# CM²

**Cooperative Mobility for Competitive Megaregions**

# Program Progress Performance Report (PPPR) #2

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# 1. ACCOMPLISHMENTS

## A. Goals and Objectives

CM$^2$ is committed to advancing research, education, and technology transfer initiatives to improve mobility, promote equity, and enhance economic competitiveness of urban and rural communities in megaregions.

- We aim to become a leading Tier 1 center specialized in megaregion mobility research. Our goal is to offer advice on strategic transportation planning, smart infrastructure investments, and informed policy-making.
- We provide high-quality transportation education and workforce development and work to connect research with practical actions.
- We promote multimodality ranging from HSR to slow-moving transportation such as walking and bicycling for diverse populations and communities. We facilitate public-private partnership for freight mobility planning and operation efficiency.

## B. Accomplishments under These Goals

### i. *Research Accomplishments*

Throughout this reporting period, the grant funded 26 researchers and 22 students. Additionally, five students were supported through matching funds. Research teams were involved in a series of projects analyzing data, laws, policies and technologies and developing solutions through modelling and analysis for cooperative mobility in megaregions. Table 1 outlines the projects currently conducted in CM$^2$. Short snapshots of current project accomplishments organized by major CM$^2$ thematic areas are highlighted below.

**Table 1: Current Projects by Partner Institutions and PIs**

| Project Title | Partner | Principal Investigator | Funding Year | Project Status |
|---|---|---|---|---|
| Multi-Modal Modelling: BIM Templates for Hub Design and Networks | UT SOA | Danelle Briscoe | Year 1 | In Progress |
| Transit Operators in Metropolitan Transportation Decision Making | UT SOA | Gian-Claudia Sciara | Year 1 | Starting on 6/1/2018 |
| Equitable access to transit within and across mega-regions | UT SOA | Jake Wegmann | Year 2 | Starting on 6/1/2018 |
| Can Crowdsourcing Support Co-productive Transportation Planning in Megaregion? Evidence from Local Practice | UT SOA | Junfeng Jiao | Year 1 | In Progress |
| Transit Deserts in the Texas Triangle: Measuring Transit Demand and Supply at the Megaregional Scale | UT SOA | Junfeng Jiao | Year 2 | In Progress |

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| The Evolving Role of Metropolitan Planning Organizations on Intra and Inter-Regional Transportation, Land Use and Access Policies and Outcomes | UT SOA | Michael Oden | Year 1 | In Progress |
| The Effects of Transportation Infrastructure Investments on Freight Mobility | UT SOA | Michael Walton | Year 1 | In Progress |
| Incorporating Active Transport into the Regional Planning Process to Support First and Last Mile Travel | UT SOA | Michael Walton | Year 2 | Starting on 9/1/2018 |
| Regional Opportunities and Challenges for Transit Oriented Development: The Case of Texas Triangle | UT SOA | Ming Zhang | Year 2 | In Progress |
| Using Technological Innovations Across the Megaregion to Enhance the Mobility and Access of Seniors | UT SOA | Sandra Rosenbloom | Year 1 | In Progress |
| Creating Neighborhood Walkability Metrics that Represent the Needs of Older People; Developing Appropriate Infrastructure and Policy Interventions | UT SOA | Sandra Rosenbloom | Year 2 | Starting on 6/1/2018 |
| The Rise of Long-Distance Trips, in a World of Self-Driving Cars: Anticipating Trip Counts and Evolving Travel Patterns Across the Texas Triangle Megaregion | UT CTR | Kara Kockelman | Year 2 | In Progress |
| Assessing Changes to Federal and State Law for Megaregion Planning | UT CTR | Lisa Loftus-Otway | Year 1 | Completed |
| Creating a Roadmap for MPO Regional Planning in Texas and Beyond | UT CTR | Lisa Loftus-Otway | Year 1&2 | In Progress |
| The Right Structure for the Right Incentives: Multimodal Transportation in America's Growing Megaregions | UT CTR | Lisa Loftus-Otway | Year 2 | In Progress |
| Improving Megaregion (MR) Freight Mobility: Impact of Truck Technologies | UT CTR | Robert Harrison | Year 1 | In Progress |
| Beyond Political Boundaries: Constructing Network Models for Megaregion | UT CTR | Stephen Boyles | Year 2 | In Progress |
| Evaluation and Analysis of Post-Disaster Re-Entry in Megaregions: A Pilot Study | LSU | Brian Wolshon | Year 1 | In Progress |
| The Effect of Shadow Evacuation in Megaregion Disasters: A Pilot Study | LSU | Brian Wolshon | Year 1 | In Progress |
| Assessment of Post-disaster Re-Entry in Megaregions: A Pilot Study | LSU | Brian Wolshon | Year 2 | In Progress |

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| Effect of Disruptions on Megaregion Emergency Evacuations: A Pilot Study | LSU | Brian Wolshon | Year 2 | In Progress |
| Creating a Framework to Determine Purpose and Need for Increased Travel Options in the Megaregion for Vulnerable (Environmental Justice) Communities | TSU | Carol Lewis | Year 1 | In Progress |
| Application of the Equity Rubric for Purpose and Need to a Demonstration Corridor in the Texas Megaregion | TSU | Carol Lewis | Year 2 | In Progress |
| Megaregion Truck Flow Estimation Model | TSU | Qisheng Pan | Year 1 | In Progress |
| Develop a GIS-based Megaregion Transportation Planning Model | TSU | Qisheng Pan | Year 2 | Starting on 5/1/2018 |
| The Philadelphia Story: Urban Renaissance and Shifting Travel Behavior in a Northeast Region | UPenn | Erick Guerra | Year 1 | In Progress |
| Transportation and land use across US and Mexican cities and megaregions | UPenn | Erick Guerra | Year 2 | In Progress |
| An Operational Platform for Modeling Multi-Modal Transportation Investments in the Northeast Corridor Megaregion | Upenn | John Landis | Year 1&2 | In Progress |
| Overcoming Impediments and High Costs for Infrastructure Projects in the Northeast Megaregion | UPenn | Marilyn Taylor | Year 1 | In Progress |
| Advancing Transformational Infrastructure Projects across Political Boundaries in the Northeast | UPenn | Marilyn Taylor | Year 2 | Starting on 9/1/18 |
| Equitable access to transit within and across megaregions | UPenn | Vincent Reina | Year 2 | In Progress |
| **Multi-Institutional** | | | | |
| Mega-Travel in Megaregions: An Update on Growth Trends and Research Needs | UT SOA/UPenn | Dean F. Steiner, R. Yaro, M. Zhang | Year 2 | In Progress |
| Airport Governance in U.S. Metro Regions: Institutional Models and their Implications for Megaregional Transport | UT SOA/UPenn | G. Sciara, M. Ryerson | Year 2 | Starting on 9/1/2018 |
| *Key:    UT SOA = UT Austin, School of Architecture;  UT CTR = UT Austin, Center for Transportation Research;        TSU = Texas Southern University;  LSU = Louisiana State University; UPenn = University of Pennsylvania* | | | | |

**Law/Policy/Planning**

- A review of federal constitutional powers outlined areas within the spending power, preemption power and commerce clause that could be utilized by federal agencies to craft megaregional transportation planning policies.
- Research into creating a Metropolitan Planning Organization (MPO) roadmap for megaregion planning has found that political membership and voting structures and new federal aid requirements for performance measures, make the development of megaregion processes and plans extremely difficult.
- Research reviewing MPO megaregional planning activities sent out a survey to directors and/or senior planners at 370 MPOs in April 2018.
- A project that assessed how crowdsourcing technology can be applied in megaregion transportation planning showed that planners can use crowdsourcing for key issues in participatory planning relevant to large areas including megaregions.
- Research quantified transit deserts in 52 major US cities and found that transit deserts make it difficult to find jobs and access medical care. The research team has developed a website with their findings, accessible at the URL, www.transitdeserts.org.
- A project looking at planning reforms for the next generation of megaregion transportation infrastructure investments used classes/studios and a bi-national advisory panel to identify challenges facing the US in rebuilding transportation infrastructure after decades of diminished investment and maintenance.
- A review of transportation and land use across US and Mexican cities and megaregions has collected and analyzed data. The team is currently preparing a report on this analysis.
- An assessment of shifting travel behavior in Philadelphia found that the travel patterns of young people did not change substantially between 2000 and 2012, but that these paled into comparison to changes among women, who have more complicated travel routines, and black residents, who are statistically more likely to travel without a car than white respondents.

**Modelling**

- Analysis of modelling for megaregions road networks that used a framework for decentralizing network assignment problems developed from a TxDOT matched project compared against a heuristic model. After extracting the Texas Triangle network from TxDOT's Statewide Analysis Model, with the passenger and freight demand data, multiple network partitioning algorithms were studied. Two algorithms were deemed best suited after the Texas Triangle network was decomposed into multiple sub-networks: Shortest Domain Decomposition Algorithm (SDDA) and Spectral Partitioning.
- Research in modelling BIM multi-modal objects surveyed multi-modal situations. The team found that certain limitations in modification for transportation specificity, and inclusion of sustainable tactics within each object mode, makes achieving 6D and 7D inclusion difficult.
- Research assessing the impacts of automated vehicles (AV) on long distance travel, changing values of travel time and elasticities due to vehicle automation assembled data

for the Texas triangle megaregion, and included data from national survey conducted from a matched TxDOT project. Parameters on destination, mode, and route choice with the survey results have been incorporated into various scenarios to assist transportation agencies in creating megaregion transportation plans.

- Research into the North East megaregion planning and investment built the basic modeling infrastructure and created a 900+ traffic analysis zone system (TAZ) for the full 13-state study region, populating it with all relevant demographic and economic data. Characteristics amalgamated into the TAZ were as follows: available roadway, rail, urban rail transit, bus transit, freight, as well as air link, node, schedule, and route data. This information was integral to developing an accurate and up-to-date system of inter and intra urban transit and air networks. Ultimately, research saw the development trip-generation and trip-distribution models for the study region.

**Freight**

- Research identifying the impacts of improved truck fuel efficiency identified the major technical elements of Class 8 trucks for model years 2018, 2021 and 2025. A technology "road map" was created to describe the performance of new Class 8 tractors and trailers over the next 8 years. Class 8 diesel truck fuel consumption rates per mile will continue falling, impacting federal and state gas tax funding streams.

- Research adapted a travel demand model to the Texas Triangle megaregion to test how freight movements could be affected by different infrastructure investments. The model was altered to accept several of the infrastructure changes that were deemed of interest to freight groups, including freight rail electrification, and truck-only lanes.

- A project developing a model for estimating megaregion truck flows has reviewed existing freight datasets and synthesized freight transportation studies. This work develops an analytical framework for megaregion truck flow model, and researchers are currently collecting freight data and constructing a database for megaregion truck flows.

**Equity**

- A project creating a framework to determine purpose and need for travel options for communities that are vulnerable to environmental justice issues has compiled GIS census tracts for all counties around the US290 corridor. Percentages were calculated for various categories, such as ethnicity, poverty designation, female single head of household, zero vehicle households, senior population and level of English proficiency.

- A project assessing equitable access to transit within the megaregions has completed a literature review, cleaned data and begun analysis. Initial findings are suggesting there is a significant tradeoff between reducing transportation costs and increasing access to opportunity areas within and across megaregions.

### ii. Education Accomplishments

Mr. Greg Griffin, a Ph.D. student at the University of Texas at Austin, received the 2017 Dwight David Eisenhower Transportation Fellowship Program (DDETFP) grant in December 2017. Greg's dissertation research is supported by CM2 under the supervision of Dr. Junfeng Jiao.

Ms. Paulina Urbanowicz, a Master's student in the Graduate Program of Community and Regional Planning at the University of Texas at Austin and a CM$^2$ graduate research assistant to Ms. Lisa Loftus-Otway, was selected as an Eno Fellow for the 2018 Transportation Leadership Development Conference program.

Mr. Brendan Goodrich, a Master's student in the Graduate Program of Community and Regional Planning at the University of Texas at Austin and a CM$^2$ graduate research assistant to Dr. Ming Zhang, received the 2017 UTC Outstanding Student of the Year Award.

### iii. Outreach/Engagement Accomplishments

As a key member of the organizing committee, CM$^2$ Director Dr. Ming Zhang participated in the FHWA "Multi-Jurisdictional Coordination for the Greater Texas Region" workshop in Houston, TX in March 2018 and presented on CM$^2$ research and activities. The event was one of 11 nationwide megaregion workshops led by the FHWA Office of Planning. Representatives from Metropolitan Planning Organizations (MPOs) and Area Councils in Texas, Oklahoma, Louisiana, and Arkansas gathered alongside FHWA and the Texas Department of Transportation to discuss pressing issues in planning for freight in the Greater Texas region.

Dr. Zhang presented a research summary of the CM$^2$ consortium at the TRB Megaregion Subcommittee meeting in January 2018. Committee members discussed FHWA activities in 2017 and hosted an interesting dialogue on possible solutions to megaregion planning including cross-jurisdictional mandates and the intersection of commuting and freight transportation, among other topics. Additionally, Dr. Zhang co-developed TRB 2019 Call for Papers for TRB megaregions subcommittee.

### iv. Administrative Accomplishments

Our administrative team has accomplished many new tasks during this reporting period.

**Hiring of Administrative Staff:** The position of Assistant Director was advertised in September 2017. In November 2017, the position was filled by Ms. Inessa Ach, who has a background in economics, accounting, project management and administration, and grants management. Her role is integral to the overall operation of the center and provides compliance, budgeting, and daily operations support across multiple partner institutions.
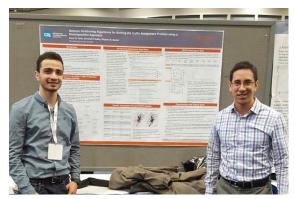
**Website Overhaul and Update:** The CM$^2$ administrative team consulted with the University of Texas at Austin's ITS Applications and Consulting Services to develop a new website. The new layout disseminates news, events, projects, and other activities in a comprehensive, easily navigable, and aesthetically pleasing way. The new website provides important program updates and will continue to be utilized to publish forthcoming reports. The website URL is https://sites.utexas.edu/cm2/.

**Organization:** The CM² administrative team continued improving the center's operations and procedures, such as:

- implementing staggered timeline for Year 3 multi- and intra-institutional CFP process; as of now, the top two multi-institutional proposal have been selected for funding, and intra-institutional proposals are being submitted and reviewed;
- setting up separate accounts for each research project to aid with financial report preparation and tracking of expenses;
- creating a new CM² logo to establish and maintain our center's brand identity.

## C. Dissemination of Results

The results of work completed to date has included one final project report disseminated on the CM² website and six papers presented at ACSA Conference in October 2017 and at TRB in January 2018. Three refereed journal papers have been published and 13 one-time, or op-ed pieces have been developed. Findings about transportation and urban planning in Mexico City from Dr. Guerra's project were presented on a TV forum in Mexico City. In addition, preliminary data and research findings have been shared with our MPO and State DOT collaborators as parts of requests for access to models and data.



## D. Plans for Next Reporting Period

The next reporting period (4/1/2018 - 9/30/2018), the CM² consortium expects to see 18 completed projects with final reports created and anticipated papers developed for TRB and other technical, policy, planning and law journals. The University of Pennsylvania's studio on Planning Reforms for the Next Generation of Megaregion Transportation Infrastructure Investments is well advanced in the preparation of its report, *Mobilizing Investment in America's Transportation Infrastructure*. It will be distributed to the Advisory Panel and others on our mailing list and posted on PennDesign Planning's website.

LSU will complete surveys as part of its pilot studies work related to post-disaster reentry procedures and gather simulation output data for the shadow evacuation project. They will also begin running simulations to assess the effect of network disruption in megaregions and begin developing re-entry curves and identifying scenarios for study. In addition, they plan to host more outreach activities. A final report will be completed, published and results will be presented in journals.

# 2. PRODUCTS

## A. Publications

### i. *Journal Publications*

- Jiao, J. 2018. Rideshare Pricing Transparency and Special Events: Uber Price Surges on the Fourth of July in Austin, Texas. Research in Transportation and Business Management. https://doi.org/10.1016/j.rtbm.2018.02.008
- Pamela Murray-Tuite, Brian Wolshon, and Deborah Matherly, "Evacuation and Emergency Transportation - Techniques and Strategies for Systems Resilience" TR NEWS 311, Sept - Nov 2017, pp. 20 – 26
- Zhang, M. and Zhang, W. 2018. When context meets self-selection: The built environment-travel connection revisited. *Journal of Planning Education and Research*. https://doi-org.ezproxy.lib.utexas.edu/10.1177/0739456X18755495.

### ii. *Books or other non-periodical, one-time publications*

- Pan, Q., Zhang, M., Huang, Z., Liu, X. (2018). Transit GIS. In: Huang, B. (Ed.), Comprehensive Geographic Information Systems. Vol. 2, pp. 381–400. Oxford: Elsevier. http://dx.doi.org/10.1016/B978-0-12-409548-9.10028-4.
- P. Murray-Tuite, M. Lindell, B. Wolshon, and E.J. Baker. "Large-Scale Evacuation: The Analysis, Modeling, and Management of Emergency Relocation from Hazardous Areas" (working title), in contracted and in development for publication by CRC Press, Taylor and Francis Publishing Group, LLC, September 2018.Zhang, M. 2018. Research summary: USDOT UTC Cooperative Mobility for Competitive Megaregions (CM2). Invited presentation at the TRB Megaregion Subcommittee meeting.

### iii. *Other publications, conference papers, presentations, and working papers*

- Goodrich, B. and Zhang, M. 2017. Understand Mega-Commute --Implications for Mega-Region Transportation Planning. Poster presentation at the 57th Association of Collegiate Schools of Planning (ACSP) Conference, October 12-15, 2017, Denver, Colorado.
- Griffin, G. and Jiao, J. 2017. Crowdsourcing Bike Share Station Location: Empty voices or powerful participation? Paper presented at the 57th Association of Collegiate Schools of Planning (ACSP) Conference, October 12-15, 2017, Denver, Colorado.
- Jiao, J. and McGrath, N. 2018. Evaluating Walkability through GIS Spatial Analysis in South Florida. Paper presented at the 97th Transportation Research Board (TRB) Annual Meeting, January 7-11, 2018, Washington, D.C.
- Jiao, J. 2018. Investigating Uber Price Surges during a Special Event in Austin, TX. Paper presented at the 97th Transportation Research Board (TRB) Annual Meeting, January 7-11, 2018, Washington, D.C.
- Boyles, S. and Yahia, C. Network Partitioning Algorithms for Solving the Traffic Assignment Problem using a Decomposition Approach. Paper presented at the 97th Transportation Research Board (TRB) Annual Meeting, January 7-11, 2018, Washington, D.C.

- Pan, Q. B. Chun, Z. Jin, and J. Zhou (2017) "Development and applications of megaregion truck flow estimation model," the ACSP 57th Annual Conference, October 12-15, 2017, Denver, Co.
- Jiao, J. and Bischak, C. 2018. Where Buses are Leaving People Behind (Op-ed). Houston Chronicle, https://www.houstonchronicle.com/local/gray-matters/article/transit-deserts-reinforce-economic-inequality-12750671.php
- Jiao, J. and Bischak, C. 2018. People are stranded in "transit deserts" in dozens of US cities (Op-ed), The Conversation, Retrieved from https://theconversation.com/people-are-stranded-in-transit-deserts-in-dozens-of-us-cities-92722
- Jiao, J. 2017. Commentary: Better planning can transform America's "transit deserts", My Statesman, Retrieved from https://www.mystatesman.com/news/opinion/commentary-better-planning-can-transform-america-transit-deserts/BocL9h6sd04YY5kPkizEWK/
- Jiao, J. and McGrath, N. 2017. Stranded in our own communities: Transit deserts make it hard for people to find jobs and stay healthy (Op-ed). The Conversation, Retrieved from https://theconversation.com/stranded-in-our-own-communities-transit-deserts-make-it-hard-for-people-to-find-jobs-and-stay-healthy-77450
- Jiao, J. Miro, J. and McGrath, N. 2017. What public transit can learn from Uber and Lyft (Op-ed). The Conversation, Retrieved from https://theconversation.com/what-public-transit-can-learn-from-uber-and-lyft-85145 Planning Reforms for the Next Generation of Megaregion Transportation Infrastructure Investments seminar's findings and recommendations have been summarized in a report, Mobilizing Infrastructure Investment: Preparing for the Future of Transportation Investment in the United States. This report has been made available in PDF form through PennDesign Planning's website.
- Loftus-Otway, L. and Hunn, A. 2018. Assessing Changes to Federal and State Law for Megaregion Planning: CM2 Working Paper. University of Texas at Austin Center for Transportation Research.
  Available at URL: http://sites.utexas.edu/cm2/files/2018/03/Year1-HunnLoftus-Assessing-ChangesPart12.pdf
- Zhang, M. and Hamidi, S. 2017. Local & State Planning for Megaregional Transportation Needs. Roundtable session at the 57th Association of Collegiate Schools of Planning (ACSP) Conference, October 12-15, 2017, Denver, Colorado.

## B. Websites

The CM² website URL is https://sites.utexas.edu/cm2/. This website is used to disseminate any information related to the program.

Dr. Junfeng Jiao created www.transitdeserts.org. This website demonstrates the findings of Dr. Jiao's research project on transit deserts.

All LSU program activities will be disseminated through http://www.evaccenter.lsu.edu

## C. Technologies or Techniques

- Phase I of the development of a 4-step travel demand and investment model for the 13-state Northeast Megaregion, including the creation of a 900+ zone TAZ system; and highway, passenger and freight rail, and intra-urban public transportation networks;
- Development of BIM template.

## D. Inventions, patent applications, and/or licenses

Nothing to report.

## E. Outreach activities



CM[2] co-sponsored the City Forum Speaker Series at the University of Texas at Austin School of Architecture. Dr. Ming Zhang and Ms. Aysha Lauren Minot (CM[2] GRA) coordinated the bi-weekly event in Fall 2017 and Spring 2018. Topics of discussion are relevant, contemporary issues ranging from the local and regional to international. City Forum provides a space for open, critical dialogue among faculty members, students, community members, planning practitioners, and policy-makers regarding crucial planning-related issues in Austin and elsewhere. The speaker series is intended to encourage discussion of diversity, multiple publics, and social change. Detailed information is available at http://soa.utexas.edu/crp/city-forum.

Dr. Jiao is working with the City of Austin's B-Cycle and UT-Austin's Parking and Transportation Services to improve bike sharing activities around the UT Austin campus. The team received data requests from the cities of Austin, Houston, and Dallas, as well as from organizations in Pittsburg PA, Minnesota, Seattle WA, and New Braunfels TX.

Dr. Wolshon and Ms. Herrera hosted a hands-on summer camp for the LSU College of Engineering. The eXploration Camp Inspiring Tomorrow's Engineers (XCITE) camp took place on July 13, 2017. The XCITE camp brings together female high school students and provides the the opportunity to explore, create, and compete in a variety of engineering and college preparatory activities to encourage interest in STEM.

Ms. Loftus-Otway will be appointed to the WTS International Board of Directors in June 2018 and she will reach out through this platform to the entire organization of nearly 9,000 members in the US, Canada, and UK to instigate dissemination of materials, papers, and other center activities.

The center's director, Dr. Ming Zhang, actively participated in the planning of "Multi-Jurisdictional Coordination for the Greater Texas Region" workshop held by FHWA on March 28-29, 2018 in Houston, Texas. Dr. Carol Lewis, Dr. Ming Zhang, and Dr. Robert Harrison attended this invitation only event, and presented on CM$^2$ activities.



Dr. Ming Zhang and Dr. Carol Lewis from Texas Southern University (TSU) provided an overview of megaregional research they have conducted. Additionally, five graduate students funded by CM$^2$ grant attended the workshop as student volunteers. The students from TSU and UT Austin provided notes to the FHWA team and presented a synthesis of the final collaborative brainstorming session, where all attendees discussed next steps. This work contributes to official FHWA workshop reporting documents and provides students with an insight into the most pressing topics in highway and freight planning today. Mr. James Garland of FHWA said: "Based on feedback and evaluations, the workshop was a huge success - and part of that credit belongs to the strong partnership forged between FHWA and the University of Texas at Austin".

## F. Courses and Workshops

Ms. Loftus-Otway and Dr. Zhang have drafted a course outline for Planning for Megaregions to be taught during the FY 19 school year as a cross-disciplinary class for the School of Architecture, School of Law, Cockrell School of Engineering, LBJ School of Public Policy, and the Moody School of Communication. The goal will be to have this course taught at all partner schools in the 2020 academic year either collaboratively or individually.

Dr. Danelle Briscoe has developed a studio course for the academic year 2019 that will be taught at UT Austin.

Dr. Yaro and Taylor co-taught fall 2017 Regional Infrastructure Seminar and spring 2018 Studio. The studio is cross-disciplinary, including students in land use planning, transportation planning, real estate development, economic and community development, urban design and architecture.

Dr. Ming Zhang taught a 6-credit hour course CRP 685D Planning Studio/Transportation Practicum on Regional TOD Challenges and Opportunities in Texas in fall 2017. Nine masters' students from the Graduate Program in Community & Regional Planning (CRP) enrolled in the course.

## G. Other products

Dr. Briscoe, has developed video products of multiple European city multi-modal hubs and BIM Models of over 100 transportation focused entities. To date, they have not yet been shared. Dr. Harrison has created a technology "road map" describing the performance of new Class 8 tractors and trailers over the next 8 years. Dr. Kockelman and Dr. Boyles have both augmented current TxDOT models, and are modelling software with megaregion analysis and data sets. Dr. Guerra presented findings about transportation and urban planning in Mexico City on a TV forum in Mexico City. Below are links to the recording and related news articles:

- https://www.facebook.com/MilenioDiario/videos/10155685297238500/?hc_ref=ARQr58FfMdXYgC47DqQ1tWdFlPa6pH4aL0TUJSJXzkw5sSAufNb3tFORPkueHLrMubo;
- http://www.milenio.com/df/invertir-transporte-publico-experto-foros-movilidad-milenio_0_1104489566.html;
- http://www.milenio.com/region/cdmx-gastar-tecnologia-erick_guerra-urbanismo-movilidad-calidad_del_aire-milenio_0_1110488969.html.

The UT Austin CM$^2$ team organized a CM$^2$ Fall Exhibition on December 1, 2017 to present ongoing research projects in a poster session format. The exhibition provided opportunities for faculty and student researchers to learn about one another's research and give them ideas for new projects, specifically collaborative projects. For example, here is a comment we received from our center's researcher Dr. Robert Harrison: "I want to reiterate my remarks in our conversation at the CM$^2$ Fall Exhibition 2017… Within each university partner, researchers can see how their work might fit into other projects in the program. Mine, for example, links to at least 3 other subjects being undertaken and it took the posters to show me."

CM² partners at UT Austin have launched a Monthly Brownbag Series in February 2018 to provide an opportunity for research teams to share their research projects with CM² colleagues and other faculty members within the university. The links to these presentations are available on the CM² website at http://sites.utexas.edu/cm2/tech-transfer/education/

# 3. PARTICIPANTS & COLLABORATING ORGANIZATIONS

## A. Organizations Involved as Partners

The members of the consortium include The University of Texas at Austin, Louisiana State University, Texas Southern University, and the University of Pennsylvania, with affiliates at Cornell University and Rutgers University. Additionally, Table 2 presents a list of current CM² partners.

**Table 2: Current CM² Partners**

| Organization Name | Location | Contribution |
|---|---|---|
| Austin, San Antonio, Houston B-Cycle | TX | Data Support |
| City of Austin DOT | Austin, TX | Data Support |
| Houston Metro | Houston, TX | Data Support |
| Alamo Area Metropolitan Planning Organization | San Antonio, TX | Data Support |
| North Central Texas Council of Governments (NCTCOG) | Dallas, TX | Data Support |
| Houston Galveston Area Council (H-CAC) | Houston, TX | Data Support |
| Capital Area Metropolitan Planning Organization (CAMPO) | Austin, TX | Data Support |
| Philadelphia Metropolitan Planning Organization | Philadelphia, PA | Data Support |
| Texas Department of Transportation | Austin, TX | Data Support |
| Center for Transportation Research's Freight Modelling Lab; Urban Information Lab, University of Texas at Austin | Austin, TX | Facilities |
| CentroGeo in Mexico City | Mexico | In-Kind Support, Research |
| UT Austin Parking and Transportation Service | Austin, TX | Research |
| Original Equipment Manufacturers (truck manufacturers) | TX | Research |
| Maricopa Association of Governments | Phoenix, AZ | Research |
| Autodesk | Multiple | Research |
| College for Creative Studies | Detroit, MI | Research |

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| Boston Region Metropolitan Planning Organization (MPO) | Boston, MA | Research |
| Rhode Island State Planning Council | Providence, RI | Research |
| (Connecticut) Capitol Region Council of Governments | Hartford, CT | Research |
| The New York Metropolitan Transportation Council | New York, NY | Research |
| Delaware Valley Regional Planning Commission | Philadelphia, PA | Research |
| Baltimore Metropolitan Council | Baltimore, MD | Research |
| Metropolitan Washington Council of Governments | Washington, D.C. | Research |
| Cornell University | Ithaca, NY | Research |
| Rutgers University | New Brunswick, NJ | Research |
| Texas Central Railways | Houston, TX | Research |
| Embry-Riddle Aeronautical University | Randolph AFB, TX | Research |
| Capital City Village | Austin, TX | Research, Facilities |
| CAPCOG, Area Agency on Aging | Austin, TX | Research, Facilities |
| Austin Jewish Community Center | Austin, TX | Research, Facilities |
| Roman Catholic Diocese of Austin | Austin, TX | Research, Facilities |
| Islamic Center of Greater Austin | Austin, TX | Research, Facilities |

CM$^2$ has also developed a Support Partnership Program (SPP) at three financial support levels to be rolled out during July and August 2018 to select private sector partners in Austin. The SPP will include collaboration with private sector partners, attendance at CM$^2$ meetings, brown bags and other events, interaction with students, faculty and researchers, and participation in class and K-12 related activities. Preliminary outreach has occurred with the Women's Transportation Seminar Heart of Texas Chapter to discuss collaborative K-12 activities to begin during summer 2018.

The University of Pennsylvania created a bi-partisan panel to provide advice and guidance to Dr. Yaro and Dr. Taylor's project assessing planning reforms for the next generation of megaregion transportation infrastructure investments. Participants include:

- Rich Barone, Vice President for Transportation, Regional Plan Association
- Kip Bergstrom, Principal, Rebooting New England, and former Deputy Commissioner Connecticut Department of Economic and Community Development
- Emil Frankel, Former Assistant Secretary, USDOT
- Foster Nichols, Principal, WSP Engineers
- Peter Peyser, Principal, Peyser Associates, LLP
- Mark Pisano, Professor of Practice, University of Southern California
- Rob Puentes, President and CEO, Eno Center for Transportation
- Karen Rae, Senior Advisor for Innovative Project Delivery, Empire State Development, State of NY
- David Seltzer, Principal and Co-Founder, Mercator Advisors, LLC
- Lyle Wray, Executive Director, Capitol Region Council of Governments, Hartford, CT

## B. Other Collaborators or Contacts

The CM² team has consistently promoted multi-jurisdictional collaboration between consortium members by setting aside funds specifically for multi-institutional proposals. There are two multi-institutional projects currently in progress, and two more multi-institutional projects have already been selected for Year 3, one of them involving all consortium partners. Dr. Ming Zhang and Dr. Fritz Steiner have continuously collaborated on the CM² Summer Forum to be held at the University of Pennsylvania in June 2018.

In addition, the researchers have collaborated intra-institutionally. For example, Dr. Junfeng Jiao and Dr. Briscoe verified the inclusion of estimated volume of pedestrian, car, bus, and train going through a hypothetical station. Ms. Loftus-Otway, Dr. Oden, and Dr. Sciara have continuously updated each other on their ongoing projects, including using one-another for review of survey's and other materials. They have set up a collaborative file sharing box on UTA's in-house file sharing system.

Dr. Guerra's research involves researchers from Cornell University and Rutgers University. They have also worked closely with the Philadelphia MPO, which provides the main data source and has a primary interest in the study results. Individuals include Christopher Puchalsky, Benjamin Gruswitz, Sarah Moran and Matthew Gates.

# 4. IMPACT

## A. Impact on the Development of the Principal Discipline(s) of the Program

**Transportation planning and policy** at the megaregional scale is currently underdeveloped. Multiple projects are reviewing how laws, regulations, and policies will need to be adapted for megaregion mobility and equity. Investigating how MPOs, State DOTs and other transportation stakeholders are structured and how they currently conduct planning will be a critical output for developing our future transportation network. Understanding where policy tweaks or major regulatory changes are required will assist policy makers as they develop statutes and regulatory environments for creating megaregion mobility, equity, and economic competitiveness.

**Traffic assignment** for very large networks (akin to megaregions) has always been a tricky problem for researchers. Multiple research studies, mainly focusing on evacuation during a calamity, have noted that solving these scenarios has either been impossible with existing resources, or extremely complicated, which requires that scenarios to be extensively modified. The work being done in the current study addresses this issue and helps make problems on this scale easier to solve. Larger networks can now be solved with existing computation power, allowing for researchers to use this methodology for running complex scenarios. This is especially useful in megaregional and evacuation studies, wherein huge networks need to be analyzed in a short time.

**Freight modelling practices**, and some of its techniques are already paying dividends in separate projects for TxDOT. Having more accurate freight modelling is essential in public policy decisions,

because freight transportation has an outsized impact on infrastructure maintenance costs and the emission of pollutants that affect public safety and climate change.

Improving our understanding of how **crowdsourcing can be used** in megaregion planning is a necessary first step to understand how slow moving transportation such as biking can be integrated to the overall transportation system and solve the first and last mile problem. In addition, this ties into more effective planning and funding decision making for multi-modal solutions to megaregional commuting.

Research into **transit deserts, and transit funding**, including the impacts of connected and automated vehicles will also be critical for policymakers involved in developing law, policies, funding, planning, and designing our future megaregional transportation systems and cities. Finally the past few years has seen multiple natural disasters affecting megaregion areas within the U.S. and globally. Understanding the flows of people and goods responding to and reacting after natural disasters across megaregional areas will be critical in designing disaster response mechanisms, securing funding, and understanding changing land use patterns, and developing robust infrastructure networks.

### B. Impact on Other Disciplines

Dr. Boyles notes that, "The comparison of network decomposition algorithms should be useful to researchers in any field dealing with networks that focus on metrics other than length. Existing network decomposition algorithm standards are based purely on length, but fields such as logistics may benefit from the comparisons provided by our research study".

### C. Impact on the Development of Transportation Workforce Development

The research projects have provided opportunities for students in engineering, policy, business administration, planning, and law. Students have been exposed to and developed GIS projects, statistical analysis, algorithm development, model development, freight analysis, network decomposition, jurisdictional planning, developing policy, and legal analysis. Students have assessed programs and policies, regional and local planning issues, and developed website(s) as well as journal articles and papers. The 21st century transportation and planning professional will need to work in collaborative, technology driven environments. CM² activities engage students through our brown bag series each month, annual meetings, K-12 outreach and other project work where there is opportunity to see one another's research through different lenses. In addition, many of our PIs have hired students out of different disciplines to work together on projects and classroom output. As an example, our current student cohort includes graduate students in civil engineering, community and regional planning, law, and policy, and undergraduate students in business and mechanical engineering.

Finally, models, products, and results will be shared with the many transportation and planning agencies that have kindly supplied data and resources or met with researchers during the projects. Models and datasets are anticipated to be provided free of charge to the agency staffers affording them critical tools to plan, design, and develop transportation infrastructure and plans.

### D. Impact on Physical, Institutional, and Information Resources at the University or Other Partner Institutions

Knowledge gained across multiple projects has been used to assist the research of other projects in the UTC using similar models. Dr. Walton at UTA notes that "*When the final results of the project are shared, it will be possible to share the modelling techniques with the other universities involved in CM²*".

Dr. Landis at the University of Pennsylvania notes that "*The project modeling procedures and datasets as implemented in the TransCad package will be made available to faculty and students at the University of Pennsylvania for instructional and research purposes beginning in the fall of 2018.*"

### E. Impact on Technology Transfer

Initial modelling results in multiple projects will be utilized by State DOTS, cities, counties, and MPOs as they develop long and short range transportation plans and programs. Regulatory and policy analysis conducted under CM² will provide policymakers with draft regulatory tools and analysis to implement or amend laws and policies currently in place.

The University of Pennsylvania notes that "*once our modeling procedures are complete, we will begin working with MPOs inside and beyond our study region to make them available at no cost*".

### F. Impact on Society beyond Science and Technology

Given that the world is rapidly urbanizing into agglomerations according to United Nations reports over the past ten years, investigating how cities, regions, and megaregions will conduct multi-jurisdictional transportation planning activities, secure funding, and craft environmental policies is extremely important. Without the development of research into how successful multi-jurisdictional planning and policy can be implemented into (i) rapidly evolving smart cities (ii) environmental justice communities  (iii) communities impacted by natural disasters and (iv) rural heartlands being left behind, finding solutions to these cross-cutting problems is a necessary part of CM²'s research mission. With transportation investment dollars becoming scarce, there is a compelling need to implement transportation planning procedures that can look beyond parochial geographies and single-modes to consider the larger national and regional productivity, equity, and environmental considerations. Strategies that provide more equitable access to transportation and advocate for cross-subsidies among programs and modes is important for future challenges. This serves as a means of funding transit in underserved areas, both urban and rural. Informing regulatory policy and economic investment decisions for cooperative mobility for competitive megaregions will require policy makers and stakeholders to have basic research fundamentals detailed, models developed, and networks analyzed.  CM² through its projects is beginning to peel back the layers to develop foundational components for multi-jurisdictional planning in the 21st century and beyond.

### G. Additional Information regarding Products and Impacts

Impacts and products being developed by CM² will improve process and modelling software to address multiple challenges within the megaregions under current funding constraints and

impending disruptive technology changes anticipated globally. Some initial research products have been widely reported across the country, for example Dr. Jiao's work on transit deserts has been cited in:

- Wired: http://www.wired.co.uk/article/uber-running-private-london-bus-routes-citymapper-ford
- Finance and Commerce: https://finance-commerce.com/2018/03/people-are-stranded-in-transit-deserts-across-the-u-s/
- Smithsonian: https://www.smithsonianmag.com/innovation/dozens-us-cities-have-transit-deserts-where-people-get-stranded-180968463/
- Houston Chronicle: https://www.houstonchronicle.com/local/gray-matters/article/transit-deserts-reinforce-economic-inequality-12750671.php

Dr. Harrison and Dr. Matthews' results provide significant proof that new trucks are more fuel efficient and offer lower ton-mile costs to Class 8 operators, particularly those in the truckload (TL) and less then truckload (LTL) trucking classes. Operators are selecting brake systems that prevent accidents related to frontal accidents related to headways. This should play a crucial role in reducing future fatality and serious accidents between Class 8 trucks and lighter vehicles. Their work shows that Class 8 trucks are on a declining path in terms of cost-allocation support for the maintenance and new construction needs on the highways used by the trucks.


# 5. CHANGES/PROBLEMS


Nothing to report.


# 6. SPECIAL REPORTING REQUIREMENTS


Nothing to Report.