beyond scientific merits, focuses on solutions and is practice-ready and would result in changes in transportation policy and practice, making climate change the center of transportation decisions as emphasized in the USDOT Strategic Plan Goals and the USDOT Climate Adaptation and Resilience Plan. CCST contributes to this mission in the following focus areas:

CATEGORY #1: Research

GOAL 1: CCST PROPOSES MULTIDISCIPLINARY RESEARCH IN FIVE BROAD AREAS:

Focus Area 1: Promoting Climate Culture in All Levels of Transportation Decisions by focusing evidence-based research agenda that goes beyond scientific merits, focuses on solutions and is practice-ready and would result in changes in transportation policy and practice.

Focus Area 2: Community-Centered Solutions to Environmental Justice by empowering communities to undertake their own investigations and actively engage in actions and decision-making.

Focus Area 3: Accelerating the Mass Market Adoption of EVs & Alternative Fuels to make transportation sector as one of the biggest contributors to VMT/GHG emission.

Focus Area 4: VMT & GHG Reduction via Modal Shift and Changes in Travel Behavior by expanding the policy-oriented efforts in public transit use, promote practices toward climate-responsible urban development to reduce VMT/GHG emission.

Focus Area 5: Smart Cities & Innovative Adaptation and Mitigation Technologies by developing and implementing a sustainable, scalable, and transferrable method for collaborating with communities to co-create solutions that meet their needs and align with their values.

GOAL 2: COMPETITIVE, PEER REVIEW PROJECT SELECTION PROCESS

- CCST projects for the year 2-5 are selected through a Request for Proposals (RFP) process. (First year projects are selected based on initial grant proposal.)
- RFPs are open to faculty at member insinuations. All faculty members, postdocs and research associates are eligible to submit research, education and technology transfer project proposals responding to CCST RFPs.
- Proposal evaluation and selection process are based on external peer review and rely on the expertise of practitioners and researchers nationally.

GOAL 3: DIVERSE RESEARCH GRANT CATEGORIES

- *RFP process:* CCST will prioritize projects are multidisciplinary and multimodal and promotes diversity and inclusion through the CCST RFP. Projects that are solutions-

based and practice-ready and would make impactful changes on transportation practice and policy.

- Projects that focus on diversity and equity
- Projects that involve underrepresented students
- Projects that involve untenured junior faculty
- Projects that involve researchers from multiple disciplines & universities
- Projects that involve faculty and students from our two Minority Institutions
- *High Impact Project(s): From Research to Policy and Practice:* CCST will a part of its budget per year to build upon the previous cutting- edge research of consortium members to transform them into actionable outcomes for practitioners in partnership with transportation agencies, local governments, private sector and non-profit community organizations. Each project should demonstrate practice-readiness and should have at least three non-academic partners. The high-impact projects will go through our peer review process, and we expect to fund 2-3 practice- ready projects per year in this category.

GOAL 4: ENHANCE COLLABORATIVE RESEARCH & PARTNERSHIP OPPORTUNITIES

- *External Advisory Board:* The Advisory Board will help CCST to identify transformative research topics, to define CCST's annual plan and strategies and to connect with appropriate partners.
- *Project Stakeholders and Partners:* As part of RFP package, CCST requests each PI to establish two partnering relationships with local, state or national organizations to implement the project results.
- *Diverse Internal Collaborations:* CCST encourages Multi-modal, multi- disciplinary and multi-university collaborations across disciplines and our areas of research covers expertise from engineering, planning, public policy, business, social science and big data.

CATEGORY #2: Education and Workforce Development

CCST's education and workforce development goals are centered around the creation of pre-college, undergraduate and graduate programs and professional development learning opportunities.

GOAL 1: ATTRACT AND EDUCATE PRE-COLLEGE STUDENTS

- *Sustainable Energy Education Program:* CCST will develop a nation-wide online course on sustainable energy education. It will host high school students for a summer course to train them on sustainable energy solutions to climate change, educational opportunities, and career paths.
- *COMTO Minority Initiative:* CCST will partner with the Maryland Conference of Minority Transportation Officials (COMTO) on a scholarship program to provide mentorship and introduction to STEM education.

GOAL 2: ATTRACT AND EDUCATE UNDERGRADUATE AND GRADUATE

STUDENTS: CCST is committed to enhance educational programs in Climate-Smart Transportation by designing and offering the following courses/programs:

- *Climate and Transportation Leaders Training:* CCST will develop a set of training opportunities on *Climate and Transportation Leadership* which will be open to undergraduate and graduate students of all majors.

- *Graduate Concentration in Citizen Science and Environmental Justice (CSEJ)*: This track will be offered to graduate students in transportation-related degrees within our consortium with the goal to train future transportation workforce with novel tools and approaches designed for empowering minority communities to actively participate in decision-making.
- *Energy Minor for Undergraduate Students*: CCST plan to create a new course on Clean Energy and Transportation: Opportunities and Challenges which will be integrated into the Energy Minor at Johns Hopkins University.
- *Undergraduate Experiential Learning Program*: In collaboration with center for Community Health (CHARMED) at JHU, CCST seeks to promote opportunities for undergraduate students to involve in research in transportation and climate change with CCST-funded research projects.

GOAL 3: PROVIDE RESEARCH OPPORTUNITIES TO UNDERGRADUATE AND GRADUATE STUDENTS:

- *Experiential Training Opportunities through Students' Involvement in Research Projects*: CCST requires research projects to include undergraduate and graduate students and offer training opportunities for research in transportation and climate change with the goal of expanding the workforce pool and diversity of new professionals.
- *Student Competitions, Fellowship and Scholarship Programs*: To demonstrate our commitment to the ongoing education for students, CCST will offer competitive scholarships, fellowships, assistantships and awards to attract students, especially those from underrepresented populations, as following:
 - *Climate Change and Transportation Competition*
 - *Environmental Justice Scholarship*
 - *Student-led Publications and Presentations*

GOAL 4: PROFESSIONAL DEVELOPMENT OPPORTUNITIES

- *CCST Net-Zero Emission Academy (NEA)*: CCST will develop and implement a virtual academy, tailored particularly for local government transportation leaders and decision-makers. Our curriculum will cover a range of topics from best practices of paths to next-zero emission, innovative technologies, equity considerations and effective policy interventions.
- *Data for Environmental Justice Workshop*: CCST will offer a day-long virtual workshop particularly designed for transportation staff to build data-driven public sector that fairly and justly uses data, research and analytics to better understand the complex nature of environmental justice challenges and implement policy interventions that lead to equitable outcomes.

GOAL 5: PROMOTE EDUCATIONAL DIVERSITY BY PROVIDING EDUCATIONAL OPPORTUNITIES FOR MINORITY STUDENTS. CCST is committed to offering opportunities for underrepresented students and researchers in all its educational, research and scholarship programs including:

- *Indigenous Communities Educational Initiative*: CCST recognizes the extreme gap in education and workforce training opportunities for Tribal communities and, in partnership with Dine College, is particularly committed to support educational and workforce development activities for this population group.

CATEGORY #3: Engagement and Technology Transfer

GOAL 1: REGULAR DISSEMINATION OF INFORMATION FOR CCST PROGRAMS, EVENTS AND NEWS:

- CCST Website and social media will be principal communication channels to both disseminate the research news and an online host for the news outlets to share CCST news with the broader audience.
- *CCST Subscription and Email Pipeline*: CCST research, news, events and updates are publicly accessible through subscription. CCST will send a quarterly e-newsletter to a list of recipients to drive interest and awareness in the center's programs.
- *YouTube Channels*: CCST YouTube channels also make CCST's recorded events, webinars, and other educational programs publicly accessible.

GOAL 2: EFFECTIVE DISSEMINATION AND IMPLEMENTATION OF EACH RESEARCH PROJECT

- *Two-Page Policy Briefs*: Each project is required to produce a plain-language research brief written for decision- and policy makers.
- *Implementation plan*: CCST research proposals will identify a strategy for implementing their outcomes and/or research findings.
- *Webinar Series*: CCST projects are required to present a webinar session upon completion of the projects
- *Partnership Development*: CCST establishes extensive partnerships with a number of local/ regional and national organizations/communities to implement the results of each project's funding. Table 1 provides an overview of the partnerships initiated in the current reporting period.

What was accomplished under these goals?

Administrative Tasks

- Created and maintained a CCST listserv including associate directors, PIs, researchers, advisory board, and student representatives from members of CCST consortium universities to communicate announcements, news, and updates.
- Forming the CCST Advisory Board with nominations from the Executive Committee to represent diverse regions and disciplines within the consortium.
- Forming the CCST student leadership committee by inviting student representative from each member institute and arranging 3 meetings to discuss and identify plans for transportation and climate related student group activities.
- CCST Director and Associate Director attended the 2024 CUTC Winter Meeting and discussed collaborations with other UTCs.
- Data management Plan for each research project was drafted, reviewed, and approved.
- Created an online platform for the submission of progress reports and other deliverables by PIs of member universities. So far, two quarterly progress reports have been submitted in the system for each research projects.
- Completing the award notifications for projects that were not awarded in the previous reporting period.
- Held regular monthly meetings with the associate directors (members of the Executive Committee) to provide updates, receive feedback and discuss upcoming opportunities.
- Finalized the job description, got internal required approvals to hire a full-time postdoc associate for the Center.
- Expanded the subject-based Peer Review Database for second year review process with input from Executive Committee as well as scholarly and professional community.

- Monthly meetings took place with the Director of the Office of Grants and Contracts at JHU pertaining to research and fellowship grants.
- CCST Year 2 budget was prepared and approved by the USDOT in collaboration with all consortium members.
- All CCST 1st year approved projects were submitted in the TRB Research in Progress database

Research

YEAR 1 Research Project Updates:

- 2023_01: Climate Change Adaptation for Active Transportation: What Are American Cities Doing? (Lead: U of Utah):
Collected the transportation, climate action, and urban forestry plans for the largest 100 cities in the U.S.: almost done with the analysis of the plans focusing on climate adaptation for active transportation and conducting content analysis of that text. In addition, the team interviewed 13 (and scheduled 4 more interviews) with professionals working on climate adaptation for active transportation, transcribed the interview recordings, and analyzed those transcripts.
- 2023_02: Predicting the impacts of mixed-use development on vehicle miles travelled. (Lead: U of Utah):
Collected details of new MXDs from 4 of the proposed 7 regions (Bakersfield, Fresno, Los Angeles, San Francisco, Sacramento), totaling 46 new MXDs. Working on developing the GIS analysis to estimate the set of D-variables to be used in modeling. In addition, the team developed a preliminary VMT-based model using the existing 622 region dataset to establish the code for modeling, perform covariate selection and develop the validation framework.
- 2023_03: The 15-Minute City Quantified Using Mobility Data (Lead: MIT):
Completed data curation, formal analysis, robustness checks, and validation exercises. Additionally, the research team drafted and published results in the prestigious Nature Human Behavior interdisciplinary journal, showcasing the significance of findings in the academic community.
- 2023_04: A Granular Characterization of Mobility-Related Air Pollution Exposure Disparity (Lead: MIT):
Completed the literature review, data acquisition and processing, and development of the methodology for individual exposure estimation. The methodology has been submitted for publication consideration in Nature Cities titled: "Big mobility data reveals hyperlocal air pollution exposure disparities in the Bronx, New York City".
- 2023_05: Green TOD: Concept, Framework, and the Empirical Case Study of Austin, TX (Lead: UT):
Completed the desktop research, literature review, data collection and generated intermediate deliverables, including a collection of related literature and resources on TOD, Green Urbanism, and Green TOD and a review report of the materials.
- 2023_06: Digital Twins as a Catalyst for Sustainable and Smart Cities (Lead: UT):
Completed the data management and visualization platform and developed a data ingestion pipeline to collect static and real-time urban transportation data. Also, the team completed the real-time city monitoring using APIs provided by the vendors to

access real-time dataset related to urban dynamics, including the GTFS Real-Time data (for transit system) and the GBFS data (for shared micro-mobility system). These real-time data were processed to extract information to visualized on Digital Twins data platform. The team also developed a deep-learning-based model for traffic prediction.

- 2023_07: Deploying Autonomous Robot Delivery System to Replace Truck Delivery and Reduce GHG Emission in Austin, TX (Lead: UT):

The team have installed and tested the autonomous delivery system on their exclusive Husky Robot. Robots have been under evaluation in the UT Austin campus to ensure their navigation system's safety. We also completed the comprehensive robot delivery strategy development for the city of Austin. In addition, the team has simulated and tested robot delivery system in the city of Austin to analyze the GHG emission reduction.

- 2023_08: Charging Forward: Crafting an Inclusive SMART Roadmap for Electric Vehicle Infrastructure in Navajo Nation, AZ (Lead: Dine' College, UT):

The Urban Information Lab (UIL) at UT Austin and Dine College held regular meetings to initiate the research plan and allocate the budget and timeline. The team have finalized and tested the proposed methods based on conditions in Austin. These methods are currently being submitted for publication in peer-reviewed journals, including the Transportation Research Record, the Journal of Computational Social Science, and Transportation Business and Management. Next, this methodology will be applied in Navajo communities.

- 2023_09: Factors Affecting Electric Vehicle and Public Charging Infrastructure Adoption in Baltimore, MD (Lead: MSU):

Conducted literature review on EV Charging Infrastructure and summarized best practices, gaps and indicators which have been used to design the survey. In addition, the team, developed the EV Charging Infrastructure survey with a series of questions covering travel behavior and preferences, socioeconomic and EV related questions. The team submitted the IRB application and is in the process of launching the survey.

- 2023_10: Metropolitan Planning Organizations' Long-range Transportation Plans: Best Practices in Sustainability, Equity, and Climate Change (Lead: MSU):

Student hiring is completed. The team has conducted a comprehensive literature review and compiled a list of environmental protection laws for all 50 states and made an assessment if they are an environmentally-progressive state.

- 2023_11: National Investigation on the Environmental, Safety and Livability Impacts of Travel Lane Width: Evidence from 10 American Cities (Lead: JHU):

Completed the data collection on more than 21 street design determinants of safety and multimodal transportation (including lane width) for 10 U.S using machine learning and vision processing techniques. Conducted the preliminary comparative analysis with transformative findings highlighting how narrower lanes lead to lower risk of crashes and higher walkability and bike-ability. The results have been widely disseminated and submitted to three top transportation journals.

- 2023_12: How Actionable are Climate Action Plans? In-depth Analysis through an Integrated Policy Mix Framework (Lead: JHU):

Developed a conceptual framework, evaluation matrix, scoring criteria and policy indicators for an in-depth analysis of the local governments' climate action plans in the top 50 cities in the U.C. In addition, we developed a data spreadsheet and collected information on US cities GHG emission, GHG reduction targets and their policies.

- 2023_13: A Census of the US Climate-High Risk Area Population: Transportation and Environmental Justice Considerations (Lead: JHU):
Conducted a comprehensive review of climate gentrification, high-risk areas, and population migration patterns. Analyzed existing measures of climate risk factors and developed a transformative methodology to operationalize and quantify high-resolution climate risks for low climate risk factors (heat and flooding). The team tested the methodology for Baltimore City and is in the process of expanding it to the entire nation.

Other Research Updates:

- CCST has been invited to submit a research proposal worth up to \$1.2 million to the Bloomberg American Health Initiative with a series of proposed research, educational and outreach programs, and activities to foster collaboration opportunities between CCST and the Initiative. If awarded, the funding will be used as a matching fund and will bring a wide network of active collaborators to CCST.
- Two other proposals from CCST have been nominated for the prestigious JHU Discovery award to foster collaboration opportunities between CCST researchers in the Bloomberg School of Public Health and top leaders from electrical engineering, systems and environmental engineering and data science. If awarded, the funding will be used as a match for CCST.
- CCST Director served as Co-chair of Transportation and Health Interest Group as part of the World Conference on Transportation Research Society (WCTRS), and co-leading the research direction for members, researchers, awards, etc.
- CCST Director served on Maryland Governor's Attainment Report Advisory Committee (ARAC) to with the mission to create long term goals, benchmarks, and the indicators for future of transportation planning in Maryland, as well as advising on the annual attainment reports and capital budget.

Education and Workforce

ATTRACT AND EDUCATE PRE-COLLEGE STUDENTS

- CCST Director and Associate Director provided a presentation and information session on Climate change and Transportation to 75 students at Baltimore Polytechnic High School in March 2024. The session offered an introduction to transportation and STEM education as a potential major for their college studies (in Collaboration with Charmed Center at JHU).
- CCST faculty from MSU gave 4 talks to more than 200 students in MSU Open House, North County High School, and Navigation Day at Magnolia Middle School to introduce the students with transportation systems discipline as a potential major for their college education and the resulting career path.

- CCST Faculties at UT provided a presentation to 200 students at Ann Richard High School to introduce them to the role of AI and smart city in addressing transportation challenges.

ATTRACT AND EDUCATE UNDERGRADUATE AND GRADUATE STUDENTS

- CCST faculty held 8 talks to more than 250 students in MSU, Undergraduate Research symposium, University of Colombia, UC Davis, UT, JHU Sustainability Symposium showcasing a wide range of research areas in transportation and climate change including smart transportation, ethical AI, and climate change
- *Research Assistantships*: Through the first cycle of CCST general RFP, a total of 21 undergraduate and graduate students are being funded to participate in research programs. Through research assistantship positions, they will gain research skillsets, technical and experiential training opportunities.
- Of 21 CCST-supported students, 5 are undergraduate students and 15 are either female or from minority racial/ethnic groups.
- CCST consortium members hired 7 postdoc associates to work closely with lead faculty and obtain necessary trainings for a successful research-based career.
- CCST faculty taught 16 undergraduate courses in transportation and climate change with more than 355 enrolled students ranging from Ethical AI and Urban transportation GIS to Climate Change Impacts, Adaptation and Mitigation, Introduction to Transportation Systems, and transportation and public health.
- CCST faculty taught 11 graduate courses in transportation, environmental justice and climate change with more than 147 enrolled students including Smart Cities, TransCAD applications in Climate Change, Advanced Geographical Data Analysis, Land Use and Transportation and Transportation Systems Evaluation.
- The concept of the 15-minute city (project 2023_03 led by MIT) are being integrated into the curriculum by Fabio Duarte for the Land Use and Transportation Planning course at MIT's Department of Urban Studies and Planning, enriching the learning experience for students.
- The project Green TOD (2023_03 led by UT Austin) has been integrated into a graduate level course, *Transit Oriented Development* offered to transportation and urban planning students at UT Austin.
- *CCST Student Leadership Council*: Each consortium member university identified a lead student council to be the core foundation of CCST student leadership council. CCST developed a list of potential student activities through brainstorming with the lead students and provided funding support for each member university to arrange transportation and climate related student activities.
- We are in the process of designing a new graduate level course focusing on applications of data science in climate change and transportation. CCST Associate Director will be the lead instructor of the course and he works closely with CCST assistant director and director of master's programs in EHE JHU on the administrative and approval process.

Engagement and Technology Transfer

Updated and expanded the CCST website with YEAR 1 project details and other center opportunities. The news and event fields will be updated frequently.

How have the results been disseminated? If so, in what way/s?

- CCST researchers delivered 32 presentations during the TRB Annual meeting featuring several CCST projects such as the 15-min City project (2023_03), the Narrowing Lane Width project (2023_11) and the Autonomous Robot Delivery project (2023_07). Other CCST projects will be submitted to the TRB next year.
- CCST researchers have delivered 24 other invited talks and keynotes during this reporting period with more than 1,640 audiences in state and national professional events such as APA Annual Meeting, Baltimore Metropolitan Counsel, ACSP Annual meeting, Bloomberg Summit, Smart Cities Conference, PWC Austin and SCL community partners.

Most CCST Year 1 projects are still in progress and are not advanced enough for dissemination. However, some of our projects are near completion and have been widely disseminated during this reporting period as following:

- The 15-min City project (2023_03) has been presented and disseminated across a global network of researchers at the Senseable City Labs, including locations in MIT, Dubai, Amsterdam, and Stockholm. The team have also shared insights with the Miami-Dade Transportation Planning Organization (TPO) Delegation. The team also is working with the C40 Cities Climate Leadership Group Inc., a global network of nearly 100 mayors of the world's leading cities, to disseminate and collaborate on research implications in the US and internationally.
- The Air-Quality Disparity project (2023_04): A website featuring an interactive map showing the results of the project is currently being developed. Upon the project release the website will be featured on MIT Senseable City Lab's homepage. It has also been presented in 5 professional and academic events.
- The Narrowing Lane Width project (2023_11): Presented in 5 professional and academic conferences including TRB, and the Bloomberg American Health Summit. The presentations led to several follow-ups for research collaborations and/or requests for technical assistance mostly from local agencies. The team met with Senator Allen (California) and 10 Caltrans (California DOT) staff to discuss lane narrowing for Pacific Coast Highway which has experienced substantial pedestrian and bike-involved car crashes and fatalities.
- The project Narrowing Lane Width (2023_11): The PIs have also been Invited as a keynote speaker to Maryland Bike Symposium and Texas Pedestrian Safety Forum with more than 250 mayors, community leaders and city council members in Maryland and Texas to discuss impacts of travel lane narrowing on bike safety
- The project Autonomous Robot Delivery (2023_07) has been disseminated through submissions to transportation research Part E, and IEEE and have been presented in 3

invited talks and guest lecture series. An interactive website is being developed to display research findings.

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

Research

- We expect most of YEAR 1 projects to be completed, and deliverables will be finalized in collaboration with the project lead PIs and CCST associate directors.
- Will schedule the CCST Signature monthly Webinar series to present the 1st year project findings and highlights.
- Developing templates and requirements for submitting 1st year projects' final deliverables including reports, policy briefs, Webinar presentations, research project highlights, 1 page project summary, and the technology transfer report.
- Providing feedback to project PIs based on their quarterly progress report to further align the project directions toward the CCST goals.
- Developing the RFP for the 2nd year projects and widely advertising it among consortium universities to foster diverse, and multidisciplinary proposal submission.
- Proposal submissions for YEAR 2 will be done during the summer. The CCST leadership will offer info sessions and will meet with researchers from diverse disciplines to ensure quality proposal submissions.
- Proposal peer review process will take place in late summer/early fall. Each submitted proposal will be reviewed by one transportation professional and one academic scholar to evaluate both potential impacts and the research quality.
- CCST expects the YEAR 2 projects to be finalized in October 2024 with the Start date of December 2024. The notice of award will be sent to PIs highlighting the CCST reporting requirements and deliverables.
- The first CCST Advisory Board meeting will take place to discuss CCST YEAR 2 direction and priorities in coordination with the executive committee.

Education and Workforce

- CCST plan and strategies for YEAR 2 educational and training programs will be established by the executive committee.
- *CCST Student Leadership Council*: the CCST student organization will be launched, and the council will develop plans for future student-led activities.
- Environmental Justice Scholarship program will be initiated: This initiative will award up to 3 scholarships on a competitive basis to a student project/video that focuses on a local pressing environmental justice issue caused by transportation decisions in the past and offer innovative solutions presentable to policymakers.
- Climate Change and Transportation competition will be initiated: Teams of students will propose policy solutions to a real-world climate and transportation challenge. Each team will be required to include students from at least three different disciplines.

- CCST Student of the Year nominations will be initiated, and the executive committee will select the awardee from the nomination list.
- CCST Consortium members will continue offering courses and degrees in transportation, climate change and related fields. CCST requires PIs to incorporate their funded research in course design.
- *Innovative Applications of Data Science to Address Transportation and Environmental Challenges Course*: CCST Associate Director, will develop this new course to train students with foundational knowledge of data science and its implementations in climate change, transportation, and community design. The main objective of this course will be to train students with real-world applications of data science to address environmental challenges of transportation, particularly climate change.

Engagement and Technology Transfer

- Publishing the final reports, project highlights and policy briefs on the CCST website and disseminating them widely through our several listservs and the rich network of collaborators.
- CCST will work with the Bloomberg American Health Initiative to disseminate results from YEAR 1 projects through their extensive network of cities, transportation agencies and health departments and to showcase some of our projects during the Bloomberg Summit.
- CCST will actively participate in the US DOT Future of Transportation Summit in August with several presentations featuring several of our YEAR 1 projects.
- CCST will work with lead PIs to ensure TRB submissions for all CCST projects to represent CCST extensively at the TRB conference and in TRB committees.
- *E-Newsletter*: The first CCST E-Newsletter will be published and disseminated widely through CCST and partners extensive network and several listservs.
- *Website*: Continue updating CCST website functionalities and performance. The CCST will include more detailed information on research projects and their progress.
- CCST-funded implementation plans: CCST will work closely with projects' PIs to draft an implementation plan for each YEAR1 completed project based on established partnerships with local/regional and national organizations for future practical and policy implications as was proposed in their proposals. CCST will document these efforts and will report to the USDOT as part of potential Impacts.

1. PRODUCTS: What has the program produced?

Publications, conference papers, and presentations

CCST projects so far have led to 46 presentations and 13 journal submission/publications. The following list are examples of journal submissions and publications during this reporting period (we could not include the complete list due to the page limit):

- Abbasov, T., Heine, C., Sabouri, S., Salazar-Miranda, A., Santi, P., Glaeser, E., & Ratti, C. (2024). The 15-minute city quantified using human mobility data. *Nature Human Behaviour*, 1-11. <https://doi.org/10.1038/s41562-023-01770-y>
- “Big mobility data reveals hyperlocal air pollution exposure disparities in the Bronx, New York City” has been submitted for publication consideration in *Nature Cities* (<https://www.nature.com/natcities/>).
- Wang, Huihai; Jiao, Junfeng; Xu, Yiming. (2024). Street Function Representation Learning on Long-Term Traffic Flow Prediction. (under review)
- Autonomous Robot Delivery System Adoption Strategy on Urban Logistics: A Case Study in Austin, Texas, submitted to *Transportation Research Part E*.
- Wang, Huihai; Jiao, Junfeng; et al., Towards Equitable Transportation Electrification Plan: Measuring Public Electric Vehicle Charging Station Access Disparities in Austin, TX. *Transportation Research Record* (1st revision)
- Jiao et al. (2024) Uncovering Electric Vehicle Ownership Disparities Using K-means Clustering Analysis: A Case Study of Austin, Texas. *Journal of Computational Social Science* (1st revision)
- Jiao et al., (2024) Who owns Tesla? The relationship between electric vehicle adoption and regional characteristics in Texas Triangle. *Research in Transportation Business and Analytics* (under review)
- Hamidi S., Azimi, E. Are Wider Lanes Safer? Evidence From New York City submitted to *Sustainable Cities and Society*
- Hamidi S., Azimi, E. Examining Safety Impacts of Travel Lane Width in An Auto-Oriented City: Evidence from Dallas, TX submitted to *Transportation Research Part D*

Website(s) or other Internet site(s)

Three CCST projects have launched their website, online tools, and interactive maps during this report period:

- <https://narrowlanes.americanhealth.jhu.edu/>
The Narrowing Lane Width project (2023_11) visualization and website highlights the project overview, impacts of narrowing lanes, implementations, recommendations for policy makers.
- <https://austindigitaltwin.com/>
The Digital Twins project (2023_06) has led to a fully functional digital twin for the City of Austin: This digital twin website includes: (1) data management and visualization platform; (2) real-time city monitoring system; and (3) 3D city model.
- <https://senseable-us-15.com/>
The 15-min City project (2023_03) has led to an interactive data visualization and website highlighting the 15-min city concept, implementations and the 15-min city index.

Technologies or techniques

One of CCST projects “2023_07: Deploying Autonomous Robot Delivery System to Replace Truck Delivery and Reduce GHG Emission in Austin, TX” led by UT Austin has led to the transformative development of a *robot delivery system simulator*.

The simulator is divided into three submodules: the infrastructure simulation module, the package delivery demand estimation module, and the robot path planning and task arrangement module. This structure allows for detailed analysis and optimization of robot delivery systems within urban environments. The research team is planning to deploy this technology on a few sites in UT Austin campus and further expand its applications to the City of Austin.

Inventions, patent applications, and/or licenses

Nothing to report for this period

Other products, such as data or databases, physical collections, audio or video products, software or NetWare, models, educational aids or curricula, instruments, or equipment

Nothing to report for this period

2. PARTICIPANTS & COLLABORATING ORGANIZATIONS: Who has been involved? What organizations have been involved as partners?

CCST faculty members continuously develop collaborations with other organizations ranging from academic institutions to technology companies and government agencies to employ the most advanced data and technologies, learn about the public sector challenges, and research gaps, and to develop a network for implementation of their research findings.

CCST currently collaborates with 45 organizations nationwide. In the current reporting period, while strengthening their previous 27 collaborations, CCST faculty members have initiated 18 new collaborations. Table 1 shares a summary of recent partnerships, information about the status and nature of collaboration.

Table1: CCST new collaborations in the reporting period

Partner(s)	Collaboration Type	Program	Member Institution	Status*
Northeastern University, Northeastern University, Harvard University, Brown University	Research – Sharing data, infrastructure and brainstorming on research design and implementation	2023_3, 2023_4	MIT	3
Spectus Inc.	In-kind support: mobility data provider	2023_4	MIT	3

NYC Department of Health (DOH)	Collaborative Research	2023_4	MIT	3
NYC Chief Technology Officer (CTO)	Research – air pollution data acquisition	2023_4	MIT	3
TransCAD	In-kind support: providing GIS modeling software	2023_9	MSU	1
Dell Inc.	Access to computational infrastructure	2023_06	UT	3
UT Good System	Sharing equipment and software	2023_06	UT	3
Autonomous Mobile Robotics Laboratory	Sharing Robot instruction and knowledge	2023_06	UT	3
Resources for the Future	Research – sharing proprietary research data and infrastructure	2023_12	JHU	2
California DOT (Caltrans)	Lane width narrowing implementation	2023_11	JHU	1
Maryland DOT Environmental and Sustainable Transportation	Research implementation, Assessing Maryland clean transportation challenges and research gaps	2023_11, 2023_12, 2023_13	JHU	2
American Planning Organization	Research Dissemination	2023_11	JHU	3
Salt Lake City, UT	Lane width narrowing implementation	2023_11	JHU	3
League of American Bicyclists	Project implementation	2023_11	JHU	2
Bloomberg American Health Initiative	Provided matching support for the projects and partnered in dissemination and data sharing	2023_11, 2023_12, 2023_13	JHU	3
<p>* Status:</p> <ol style="list-style-type: none"> 1. Initial arrangement 2. Agreement for collaboration made 3. Implementation phase 4. Completion 				

P.S. This list only shows NEW collaborations/partnerships during this reporting period:

Have other collaborators or contacts been involved?

Other organizations that have been involved in CCST programs include Baltimore Polytechnique High School, Ralph O'Connor Sustainable Energy Institute (ROSEI) at JHU, Center for Community Health (CHARMED) at JHU, Bloomberg Philanthropy, Baltimore Transit Equity Coalition, California Air Resources Board, Wasatch Front Regional Council, Capital Metro, City of Austin, Navajo Nation Division of

Transportation, Baltimore City Office of Sustainability, Sacramento Area Council of Governments, Massachusetts Department of Environmental Planning, City of Boston and Maryland Environmental Services.

3. **IMPACT:** What is the impact of the program? How has it contributed to transportation education, research and technology transfer?

What is the impact on the development of the principal discipline(s) of the project?

Nothing to report for this period

What is the impact on the other disciplines?

Nothing to report for this period

What is the impact on development of human resources?

Nothing to report for this period

What is the impact on physical, institutional, and information resources at the university and/or other partner institution?

Nothing to report for this period

What is the impact on technology transfer (include transfer of results to entities in government or industry, adoption of new practices, or instances where research has led to the initiation of a start-up company)?

Nothing to report for this period

What is the impact on society beyond science and technology?

Nothing to report for this period

4. **CHANGES/PROBLEMS**

Changes in approach and reasons for change

Nothing to report for this period

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

Nothing to report for this period

Changes that have a significant impact on expenditures

Nothing to report for this period

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

Nothing to report for this period

Change of primary performance site location from that originally proposed

Nothing to report for this period